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

CONTENTS

Annexes

SECTION A. General description of project activity

A.1. Title of the project activity:

Heilongjiang Huanan Hengdaishan East (II) Wind Power Project

Document version number: 5.0

Document version date: 12/02/2009

A.2. Description of the project activity:

Heilongjiang Huanan Hengdaishan East (II) Wind Power Project is to build and operate a 20.4 MW grid connected wind farm, located in Hengdaishan, Huanan District, Jiamusi City, Heilongjiang Province, P.R.China. The scenario existing prior to the start of the implementation of the project activity is Northeast China Power Grid providing the same electricity supply as the proposed project. The project installs totally 24 wind turbines with a nominal capacity of 850KW. During the operational period, the wind farm of which the plant load factor designed in FSR is 23.7 percent have delivered about 42.338GWh to the Heilongjiang Power Grid that is integral to and forms a part of the Northeast China Power Grid. The electricity generated by the project is expected to displace grid electricity generated from fossil fuels and reduce GHG emissions by an amount of approximately 48,426 tCO_{2e}(tons of carbon dioxide equivalent) per year for the duration of the project activity. A reduction of approximately 338,982 tCO_{2e}, is forecast for the first 7-year crediting period.

The baseline scenario is the same as the scenario existing prior to the start of implementation of the project activity.

Wind power is a priority development area as a green energy supply technology in China. The Project can improve energy security and air quality and contribute to sustainable development in various ways:

- It increases the share of renewable energy in the national grid and helps to stimulate the growth of the wind power industry in China, thereby contributing to the national private expertise in the installation and operation of such technology.
- It is accorded with the government's energy policy objective, which promotes the local economy and creates local employment during the installation and operation periods.
- It reduces greenhouse gas emissions resulting from the power generation industry in China, compared to a business-as-usual approach.

- Wind power development is at beginning stage both in local area and China. The successful implementation of the project will be serving as a demonstration for wider deployment of wind power technology in local and national level.

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)	Huanan Longyuan Wind Power Co., Ltd.	No
Switzerland	Essent Trading International S.A.	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time ofrequesting registration, the approval by the Party(ies) involved is required.		

Please see Annex 1 for detailed contact information

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A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

China

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

Heilongjiang Province

A.4.1.3. City/Town/Community etc:

Longshan Town, Huanan District, Jiamusi 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 on the Hengdai Mountain in Huanan District, Jiamusi City, Heilongjiang Province of China. The geographical co-ordinates are: longitude 130º09.958′, and northern latitude46º17.038′, and the maximal altitude 298 m. Figure 1 gives an illustration of the location.

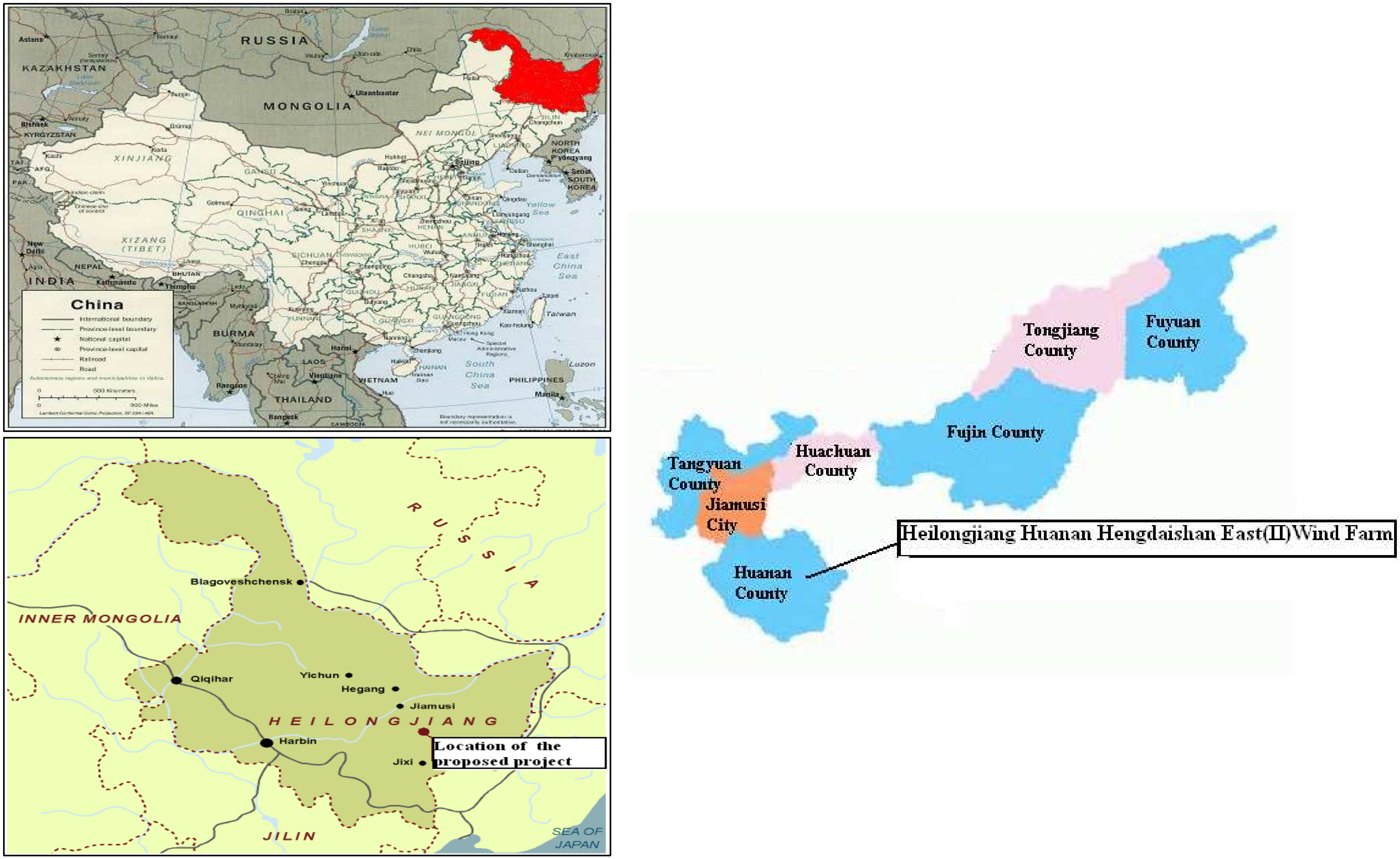

Figure 1 Location of Heilongjiang Huanan Hengdaishan East(II) Wind power Project

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

Category: Renewable Energy in grid connected applications

Sectoral Scope 1: Energy Industries

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 replace the same amount of power generation in Northeast China Power Grid.

The proposed project is to install totally 24 wind turbines with a nominal capacity of 850 KW, providing a total capacity of 20.4 MW. Table 1 provides all technical information for Heilongjiang Hengdaishan East (II) Wind Power plant. The proposed project will adopt a unit connection mode of one-turbine-one-transformer, which will utilize a 900kVA converting box to switch 35kV. By the 35kV line the electricity generated by the proposed project is linked the 110kV substation in the Heilongjiang Huanan Hengdaishan east windfarm, and then delivered to the Northeast Power Grid by Huanan substation. The wind turbines and transmission facility is to be monitored and controlled either by onsite central control room or remotely through the internet. The proposed project shares the same transformer, substation or transmission line with Heilongjiang Huanan hengdaishan west wind power project and Heilongjiang Huanan hengdaishan east wind power project. To monitor the net electricity supplied by the projects, four electronic multifunctional electricity meters (accuracy degree is 0.2s-0.5, bidirectional) are installed in the transformer substation.

The wind turbine (Gamesa58-850kW and Gamesa52-850kW) used by the proposed project is the primary production of Gamesa Eólica .Gamesa Eólica is one of the biggest manufacturers and supplies of technologically advanced products installations and services in the renewable energy sectors, which has set up the subsidiary company to produce the wind turbines in Tianjin. At present, the accessories of the wind turbine (Gamesa58-850kW and Gamesa52-850kW) mostly yielded domestically with the percent of 70. The main characteristics of Gamesa Eólica's wind turbines are their robustness, adaptability, reliability and maximum performance on all types of sites and in all types of winds.

Therefore, the transfer of technology contributes to promote the development of domestic wind turbines and maximum performance on all types of sites and in all types of wind resources.

Table 1 Technical Characteristics of Wind Turbines for the proposed project

	G52-850	G58-850
Manufactory	Tianjin in China	Tianjin in China
Number	3	21
Rotor		
Type	3-bladed, horizontal axis, upwind	3-bladed, horizontal axis, upwind
Rotor Diameter	52 m	58m
Swept Area	2124 m^2	2624 m^2
RPM	14.6-30.8 RPM	14.6-30.8 RPM
Cut in-cut-out wind	4 / 25 m/s	3 / 21 m/s
Nominal Output at velocity	14 m/s	14 m/s
Design conditions in terms of velocity	70 m/s (IEC)	70 m/s (IEC)
Lifetime of turbine	20 years	20 years
Blades		
Blade Length	25.3 m	28.3 m
Material	Epoxy reinforced glass fibre	Epoxy reinforced glass fibre
Generator		
Nominal Power	850 kW	850 kW
Type	Doubly fed machine	Doubly fed machine
Synchronous speed	1620 r.p.m	1620 r.p.m
Towers		
Type	Tubular (cone-shaped)	Tubular (cone-shaped)
Hub heights	65 m	65 m

Data sources from：http://www.gamesa.es/files/File/G52-ingles.pdf
http://www.gamesa.es/files/File/G58-ingles.pdf

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

Years	**Annual estimation of emission reductions in tonnes of CO_2 e**
01/07-31/12/2009	24,213
2010	48,426
2011	48,426
2012	48,426
2013	48,426
2014	48,426
2015	48,426
01/01-30/6/2016	24,213
Total estimated reductions (tonnes of CO_2e)	338,982
Total number of crediting years	7
Annual average over the crediting period	48,426

of estimated reductions (tonnes of CO_2e)	

A.4.5. Public funding of the project activity:

No public funds from countries in Annex I is involved in the project.

SECTION B. Application of a baseline and monitoring methodology:

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

Methodology:

Approved consolidated baseline and monitoring methodology ACM0002 (Ver 08):

"Consolidated baseline methodology for grid-connected electricity generation from renewable sources"

Tools:

- Tool for the demonstration and assessment of additionality (Ver 05.2)
- Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion (Ver. 02)
- Tool to calculate the emission factor for an electricity system(Ver 01.1)

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/methodologies/PAmethodologies/approved.html.

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

The above methodologies are applicable to the project activities under the following conditions:

- The project is a grid-connected zero-emission renewable electricity capacity additions from wind source;
- The project is not an activity that involves switching from fossil fuels to renewable energy at the site of the project activity;
- The geographic and system boundaries for the Northeast China Power Grid can be clearly identified and information on the characteristics of the grid is publicly available.

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

The proposed project is the installation of a new grid-connected renewable power plant, and the baseline scenario is the following:

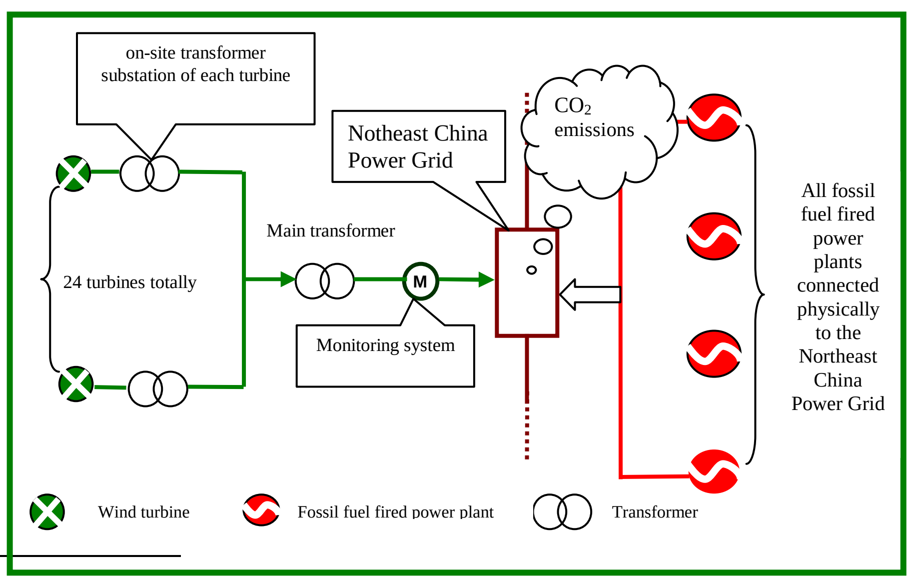
Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".

Spatial boundary:

The spatial extend of the project boundary includes the proposed project and all the other power plants connected to Northeast China Power Grid. The Northeast China Power Grid is the project electricity system, which is defined by the spatial extent of the power plants that can be dispatched without significant transmission constrains.Using the boundary definitions of the Chinese NDRC[1], the Northeast China Power Grid consists of Liaoning, Heilongjiang and Jilin power grids. In Northeast China Power Grid, 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[2]. The connected electricity system is North China Power Grid, which is connected by transmission lines to the project electricity system, and the Northeast China Power Grid has the electricity exports to the North China Power Grid. The flow diagram of the project boundary is as in figure 2.

Emission sources:

For the baseline determination only CO_2 emissions from electricity generation by fossil fuel fired power plant that is displaced due to the project activity are taken into account.



[1] http://cdm.ccchina.gov.cn/web/index.asp .

[2] China Electric Power Yearbook 2007

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	CO_2 emissions from electricity generation in fossil fuel fired power plants that is displaced due to the project activity	CO_2	Yes	Major emission sources
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
Project Activity	Wind power	CO_2	No	According to ACM0002, the project emission of renewable energy project activity is not considered.
		CH_4	No	According to ACM0002, the project emission of renewable energy project activity is not considered.
		N_2O	No	According to ACM0002, the project emission of renewable energy project activity is not considered.

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

According to the description in the approved consolidated baseline and monitoring methodology ACM0002, if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

> Electricity delivered to the grid by the project 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) calculated described in the “Tool to calculate the emission factor for an electricity system”.

The proposed project is connected to the Heilongjiang Grid, an integrated part of the Northeast China Grid. So Northeast China Grid is considered as the “connected electricity system”, which is defined as the “project boundary” of the proposed project. It includes the grids of Liaoning Grid, Jilin Grid, and Heilongjiang Grid. Therefore, being a project with the boundary of

Northeast China Grid that does not modify or retrofit an existing electricity generation facility, the baseline scenario of the proposed project can be identified as the following:

> Electricity delivered to the grid by the proposed project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources within the Northeast China Grid, as reflected in the combined margin (CM) calculated described latter.

The analysis and description in B.5 and B.6 will support the baseline scenario shown above.

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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	04/2006	The EIA of the proposed project
2	05/2006	The approval letter by Environmental Protection Bureau of Heilongjiang Province
3	11/11/2007	The provisions about economical estimation of the proposed project by the board of directors
4	12/2007	The feasibility study report of the proposed project with CDM consideration
5	05/02/2008	The meeting about CDM development of the board of directors
6	19/02/2008	The approval letter by Development and Reform Commission of Heilongjiang Province
7	29/02/2008	Wind turbines purchasing agreement
8	20/03/2008	CDM development contract between Huanan Longyuan wind power Co.Ltd and China Fulin Windpower Development Corporation
9	15/04/2008	The construction contract
10	15/04/2008	The project construction permission for the proposed project issued by the construction supervision company.
11	04/07/2008	The LoI signed by the project owner with EDF Trading Limited
12	07/2008	Wind turbines installation contract
13	10/12/2008	The letter of approval the DNA of China
14	19/12/2008	The letter of approval from the DNA of Switzerland
15	01/05/2009	Expected operational date of the project activity
16	01/07/2009	Expected registered date of the project activity as a CDM project

It can be found from the above table that the CDM was essential for project owner to go ahead with the implementation of the proposed project.

At the beginning of the feasibility study report for the proposed project, the project owner thought about the adverse effect of technical risk and financial risk on the economical attraction of the proposed project, based on the developmental experiment of same types of wind power plants in Heilongjiang Province. To implement successfully the FSR of the proposed project, the board of directors held the special meeting to research the measures to solve the unexpected disadvantageous economical conditions including applying for CDM assistant. According to the provisions of the board of directors and actual IRR, the design company compared the difference between IRR with the support of CDM and IRR without the support of CDM in the FSR of the proposed project. Finally, the FSR of the proposed project was approved by Heilongjiang province DRC on 19th February 2008, in which the IRR of the project was 7.22% with the expected tariff of 0.5622 RMB/kWh (Excluding VAT). In the feasibility study report of the proposed project, the project owner thought about the support of CDM with the expected IRR of 10.76% that is higher than the benchmark (8%)。Therefore, the directorate thought that the proposed project could be considered as financially attractive. Under this condition, the project owner used the experiences of CDM implementation on Heilongjiang Huanan Hengdaishan West Windpower project and implements the CDM application to obtain the revenues resulted in the CO_2 emission reduction for the propose project. After the project owner obtains the support from CDM consulting company, the proposed project began to perform the construction on *15th April 2008.*

The project uses the *Tool for the Demonstration and Assessment of Additionality (version 05.2)* to demonstrate the additionality .It is including the steps as follows:

Step1. Identification of alternatives to the project activity consistent with current laws and regulations.

Define realistic and credible alternatives to the project activity(s) through the following Sub-steps:

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

To provide the same output or services comparable with the proposed CDM project activity, these alternatives are to include:

a) The proposed project not undertaken as a CDM project activity but as a commercial project;
b) The fossil fuel power plant with the same annual electricity output as the proposed project;

c) Other power plants using other sources of renewable energy with the same annual electricity output as the proposed project;
d) The Northeast China Power Grid as the provider for the same capacity and electricity output as the proposed project.

In the Northeast China Power Grid, other renewable energies including hydropower, solar PV, biomass and geothermal are the possible grid-connected technologies. Due to the technology development status and the high cost for power generation, solar PV, geothermal and biomass of the similar installed capacity as the proposed project are alternatives far from being attractive investment in the grid in China[3]. Only hydropower projects have an investment return that can compete over that of wind power projects in China. However, the proposed project is located in Northeast China, where winter is very long. Rivers ice up from November to March the next year, which is 5 months per year, and the hypsography of the city is flat[4], as a result, it is not a good place to invest hydropower project. Moreover, the proposed project owner is only dedicated to wind power development in Heilongjiang Province, and has no experience and ability to develop other renewable energy power plants. So the scenario c) couldn't be considered as an alternative scenario.

Outcome of Step 1a:
Four realistic and credible alternatives to the project activity are selected and the scenario c) is excluded.

Sub-step1b. Consistency of mandatory laws and regulations

As the annual operation hours of a coal-fired power plant and a wind farm differs considerably, the annual electricity generation and associated supply reliability for the two, which has equivalent installed capacity, remain incomparable. Based on the latest national power statistic, the operational hour of a fossil fuel plant (5612 hours) is about 2.7 times more than that of the proposed project (2075.4 hours) with the same capacity[5]. Therefore, a coal-fired power plant which provides equivalent annual electricity generation would require an installed capacity lower

[3] http://jjckb.xinhuanet.com/cjxw/2007-11/27/content_75467.htm; http://finance.people.com.cn/GB/1038/59942/59949/6294546.html

[4] http://www.sinoct.com/hometown/homeshow.asp?id=9583;

http://baike.baidu.com/view/17769.htm

[5] China Electric Power Yearbook2007, page626

than 10MW. According to Chinese power regulations, coal-fired power plants of less than 135MW are prohibited for construction in the areas covered by large grids[6].Alternative b) is not in compliance with Chinese regulations. Therefore, b) is not a realistic and credible alternative.

Outcome of Step 1b:

Mandatory legislation and regulations to each alternative are taken into account in sub-step 1b.Based on the above analysis, the proposed project activity is not the only alternative amongst the ones identified that is in compliance with legal and regulatory requirements. Therefore, the proposed CDM project activity may be additional.

Step2. Investment analysis

This step will determine whether the project is the economically or financially less attractive than other alternatives without the revenue from the sale of CERs.

Sub-step 2a. Determine appropriate analysis method

Tool for the Demonstration and Assessment of Additionality (version05.2) provides three analysis methods to apply for the investment analysis: the simple cost analysis (option I), the investment comparison analysis (option II) and the benchmark analysis (option III).

For the proposed project, the simple cost analysis method is not applicable because the project activity will produce economic benefit (from electricity sale) other than CDM related income. The investment comparison analysis method is also not applicable because the baseline scenario is the Northeast China Power Grid rather than a new investment project.

To conclude, the proposed project will use the benchmark analysis method based on total investment IRR to identify whether the financial indicators of the proposed project is better than relevant benchmark value.

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

In according with *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects* issued by former State Power Corporation of China[6], the financial internal rate of return (IRR) as benchmark in China's power generation industry is 8% considering economic assessments of hydropower projects, fossil fuel fired projects, transmission and substation

[6] *On Prohibition of 135MW and Smaller-scale Coal-fired Power Plants, General Office of State Council(*http://www.gov.cn/gongbao/content/2002/content_61480.htm*)*

[6] http://www.law-lib.com/law/law_view1.asp?id=8867

projects, especially the interest rate of commercial loans over five years. Nowadays China's existing wind power projects have also applied it as the benchmark IRR.

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

(1) Basic parameters for calculation of financial indicators

According to the feasibility study report of the proposed project, the parameters for calculation of financial indicators are shown in Table 2.

Table 2 Main parameters for calculation of financial indicators

Items	Unit	Amount	Data source
Capacity	MW	20.4	FS
Static total Investment	Million RMB	178.79	FS
Annually output	GWh/year	42.338	FS
Annually average Operation cost	Million RMB	3.92	FS
Electricity Tariff (Excluding VAT)	RMB/kWh	0.5622	FS
Value Added Tax (VAT)	%	8.5	FS
Income tax	%	25	FS
Expected CERs Price	EUR/tCO_2	12.60	Letter of intent
Project life time	Year	20	FS
CERs crediting time	Year	7×3	Section C

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

In according with the benchmark analysis method, the proposed project will not be considered as financially attractive if its financial indicators (such as IRR) are lower than the benchmark rate. Table 3 shows the IRR of the proposed project with and without CERs revenues. Without CERs revenues, the IRR on the total investment is 7.22%, lower than the benchmark rate 8%. Thus the proposed project is not considered as financially attractive. However, taking into account the CERs revenues, the IRR on the total investment is10.77%, which is significantly improved and higher than the financial benchmark rate. Therefore, the proposed project with CERs revenues can be considered as financially attractive to the investors.

Table 3 Comparison of financial indicators with and without CERs revenues

Scenario	IRR (the benchmark of 8%)
Without CERs revenues	7.22
With CERs revenues	10.77

Sub-step 2d. Sensitivity analysis

The purpose of the sensitivity analysis is to examine whether the conclusion regarding the financial viability of the proposed project is sound and tenable with those reasonable variations in the assumptions.

Four factors are considered in following sensitivity analysis:

1) Total investment
2) Annual operation and maintenance cost(**O&M cost**)
3) Tariff
4) Plant load factor(PLF)

The fuor financial parameters were identified as the main variable factors for sensitive analysis of financial attractiveness. Their impacts on IRR of total investment were analyzed in the below tables (Table 4 –Table7).

Table 4 Sensitivity of total investment IRR to **Total investment**

IRR Range / Parameters	-7.5%	-5.6%	-5.0%	-2.5%	0%	2.5%	5.0%	7.5%	10%
Total investment	8.28	**8.00**	7.91	7.56	7.22	6.89	6.58	6.28	5.98

Table 5 Sensitivity of total investment IRR to **O&M cost**

IRR Range / Parameters	-34.5%	-7.5%	-5.0%	-2.5%	0%	2.5%	5.0%	7.5%	10.0%
O&M cost	**8.00**	7.39	7.33	7.28	7.22	7.16	7.10	7.04	6.98

Table 6 Sensitivity of total investment IRR to **Tariff**

IRR Range / Parameters	-10%	-7.5%	-5.0%	-2.5%	0%	2.5%	5.0%	5.55%	7.5%
Tariff	5.75	6.12	6.49	6.86	7.22	7.57	7.92	**8.00**	8.27

Table 7 Sensitivity of total investment IRR to **PLF**

IRR Range / Parameters	-10%	-7.5%	-5.0%	-2.5%	0%	2.5%	5.0%	6.4%	7.5%
PLF	5.96	6.28	6.59	6.91	7.22	7.57	7.83	**8.00**	8.14

As shown in the above tables, the tariff is the most important factor affecting the financial attractiveness of the proposed project. In the case that the tariff increases by 5.55%, the FIRR of

the proposed project begins to exceed the benchmark. According to the market rules of Northeast China power market, the proposed project is an un-tendering project that doesn't been implemented via public bidding while the tariff is regulated by the regulating entities. According to China's Management Rules on Tariff issued by NDRC[7], the tariff of the un-tendering projects should be determined by the government with reference to the tariff of tendering wind projects. Thereafter, the PPA of the tariff of power projects is determined by the grid company and project owners according to the guiding price of the government. As a whole, the tariff for newly built project is generally not allowed to be higher than the tariff provided in the latest guiding price .By this pricing principle, China government is gradually lowering down the wind power in-grid tariff[8.] Moreover, the trend of tariff for wind power projects in China is fleetly decreasing during the recent 10 years[9.] Recently, the tariff concluded in Heilongjiang province lately [10] shows: it is very difficult that the actual tariff will be higher than the expected tariff of 0.5622 Yuan. According to the National Development and Reform Commission issued the approval about the tariffs of the new wind plants[11] on 3rd *Dec* .2007, the tariff of the proposed project will be no more than 0.5622 Yuan/kWh (Excluding VAT). Therefore it is impossible that the expected tariff of the proposed project could increase 5.55%, so the proposed project is always lack of financial attractiveness.

The next important factor for financial attractiveness is the total investment. In the case that total investment decreases by about 5.6%, the IRR of the proposed project begins to exceed the benchmark. Since 81.39% of the total investment of the proposed project is used to the purchase and installation of electric equipments (wind turbines and transformers)[12].Moreover, the wind turbines demand exceeds supply in the whole world that leads the price of wind turbines gradually increasing [13].Hence, it is impossible to lower the expected total investment of the project in the Feasibility Study. Within the reasonable range of total investment, the proposed project is always lack of financial attractiveness.

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[7]Trial Measures for the Administration of the Pricing of, and the Sharing of Costs in Connection with, the Generation of Electricity Using Renewable Energy Resources, FAGAIJIAGE(2006) No.7

[8] http://www.eri.org.cn/manage/upload/uploadimages/eri200672795944.pdf

[9] http://www.2008red.com/member_pic_461/files/qiangweinengyuan/html/article_2757_1.shtml

[10] http://www.gov.cn/zwgk/2008-02/19/content_892937.htm

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

[12] The feasibility study report of Heilongjiang Huanan Yimashan Wind Power Project(P104)

[13] http://info.electric.hc360.com/2007/06/28101158551-6.shtml

The sensitivity analysis of PLF is equivalent to the sensitivity analysis of tariff (both impact the turnover the same way). In the case that the PLF increases by 6.4%, the FIRR of the proposed project begins to exceed the benchmark. According to the Chinese Renewable Energy Law enacted on January 1st 2006, wind power generation should be purchased fully by the grid[14]. Therefore, the PLF reflects the annual generation output of the proposed project, which depends on the average wind speed at the project site for a specific wind turbine. According to the feasibility study report of the proposed project, the annual output is estimated basing on the long term weather statistic data provided by local meteorological station and wind resources measurement, which first using professional software WAsP to select the rich wind source area, then using software WindFarmer to optimize the location of each turbine for maximize power generation. As shown in Figure 3, the average wind speed is 3.54m/s in the past 10 years. Moreover, the PLF value is positive correlation with the wind speed, the annual average wind speed of the project site tends to gradually be stable over the past 10 years for which data are available recently[15] as shown in Figure 2. Therefore, the probability that PLF is 6.4% higher than the estimated value is very small.

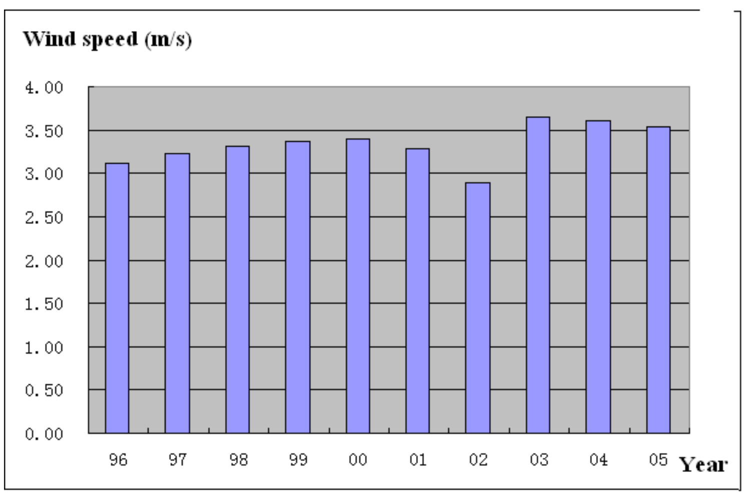

Figure 3 Average Wind speed provided by local meteorological station

[14] http://www.gov.cn/ziliao/flfg/2005-06/21/content_8275.htm

[15] The feasibility study report of the proposed project.

The impact of the annual O&M cost is the slightest. The FIRR of the proposed project could reach the benchmark when the annual O&M cost decreases by 34.5%. However, according to the Feasibility Study Report of the proposed project, the detailed operation costs is composed of four kinds of costs - maintenance costs, annual salaries for the employees, insurance premium of fixed assets and other costs. In the recent years, the price of material and salaries of the employees and tax rates are gradually increasing in Chin[16], especially the price rising of steels[17] that is the main material of the proposed project. At the same time, the maintenance costs for accessorial equipments of wind turbines are also increasing, because the wind turbines demand exceeds supply in the whole world[18]. As above description, the annual O&M cost is gradually increasing during the operation period for the proposed project. Therefore, it is impossible that the annual O&M cost could decrease 34.5%, so the proposed project is always lack of financial attractiveness within the reasonable range of annual O&M cost.

Outcome of Step 2:

After the sensitivity analysis it is concluded that the proposed CDM project activity is unlikely to be financially attractive, and then proceed to Step 4 (Common practice analysis)

Step 4. Common practice analysis

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

In 2006, the installed capacity of wind power accounted for only 1.24% of the total installed capacity in the Northeast Power Grid (including Liaoning ,Jilin and Heilongjiang province)and 0.38% of actual supply on the Northeast Power Grid[19], it is clear that wind power is not a common practice generally.

Before 2002, China wind farm often received high tariffs as no bidding process was required and power companies and grid companies share the same interests. So the wind power plants were

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[16] http://info.bm.hc360.com/2007/12/03102559376.shtml

http://www.chinadaily.com.cn/hqcj/2007-09/03/content_6075777.htm

[17] http://www.hnpi.net/fxyc/list.asp?id=950

[18] http://www.86wind.com/info/detail/4-5335.html

http://energy.people.com.cn/GB/5720709.html

[19] China Electric Power Yearbook 2007,p637,638

demonstration projects and enjoyed higher price than the present project, which are essential distinctions between the present project and the parts of existing similar projects. Thus they had no restrictions in power grid connection. Since 2002, there are several grid-connected wind farms similar to the present project in Heilongjiang province, as shown in Table 8.

Table 8 Grid-connected wind farms similar to the project in Heilongjiang province

project	Installed capacity(MW)	status	Tariff(excluding VAT) Yuan/kWh	Is it applying for CDM?
Huafu Mulan Wind Farm project	12	Operational (2003.12)	0.78	No. Demonstration Project
Huafu Fujin Wind Farm	24.3	Operational (2004.9)	0.78	No. Demonstration Project

Data source：http://www.cwea.org.cn/upload/200612391640820.doc
http://www.biox.cn/environ/200609/20060927025244_268647.shtml
http://cdm.unfccc.int/Projects/registered.html
http://www.dnv.com

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

Since the Shandong Rongcheng wind power plant that is the first wind power plant in China connected into the Grid and operated in May 1986, the development of wind power in China has carried through several different phases. The demonstration projects and experimental projects have been exploited to obtain the experiences for the extensive implementation in the first phased from 1986 to 1990. During this phase, four wind power plants had been built with the total capacity of 4.215MW. With the successful implementation of demonstration projects and the advance of wind technology, the development of wind power in China has come into the second phase from 1991 to 1995. During second phase, wind power technology has been spread step by step with the total capacity of 33.285MW.However, the scales of the wind power plants were yet small and the nominal capacity of wind turbines was under 500kW. After 1996, the nation added the investment on the wind power plants and promoted fleetly the development of wind power, including the scale, the technology and the max nominal capacity of wind turbines[20]. When the State Council approved Reform Plan of Power System[21] was implemented on 2002, the

[20] *http://www.ctgpc.com.cn/news/view_info.php?mNewsId=18194*

[21] http://hy.stock.cnfol.com/070518/124,1469,2981102,00.shtml

price cap regulation for wind power electricity tariff is impossible for wind farm developers[22]. Therefore, the phase from 1996 to 2002 should be third phase defined as the protective development. Hereafter, the development of wind power must follow the commercial rule after 2002.

The wind farms shown in Table 8 were constructed before 2002, which enjoyed higher tariff or constructed as demonstration projects[23]. Moreover, during this phase, the wind farms enjoyed other favourable policies from the nation including derating the tax and financial allowance[24], which are essential distinctions between the present project and the parts of existing similar projects in Table 8. Without all kinds of favourable policies, the proposed project faces the investment barriers and technology barriers. Since there is serious barrier for the proposed project, the CDM has been considered in the early evaluation period to overcome investment and technological barriers. Therefore, it is clear that wind power is not a common practice generally.

Outcome of Step 4:

Sub-steps 4a and 4b are satisfied, similar activities are observed, but essential distinctions between the project activity and similar activities had reasonably been explained, then the proposed project activity is additional.

B.6. Emission reductions:

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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 CO_2 emissions from electricity generation in fossil fuel fired

[22] http://www.ndrc.gov.cn/xwfb/t20050708_28096.htm

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

[24] http://www.grchina.com/gb/greenpower/advise-0-5.htm

power plants that are displaced due to the project activity, calculated as follows:

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

Where:

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[25], The spatial extent of the project boundary includes the proposed project and all power plants connected physically to the Northeast China Power Grid that the CDM project power plant is connected to. The Northeast China Power Grid is defined as the **project electricity system**, which consists of independent province-level electricity systems including Liaoning, Heilongjiang and Jilin 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. Power plants within the connected electricity system can be dispatched without significant transmission constraints but transmission to the project electricity system has significant transmission constraint.

Electricity transfers from connected electricity systems to the project electricity system are defined as **electricity imports** and electricity transfers to connected electricity systems are defined as **electricity exports**. The Northeast China Power Grid has the electricity **exports** to the North China Power Grid.

For the purpose of determining the build margin emission factor, the spatial extent is limited to the project electricity system (Northeast China Power Grid), since the electricity **exports** to North China Power Grid account for a very small percentage and recent or likely future additions to transmission capacity will not enable significant increases in **export**ed electricity.

For the purpose of determining the operating margin emission factor, electricity exports should not be subtracted from electricity generation data used for calculating and monitoring the electricity emission factors.

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

[25] http://cdm.ccchina.gov.cn/web/index.asp.

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[26] 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 should be documented in the CDM-PDD and not be changed during the crediting periods.

Power plants registered as CDM project activities should be included in the sample group that is

[26] 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.

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 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 5.43%,4.72%, 6.46%, 8.28% and 5.25%[27] of total generation of Northeast China Power Grid from the year 2002 to 2006 (China Electric Power Yearbooks 2003-2007). Therefore, method (a) is chosen to calculate OM emission factor for the proposed project.

In conclusion, the Ex ante option of the data vintages is chosen to calculate the emission factor of

[27] China Electric Power Yearbook 2003-2007

the Northeast China 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 (tCO_2/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:

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

Where:

$EF_{grid,OMsimple,y}$ = Simple operating margin CO_2 emission factor in year y (tCO_2/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)

$EF_{CO2,i,y}$ = CO_2 emission factor of fossil fuel type i in year y (tCO_2/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.

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 2005-2007and China Electric Power Yearbooks 2005-2007.

Given the above, the simple operating margin CO_2 emission factor ($EF_{grid,OMsimple,y}$) of Northeast China Power Grid is 1.2561 tCO_2**/MWh.** The detailed calculations and data are listed in the annex 3 (The baseline emission factor OM is same as that provided by Chinese NDRC, 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[28].

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.

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

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

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

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:

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

Where:

$EF_{grid,BM,y}$ =Build margin CO_2 emission factor in year y (tCO_2/MWh)

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

$EF_{EL,m,y}$ = CO_2 emission factor of power unit *m* in year y (tCO_2/MWh)

m = Power units included in the build margin

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

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. Then the following deviation was adopted to calculate the Build Margin emission factor. 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)

♦ Use of capacity additions for estimating the build margin emission factor for grid electricity.

♦ Use of weights estimated using installed capacity in place of annual electricity generation.

♦ 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).

Following the EB's guidance the build margin is calculated as follows:

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. 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.

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=1999, the total capacity addition during 1999 to 2006 consisting of 9079.1MW of fossil fuel fired capacity, 603.3MW of hydropower capacity and 0MW of nuclear power capacity, and 529.1MW of other capacity[29], the total capacity addition during 1999 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 CO_2 emissions from coal fired power generation, oil fired power generation, and gas fired power generation against total CO_2 emissions from fossil fuel fired power generation:

$$\lambda_{Coal,y} = \frac{\sum_{i \in COAL,j} FC_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} FC_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (4)$$

$$\lambda_{Oil,y} = \frac{\sum_{i \in OIL,j} FC_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} FC_{i,j,y} NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (5)$$

[29] China Electric Power Yearbook 2001-2007

$$\lambda_{Gas,y} = \frac{\sum_{i \in GAS,j} FC_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} FC_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (6)$$

Where:

$FC_{i,j,y}$ = The amount of fuel i (in a mass or volume unit) consumed by province j;

$NCV_{i,y}$ =Net calorific value (energy content) of fossil fuel type i (GJ/ mass or volume unit) ;
$EF_{CO_2,i,j,y}$ = CO_2 emission factor of fossil fuel type i in year y (tCO_2/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:

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

Where:

$EF_{Coal,Adv,y}$, $EF_{Oil,Adv,y}$ and $EF_{Gas,Adv,y}$ 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 China Power Grid (See Annex 3 for detailed calculation):

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

Where:

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

Following the four steps above, the build margin emission factor $EF_{grid,BM,y}$ of the Northeast China Power Grid is calculated to be 0.8068tCO_2/**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 NDRC, 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:

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

Where:
$EF_{grid,BM,y}$ =Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,OM,y}$ =Operating margin CO_2 emission factor in year y (tCO_2/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:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} = 1.1438 \text{ t}\mathbf{CO_2/MWh}$$

Project emissions

For wind power project activities, $PE_y = 0$

Leakage

For wind power project activities, $LE_y = 0$

Emission reductions

To sum up, the Emission reductions are calculated as follows:

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

Where:

ER_y = Emission reductions in year y (t CO_{2e}/yr).
BE_y = Baseline emissions in year y (t CO_{2e}/yr).
PE_y = Project emissions in year y (t CO_2/yr).
LE_y = Leakage emissions in year y (t CO_2/yr).

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

Data / Parameter:	*Fi,y*
Data unit:	t/m^3
Description:	Amount of fuel *i* consumed in year(s)
Source of data used:	China Energy Statistical Yearbook2003-2007
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Since the detailed fuel consumption data by power plants are not publicly available, therefore the aggregated data by fuel types are used instead
Any comment:	

Data / Parameter:	*GENi,y*
Data unit:	MWh
Description:	Electricity (MWh) delivered to the grid excluding low operating cost/must run power plants in year *y*
Source of data used:	China Electric Power Yearbook 2003-2007
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Since the detailed generation data by power plants are not publicly available, therefore the aggregated data by fuel types are used instead.
Any comment:	

Data / Parameter:	*NCVi*
Data unit:	$TJ/t(m^3)$
Description:	Net calorific value (energy content) per mass or volume unit of fuel *i*
Source of data used:	China Energy Statistical Yearbook 2003-2007
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to ACM0002, the national specific value shall be used preferentially
Any comment:	

Data / Parameter:	*OXIDi*
Data unit:	%
Description:	Oxidation factor of the fuel *i*
Source of data used:	2006 IPCC default value
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The country specific values of oxidation factors in China are not available. As such IPCC default values are used instead.
Any comment:	

Data / Parameter:	$EF_{CO2,i}$
Data unit:	tCO_2/TJ
Description:	CO_2 emission factor per unit of energy of the fuel *I*
Source of data used:	2006 IPCC default value
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The country specific values of fuel CO_2 emission factor in China are not available. As such IPCC default values are used instead.
Any comment:	

Data / Parameter:	Coal fire power supply efficiency
Data unit:	%
Description:	the best commercially available technology of coal fired power generation
Source of data used:	http://cdm.ccchina.gov.cn/web/index.asp
Value applied:	37.28
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to EB guidance, the statistics by State Electricity Regulatory Commission (SERC) on newly built thermal plants in 10^{th} "Five-Year Plan" period can be used.
Any comment:	

Data / Parameter:	Oil and gas fire power supply efficiency
Data unit:	%
Description:	the best commercially available technology of oil and gas fired power generation
Source of data used:	http://cdm.ccchina.gov.cn/web/index.asp
Value applied:	48.81
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to EB guidance, the statistics by State Electricity Regulatory Commission (SERC) on newly built thermal plants in 10^{th} "Five-Year Plan" period can be used.
Any comment:	

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

According to the calculation results in B6.1, the emission reductions of the proposed project are calculated as follows:

Baseline emissions

Operating Margin emission factor ($EF_{OM,y}$) (tCO_2/MWh) : 1.2561
Build Margin emission factor ($EF_{BM,y}$) (tCO_2/MWh) : 0. 8068
Baseline Emission factor (EF_y) (tCO_2/MWh) : 1.1438

Project emissions

According to the approved consolidated baseline and monitoring methodology ACM0002 (Version08):, the GHG emission of the proposed project within the project boundary is zero, i.e.

$$PE_y = 0$$

Leakage

According to the Approved consolidated baseline and monitoring methodology ACM0002 (Ver 08), the leakage of the proposed project is not considered,

$$L_y = 0$$

Project Emission Reductions

The emission reduction (*ERy)* by the project activity during a given year y is the difference between baseline emissions (*BEy*), project emissions (*PEy*) and emissions due to leakage (*Ly*), as follows:

$$ER_y = BE_y - PE_y - L_y$$

Where: according to the approved consolidated baseline and monitoring methodology ACM0002 (Ver 08), PE_y=0 and L_y=0. Therefore, the annual emission reductions of the project during the first crediting period are estimated to be:

$$ER_y = BE_y = EG_y \times EF_y$$

Annual generation (net of auxiliary power i.e. the on site electricity usage for the operation of the hydro station) is estimated as 42338MWh. Using the approach above, the annual emission reductions are estimated to be 48,426 tCO_2 .the proposed project activity is expected to achieve 338,982 tCO_2 of net emission reductions during the first 7-year crediting period. (details in Annex3).

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

Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
01/07-31/12/2009	0	24,213	0	24,213
2010	0	48,426	0	48,426
2011	0	48,426	0	48,426
2012	0	48,426	0	48,426
2013	0	48,426	0	48,426
2014	0	48,426	0	48,426
2015	0	48,426	0	48,426
01/01-30/06/2016	0	24,213	0	24,213
Total (tonnes of CO_2e)	0	338,982	0	338,982

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:	Electricity generated by the project
Source of data to be used:	Measured and verified against sales data
Value of data applied for the purpose of calculating expected emission reductions in section B.5	42338
Description of measurement methods and procedures to be applied:	Calculated based on the recording directly measured by metering systems installed at the project site. The recording frequency will be hourly measured and monthly recorded. The proportion of data to be monitored is 100% and the data will be archived electronically and kept during the crediting period and 2 years after. Double check by receipt of sales. The metering devices are calibrated as stated in B.7.2
QA/QC procedures to be applied:	The data will be directly used to calculate emission reductions. The record of sales to the grid and other relevant records are used to ensure consistency.
Any comment:	

Data / Parameter:	$EG_{self\text{-}use}$
Data unit:	MWh
Description:	Electricity utilized by the project
Source of data to be used:	Measured and verified against sales data
Value of data applied for the purpose of calculating expected	0

emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Calculated based on the recording directly measured by metering systems installed at the project site. The recording frequency will be hourly measured and monthly recorded. The proportion of data to be monitored is 100% and the data will be archived electronically and kept during the crediting period and 2 years after. Double check by receipt of electricity purchase. The metering devices are calibrated as stated in B.7.2
QA/QC procedures to be applied:	The data will be directly used to calculate emission reductions. The record of purchase from the grid and other relevant records are used to ensure consistency.
Any comment:	

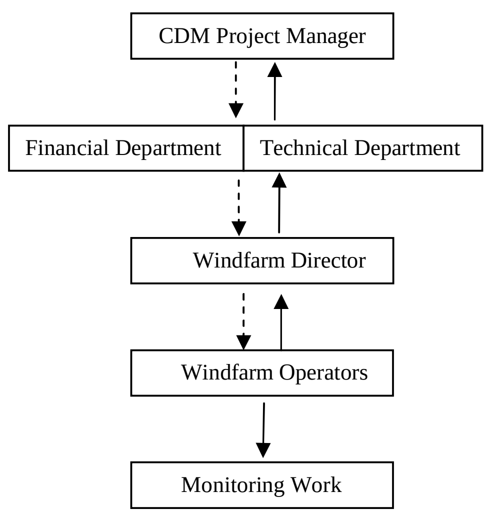
B.7.2. Description of the monitoring plan:

1. Introduction

The project adopts the approved consolidated baseline and monitoring methodology ACM0002 " Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (version 08) to determine the emission reductions from the wind farm. This plan describes the process in more detail.

2. Responsibility

This monitoring plan will be implemented by professional staff authorized by the owner of the proposed project, i.e. Huanan Longyuan Wind Power Co., Ltd. The management structure is illustrated as follows:



Windfarm Derector will collect the information and data required by the Monitoring Plan. The collected information will be documented and sent to the CDM manager and responsible staffs of the Hunan Longyuan wind power Co. Ltd. monthly. The CDM manager will in charge of the implementation of the Monitoring Plan and the confirmations on monitoring, calculation data and report to the General Manager of the company. Managers of the proposed project must maintain credible, transparent, and

adequate data estimation, measurement, collection, and tracking systems to maintain the information required for an audit of an emission reduction project.

3. Training

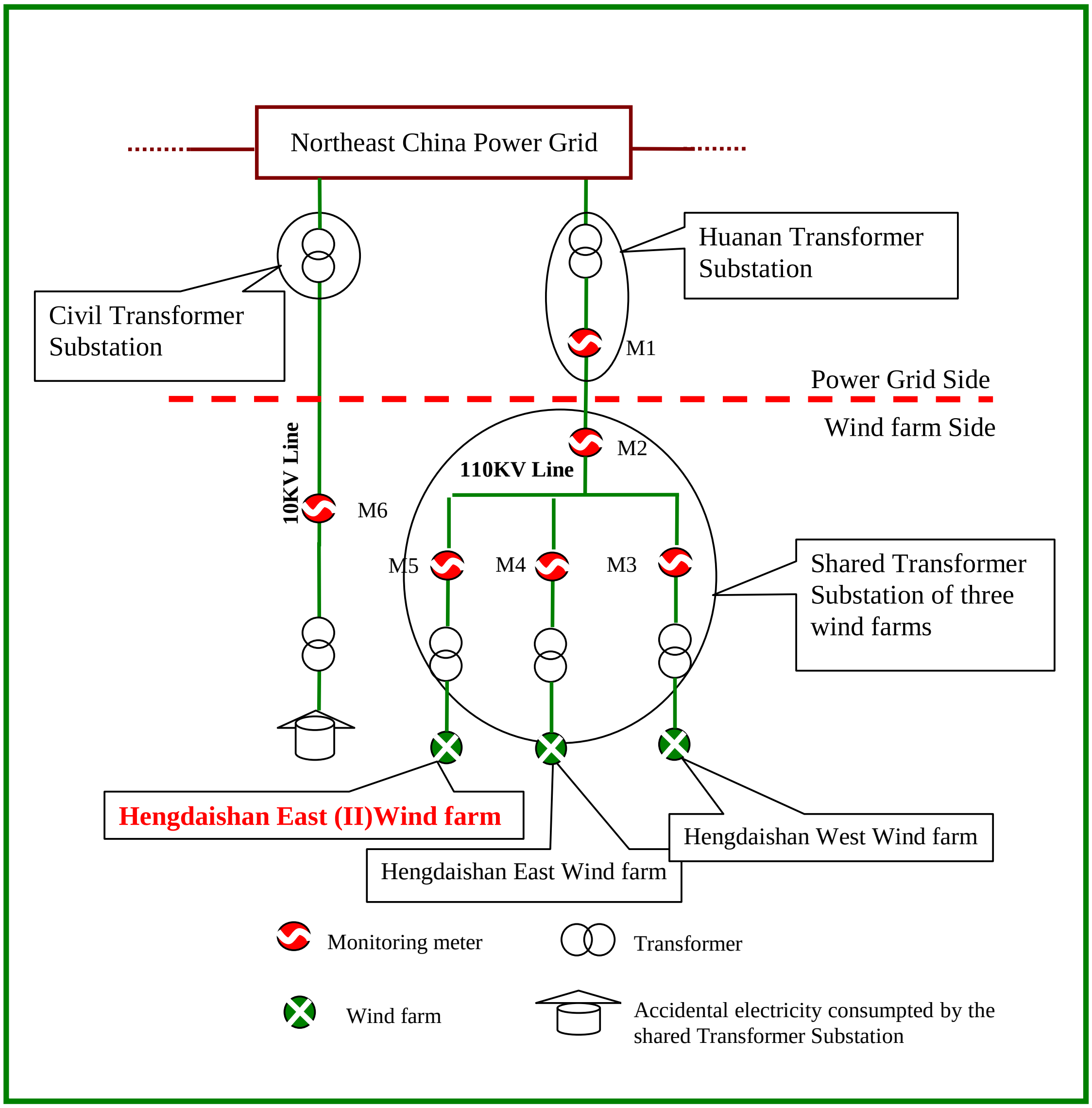
The Management Group has all received sufficient training in terms of monitoring and verification. They have received general training on wind power project operation organized the project owner, including reading and calibration of the meter, recording of the readings, adjustment of readings, and reporting of readings. On the other hand, they have received CDM training organized by professional CDM consulting company, including validation, registration and verification. When necessary, the CDM Manager is responsible for organizing or attending trainings on Monitoring and Verification.

4. Meters system

The proposed project shares the same transformer, substation or transmission line with Heilongjiang Huanan hengdaishan west wind power project and Heilongjiang Huanan hengdaishan east wind power project, and then delivered to the Northeast Power Grid by Huanan substation. The wind turbines and transmission facility is to be monitored and controlled either by onsite central control room or remotely through the internet.

As shown in diagram of monitoring meters, main meter M1 was installed at the 110kv side of Huanan Transformer Substation by the local electric power company. The check meter M2 was installed at the 110kv output side of the Shared Transformer Substation by project owner. The separate meters of each project in three wind farms M3 system, M4 syestem and M5 system were installed at the 110kv side of each project’s transformer by the project owner. The electricity of the two windfarms imported from the Grid under accidental condition is monitored by M6. M6 was installed at the 10kv side of the self-use transformer by the project owner. The draft diagram of monitoring meters and the detail information about the five meters are described as follows:

Metering diagram



Meter	Management	Calibration frequency	Accuracy degree	Monitoring style	Monitor data	Doubly check procedures
M1	Northeast China Power Grid	Annually	0.5s	bidirectional	Main Meter 1. Monitor the total electricity supplied to the Grid by three projects at the substation (EG_{total}); 1. Monitor the total electricity imported from the Grid by three projects at the substation ($EG_{total,\ self\text{-}use}$).	M1 checked doubly by M2
M2	Project Owner	Annually	0.5s	bidirectional	Check meter of M1	M2 checked doubly by the sum of M3 system,M4 system and M5 system
M3	Project Owner	Annually	0.5s	bidirectional	1. M3 system including four loop's meters, the recording of M3system is the sum of the four meters in the loops, respectively. 2.Monitor electricity generated by Hengdaishan West wind farm (E_{west}); 3. Monitor electricity imported by Hengdaishan West wind farm ($E_{west\ ,self\text{-}use}$)	M3 system checked doubly by the operatiaonal data of wind turbines of Hengdaishan West wind farm
M4	Project Owner	Annually	0.5s	bidirectional	1. M4 system including two loop's meters, the recording of M4system is the sum of the two meters in the loops, respectively. 2.Monitor electricity generated by Hengdaishan East wind farm (E_{east}); 3. Monitor electricity imported by Hengdaishan East wind farm ($E_{east,\ self\text{-}use}$).	M4 system checked doubly by the operatiaonal data of wind turbines of Hengdaishan East wind farm
M5	Project Owner	Annually	0.5s	bidirectional	1. M5 system including two loop's meters, the recording of M5 system is the sum of the two meters in the loops, respectively. 2.Monitor electricity generated by Hengdaishan East(II) wind farm ($E_{east(II)}$);	M5 system checked doubly by the operatiaonal data of wind turbines of Hengdaishan East (II) wind farm

					3. Monitor electricity imported by Hengdaishan East(II) wind farm ($E_{east(II), self-use}$).	
M6	Project Owner	Annually	0.5s	Monomial	Monitor the electricity imported from the Grid by both projects under accidental condition	M6 checked doubly by the invoice of purchases

5. Calibration

The metering equipments at the transformer substations are calibrated and tested yearly by a qualified third party appointed by the Northeast China Power Grid for accuracy according to *the requirement from Technical administrative code of electric energy metering (DL/T448 - 2000).* For the proposed project, all the meters installed shall be tested by a qualified institute which is authorized by the Northeast China Power Grid - within 10 days after: the detection of meter reading beyond allowable error level; the repair of all or part of meter caused by the failure of one or more parts to operate in accordance with the specifications. The meters shall be jointly inspected and sealed on behalf of the parties concerned and shall not be interfered with by either party except in the presence of the other party or its accredited representatives.

6. Monitoring data

According to the meters system mentioned above, the net electricity supplied by the proposed project activity is calculated based on the recording measured by metering systems installed at Huanan Transformer Substation and the project side , recording exports to the grid (supply) and imports from the grid (consumption). Net electricity supplied is calculated by exports minus imports. The recording frequency will be hourly measured and monthly recorded.

The net electricity supplied to the grid by the project is calculated using following equations:

$$EG_y = EG_{total} * (E_{east(II)} / (E_{east(II)} + E_{east} + E_{west})) - EG_{total,\ self\text{-}use} * (E_{east(II),\ self\text{-}use} / (E_{east(II),\ self\text{-}use} + E_{east,\ self\text{-}use} + E_{west,\ self\text{-}use})) - EG_{accident}$$

Where:

EG_y is the net calculated electricity generation from the proposed project;

EG_{total} is the total electricity supplied to the Grid at Huanan Transformer Substation , metered by M1;

$EGt_{otal,\ self\text{-}use}$ is the total electricity imported from the Grid at Huanan Transformer Substation, metered by M1;

$EG_{accident}$ is the electricity imported from the civil Transformer Substation under accidental condition, metered by M6;

$E_{east(II)}$ is the electricity generation from the proposed project, metered by M5 system;

E_{east} is the electricity generation from Hengdaishan east wind farm project, metered by M4 system;

E_{west} is the electricity generation from Hengdaishan West wind farm project, metered by M3 system;

$E_{east(II), self-use}$ is the electricity imported from the Grid by the proposed project, metered by M5 system.

$E_{east,self-use}$ is the electricity imported from the Grid by Hengdaishan East wind farm project, metered by M4 system;

$E_{west,self-use}$ is the electricity imported from the Grid by Hengdaishan West wind farm project, metered by M3 system;

The information of main monitoring data is shown in the below Table:

ID number	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long is archived data kept?	Comment
1.EG_{total}	the total electricity supplied to the Grid at Huanan Transformer Substation	M1	MWh	*m*	hourly measured and monthly recorded	100%	Paper	During the crediting period and two years after	checked with meter recordings of M2
2. $EG_{total, self\text{-}use}$	the total electricity imported from the Grid at Huana Transformer Substation	M1	MWh	*m*	hourly measured and monthly recorded	100%	Paper	During the crediting period and two years after	checked with meter recordings of M2
3. $E_{east(II)}$	the electricity generation from the proposed project	M5 system	MWh	*m*	hourly measured and monthly recorded	100%	Electronic and paper	During the crediting period and two years after	checked with the operational records of wind turbines of the proposed project
4. $E_{east(II)\ self\text{-}use}$	the electricity imported from the Grid by the proposed project	M5 system	MWh	*m*	hourly measured and monthly recorded	100%	Electronic and paper	During the crediting period and two years after	checked with the operational records of wind turbines of the proposed project
5.E_{east}	the electricity generation from Hengdaishan East wind farm	M4 system	MWh	*m*	hourly measured and monthly recorded	100%	Electronic and paper	During the crediting period and two years after	checked with the operational records of wind turbines of Hengdaishan East wind farm
6.$E_{east, self\text{-}use}$	the electricity imported from the Grid by Hengdaishan East wind farm	M4 system	MWh	*m*	hourly measured and monthly recorded	100%	Electronic and paper	During the crediting period and two years after	checked with the operational records of wind turbines of Hengdaishan East wind farm

7.E_{west}	the electricity generation from Hengdaishan West wind farm	M3 system	MWh	*m*	hourly measured and monthly recorded	100%	Electronic and paper	During the crediting period and two years after	checked with the operational records of wind turbines of Hengdaishan West wind farm
8.$E_{west\ self\text{-}use}$	the electricity imported from the Grid by Hengdaishan West wind farm	M3 system	MWh	*m*	hourly measured and monthly recorded	100%	Electronic and paper	During the crediting period and two years after	checked with the operational records of wind turbines of Hengdaishan West wind farm
9.$EG_{accident}$	the electricity imported from the civil Transformer Substation under accidental condition	M6	MWh	*m*	hourly measured and monthly recorded	100%	Paper	During the crediting period and two years after	Checked with the invoice of electricity purchase
10. EG_y	the net calculated electricity generation from the proposed project	Calculation	MWh	*c*	monthly recorded	100%	Paper	During the crediting period and two years after	Checked with the invoice of electricity sales
11．E_{check}	Total electricity supplied to the Grid by Shared Transformer Substation	M2	MWh	*m*	hourly measured and monthly recorded	100%	Electronic and paper	During the crediting period and two years after	Checked with the recordings of M3 and M4
12．$E_{check,\ self\text{-}use}$	Total electricity imported from the Grid by Shared Transformer Substation	M2	MWh	*m*	hourly measured and monthly recorded	100%	Electronic and paper	During the crediting period and two years after	Checked with the recordings M3 ,M4and M5

7. Quality assurance and Quality control

Huanan Longyuan Wind Power Co., Ltd specially issued the regulations of monitoring and management for CDM project to monitor and verify the emission reductions from the two wind farms. Moreover, the management procedures and regulations like operation, meter recordings, maintenance and emergency management are established in the CDM Manual, which guides the technicians to operate and guarantee the quality assurance and quality control procedures for recording, maintaining and archiving data in detail. This is an on-going process that will be ensured through the CDM in terms of the need for verification of the emissions on an annual basis according to methodology ACM0002.

Several processes required to meet the requirements for emissions reduction monitoring include:
The local Electric Power Company reads the main meter (M1) monthly, the project owner reads the check meter (M2) and other relevant separate meters system (M3system, M4 system, M5system and M6) monthly and supplies the recordings to the Northeast Electric Power Company. If needed, the project owner carries out an internal audit and reports the meter readings to the DOE before the verification.
If either party finds any reading of the Meters more than the allowable error or the monitoring equipment functions improperly, it should inform the other party immediately. The project owner and Northeast Power Grid Corporation should retain a qualified measure institute together to check the meters or equipment, solve the problems and get everything into normal condition. Finally, the electricity delivered to the grid by the project shall be determined by:

- If the main meter (M1) is not within the acceptable limits of accuracy, the net electricity supplied to the grid generated by the proposed project is calculated according to the below steps:

(a) The net electricity supplied to the grid by the proposed project is calculated as the monitoring data of the check meter (M2), which is verified by the project owner and the Northeast Electric Power Company, deducting the transmission line loss electricity[1], unless a test by either party reveals it is inaccurate;

(b) If the check meter (M2) is not within acceptable limits of accuracy or performed improperly, the project owner and Northeast China Power Grid shall jointly prepare an reasonable and

[1] Transmission line loss electricity is calculated according to the maximal Line-loss rate ($R=(E_{check}-EG_{total})/E_{check}$)

conservative estimate of the correct reading, and provide sufficient evidence that this estimation is reasonable and conservative according to the item 80 of *Regulations and Rules of Power Supply*[2] issued by State Electricity Regulatory Commission of China: using the reading of M2 without any errors as the benchmark, the revised reading is deducted the value resulted by any errors. The net calculated electricity supplied to the grid generated by the proposed project will base on the revised reading of M1 or M2.

- When M3 system or M4 system or M5 system is not within the acceptable limits of accuracy, the monitoring data of M3system is calculated based on the operational data of wind turbines of Hengdaishan West Windfarm and the monitoring data of M4 system is calculated based on the operational data of wind turbines of Hengdaishan East Windfarm, and the monitoring data of M5 system is calculated based on the operational data of wind turbines of the proposed project.
- When any errors of all meters are detected beyond the allowable value, the correlative proprietor should repair or recalibrate or replace the meter and give the other party sufficient notice to allow a representative to attend during any corrective activity.
- For the handling of disputes between the proposed project owner and the grid, measures will be adopted according to relevant articles of *Interim Measures for Settlement of Electricity Charges between the Power Generating Enterprises and the Grid Enterprises* (No. 24, Dianjianjiacai (2008)) [3]issued by State Electricity Regulatory Commission of China.

8. Data Management System

Overall responsibility for monitoring greenhouse gas emissions reductions will rest with the CDM monitoring staff of the proposed project. The CDM manual sets out the procedures for tracking information from the primary source to data calculations in paper format. Moreover, the credibility and reliability of those data and information must be confirmed. Physical documentation such as paper-based maps, diagrams and environmental assessment will be collated in a central place, together with this monitoring plan. In order to facilitate auditor's reference, monitoring results will be indexed. All paper-based information will be stored by Huanan Longyuan Wind Power Co., Ltd. and kept at least one copy, and all data including calibration records is kept until 2 years after the end of the total crediting period of the CDM project.

[2] http://www.serc.gov.cn/flfg/bmgz/200802/t20080220_5931.htm

[3] http://www.chinapower.com.cn/article/1130/art1130580.asp

The following table below outlines the key documents relevant to monitoring and verification of the emission reductions from the proposed project.

Table List of the key documents relevant to monitoring and verification

ID No.	Document Title	Main Content	Source
F-1	PDD, including the electronic spreadsheets and supporting documentation(assumptions, estimations, measurement, etc)	Calculation procedure of emission reduction and monitoring items	Proposed project owner or UNFCC website
F-2	Report on monitoring and checking of electricity supplied to the grid	Record based on monthly meter reading and electricity sale receipts	Proposed project owner
F-3	Report on maintenance and calibration of metering equipment	Reasons for maintenance and calibration and the precision after maintenance and calibration	Proposed project owner
F-4	Report on the qualifications of the operators	Technical post ,working experience etc.	Proposed project owner
F-5	the project management record (including date collection and management system)	Comprehensively and truly reflect the management and the operation of the proposed project	Proposed project owner

9. Verification and monitoring results

The verification of the monitoring results of the proposed project is a mandatory process required for all CDM projects. The main objective of the verification is to independently verify that the project has achieved the emission reductions as reported and projected in the PDD. It is expected that the verification will be done annually.

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

Date of completion of baseline study: 12/02/2009

Names of person/entity determining the baseline are listed as follows:

(Not the project participants listed in Annex 1)

- Mr. Li , Gang,

  Entity: China Fulin Windpower Development Corporation.

  Address: The 6th-9, North Avenye Fuchengmen Xicheng District, Beijing 100034, China

  Telephone/fax: +8610-66091326 /66091396

E-mail: Ligang@clypg.com.cn

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SECTION C. Duration of the project activity / Crediting period

C.1 . Duration of the project activity:

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C.1.1. Starting date of the project activity:

29/02/2008 (Wind turbines purchasing agreement)

The date of wind turbines purchasing agreement is the earliest date of the real actions (including construction and equipment purchase) of the project activity during the starting period. The correlative timelines were shown in B5.

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

20years

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

The project will use a renewable crediting period of up to 7 years.

C.2.1. Renewable crediting period

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

01/07/2009

C.2.1.2. Length of the first crediting period:

7 years

C.2.2. Fixed crediting period:

N/A

C.2.2.1. Starting date:

N/A

C.2.2.2. Length:

N/A

SECTION D. Environmental impacts

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

In accordance with relevant environmental law and regulations, an environmental impact assessment

(EIA) of the project was completed.The project is likely to cause the following environmental impacts:

- **Impacts on Air Environment**

Wind Power plants are known to contribute to zero atmospheric pollution as no fuel combustion is involved during any stage of the operation. However, the sources of air pollution are mainly due to the construction activities including the transportation of construction material, road construction and Improvement and cadre construction etc. The impacts on air environment are temporarily that the impact will be ended when the construction is completed. It is suggested that several measures shall be taken into account, such as the construction under strong wind weather is prohibited, reducing as much as possible the area of construction, spraying water when undertaking construction, and reducing the speed of vehicles in the field. Hence, air pollution caused by the project is not significant to the surrounding environment.

- **Impacts on Noise Environment**

The noise of the project in construction phase is from vehicles and machines on-site. According to the monitoring data from the construction site, the noise is at a level between 91-102 dB. Based on the formula of declining of sound emitted from a non-directional source, it is estimated that the maximum noise effective distance of the project is 50m in daytime and 300m at night. Moreover, the magnitude of the impacts during construction phase exists for a temporary period of time till the end of construction phase. However, operational noise from the rotating blades is expected to be minimal due to the higher background noise caused by strong winds. The closest residential area to the site of the Project is over 5km away. Therefore, the noise of the project will not have impact on nearby residents.

- **Impacts on Water and Solid Waste**

The wind-farm does not consume any water, nor does it generate any wastewater in the operation phase. The possible negative impacts are the household wastewater and solid waste produced by builders and staff, and the waste earth from digging of the foundation in the construction phase. Under normal conditions with highly automated monitoring and control system, the household wastewater will be first treated in a septic tank, and then be disinfected to discharge for circumjacent virescence. Moreover, the amount of household solid waste will be very little, which will not have impact on the environment. Besides, the solid waste will be collected and moved to the landfill site of the nearest city. The waste earth from the digging should be firstly used for refilling. The rest of the waste earth should be placed in the low area of the site and replanted with grass. Following the suggestion, the water and solid waste should have no significant impact on the environment.

- **Impacts on Ecosystem Environment**

A serious potential concern for wind farms is their impact on vegetation, animals and migrating birds. The land on which the project activity takes place is barren and unfertile. Prior to the project activity the land had no beneficial use. The vegetation in the project area was substituted by grassland for livestock

use and land for cultivation. So the minor quantity of solid / liquid discharge, likely to be generated during the construction phase has no noticeable impact on soil use and the project proponent has made arrangements to dispose them in an environmentally acceptable manner. Moreover, there are no migratory birds / endangered species in the region of project activity. Therefore, the activities to be carried out will not generate any negative impact on the ecological environment.

- **Socio-Economic Impacts**

The preliminary appraisal assumed a larger installed capacity and higher coal displacement in the project. The project is estimated to supply 42.338 GWh of power to the Liaoning Power Grid, which is estimated that 14000 tce will be saved. So the project generates eco-friendly, GHG free power that contributes to sustainable development of the region. Moreover, the locals have benefited economically through land sales and revenues. The project activity not only helps the uplift of skilled and unskilled manpower in the region, but also improves employment rate and livelihood of local populace in the vicinity of the project.

- **Conclusion**

The net impact under environmental pollution category would be positive as all necessary abatement measures would be adopted and periodically monitored. The project activity does not have any major adverse impacts on environment during its construction or operational phase. The project is definitely an environmentally more friendly way of providing power than the coal-fired power and to a lesser extent hydropower.

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:

The construction and operation of the proposed project have no significant environmental impacts. The Environmental Assessment Report of the project has been approved by the Environmental Protection Administration of Heilongjiang Province.

SECTION E. Stakeholders’ comments

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

According to the requirement by the *Measures for Operation and Management of Clean Development Mechanism Projects in China* and PDD, the staff of Huanan Longyuan Wind Power Co., Ltd. held an open public survey and a stakeholders’ conference on the local villagers and residents during April-June 2008. In the public survey and conference, the stakeholder representatives were respectively from the local government and the nearby village where the proposed project is located.

- Public survey: during April-June 2008, one-page questionnaire was used to carry out a survey on the local villagers, which was designed easily to fill in as following sections:

1) Respondent’s basic information and education level;

2) The influences on their surrounding environment and livelihoods during construction and operation of the project;
3) The suggestions to the company regarding the project;
4) Whether or not agree with the construction of this project.

The survey had a 100%response rate (20 questionnaires returned out of 20, education level of the respondents: primary level (70%), middle level (10%) and high level (20%).The statistical result was shown in E.2.

- Stakeholder conference: the meeting was held on 10th June 2008 in Huanan county to explain CDM，better understand the stakeholders' interests and obtain their comments. In the meeting, the presentations were followed by a question and answer section and further discussion. Present at the conference were totally 10 representatives and experts, mainly from the local Development and Reform Bureau, the local Environmental Protection Bureau, the local Power Supply Corporation, and the nearby village.

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E.2. Summary of the comments received:

The public survey and conference not only obtained the stakeholder's comment on the project, but also introduced the information of the project and CDM to the stakeholders. According to the comments of stakeholder representatives, there are no adverse comments on the project activity, and mostly representatives were supportive of the project. The summary of the comments is as follows:

- 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. The local government highly supports the proposed project, and expects the increase of local financial revenues and new employment opportunities through the implementation of the proposed project.
- Wind power is renewable energy and is helpful in diversifying power mix of local power grid. Furthermore, wind power takes up a small share in the local power grid and will not have much impact.
- The proposed project site is located at wasteland. There are no residents with 210 m around the proposed project. Therefore, there is no issue on noise disturbance and residents migration. Moreover, the project owner has made compensation for the land occupied by the proposed project. The local residents also benefit from the employment opportunities for construction and operation of the proposed project.

Table 9 Statistic of the comments in the survey

No.	Discussional items	Options	Percentage (%)
1	Did the respondents know or hear the information of the	*Yeah*	100

	proposed project	*No*	0
2	Are they satisfied with their life conditions and surrounding environment?	*Yeah*	100
		No	0
3	Will the project improve the local economy and increase job opportunities?	*Yeah*	100
		No	0
4	Will the project have negative impacts on their livelihood?	*Yeah*	0
		No	100
5	Did the respondents be satisfied with the measures for environmental protection during the construction and operation phases?	*Yeah*	100
		No	0
6	What the impacts on environment should be considered? (Muti-options)	*Ecological environment*	40
		Noise pollution	50
		Water pollution	5
		Solid waste	35
		Air pollution	15
7	Did the respondents be satisfied with the compensatory measures for soil use in the proposed project	*Yeah*	100
		No	0
8	Will they support the construction of the project?	*Yeah*	100
		No	0

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

Since there is no negative comment received, it's no need to make adjustment on design, construction and operation of the project. However, to reduce the impacts on the local environment produced from the construction of the project, the project stakeholders should guarantee and suitably add the investment of environmental protection. At the same time, the construction processes should be strictly implemented according to the national environment criterions.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

The Project Entity:

Organization:	Huanan Longyuan Wind Power Co., Ltd.
Street/P.O.Box:	Shengli
Building:	-
City:	Huanan
State/Region:	Heillongjiang Province
Postfix/ZIP:	154400
Country:	China
Telephone:	0455-8702818
FAX:	0455-8702896
E-Mail:	xalfdgs@vip.hl.cn
URL:	-
Represented by:	-
Title:	General Manager
Salutation:	-
Last Name:	Zhao
Middle Name:	-
First Name:	Lijun
Department:	-
Mobile:	13904851621
Direct FAX:	0455-8703387
Direct tel:	0455-8702818
Personal E-Mail:	xalfdgs@vip.hl.cn

CERs Buyer:

Organization:	Essent Trading International S.A.
Street/P.O.Box:	Rue des Glacis-de-Rive 12-14
Building:	—
City:	Geneva
State/Region:	—
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding from Annex I countries is involved in the proposed project.

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	84543000	7.21	78447450
Jilin	33242000	7.68	30689014
Heilongjiang	53482000	7.84	49289011
Total			**158425475**

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	83697000	7.03	77813101
Jilin	35294000	6.59	32968125
Heilongjiang	58000000	7.96	53383200
Total			**164164426**

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	96282000	6.62	89908132
Jilin	38576000	6.78	35960547
Heilongjiang	62964000	7.85	58021326
Total			**183890005**

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	20908 kJ/kg	25.80
Washed coal	26344 kJ/kg	25.80
Other Washed Coal[33]	8363 kJ/kg	25.80
Coke	28435 kJ/kg	29.20
Crude oil	41816 kJ/kg	20.00
Gasoline	43070 kJ/kg	18.90
Kerosene	43070 kJ/kg	19.60
Diesel	42652 kJ/kg	20.20
Fuel oil	41816 kJ/kg	21.10
Other petroleum products[34]	38369 kJ/kg	20.00
Other coked product	28435 kJ/kg	25.80
Natural gas	38931 kJ/m3	15.30
Coke oven gas[35]	16726 kJ/m3	12.10

[33] 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.

[34] 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.

[35] 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.

Other gas[36]	5227 kJ/m3	12.10
LPG	50179 kJ/kg	17.20
Refinery gas	46055 kJ/kg	15.70

Data sources:

NCV_s are from China Energy Statistical Yearbook 2007

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

36 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.

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	188689376.8
Washed coal	10^4t	84.75	1.09	4.88	90.72	25.8	26344	2260871.585
Other Washed Coal	10^4t	577.67	14.26	61	652.93	25.8	8363	5165589.096
Coke	10^4t				0	25.8	28435	0
Coke oven gas	10^8M^3	4.83	2.91		7.74	12.1	16726	574367.4948
Other gas	10^8M^3	57.33	4.19		61.52	12.1	5227	1426676.894
Crude oil	10^4t				0	20	41816	0
Diesel	10^4t	2.04	1.16	0.24	3.44	20.2	42652	108672.7465
Fuel oil	10^4t	12.81	1.78	2.86	17.45	21.1	41816	564536.2111
LPG	10^4t	2.19			2.19	17.2	50179	69305.22764
Refinery gas	10^4t	9.79		1.14	10.93	18.2	46055	335923.0208
Natural gas	10^8M^3		0.03	2.53	2.56	15.3	38931	559111.4496
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								199754430.5

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	200454895.9
Washed coal	10^4t					25.8	26344	0
Other Washed Coal	10^4t	524.74	19.26	24.16	568.16	25.8	8363	4494939.888
Coke	10^4t					25.8	28435	0
Coke oven gas	10^8M^3	1.03	3.57	0.68	5.28	12.1	16726	391816.5856
Other gas	10^8M^3	12.62	8.37		20.99	12.1	5227	486767.6854
Crude oil	10^4t	1.16			1.16	20	41816	35571.47733
Diesel	10^4t	1.18	1.48	0.57	3.23	20.2	42652	102038.6544
Fuel oil	10^4t	9.32	2.46	1.55	13.33	21.1	41816	431247.4323
LPG	10^4t	0.12			0.12	17.2	50179	3797.54672
Refinery gas	10^4t	5.48		1.32	6.8	18.2	46055	208991.4493
Natural gas	10^8M^3		0.84	2.24	3.08	15.3	38931	672680.9628
Other oil product	10^4t					20	38369	0
Other coked product	10^4t					25.8	28435	0
Other energy	10^4t	16.18			16.18	0	0	0
Total								207282747.6

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	219912851
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	6238691
Coke	10^4t	3.32			3.32	29.2	28435	101075
Coke oven gas	10^8M^3	2.68	0.16	1.44	4.28	12.1	16726	317609
Other gas	10^8M^3	55.26	1.43		56.69	12.1	5227	1314667
Crude oil	10^4t	0.49			0.49	20	41816	15026
Diesel	10^4t	0.75	0.39	0.3	1.44	20.2	42652	45491
Fuel oil	10^4t	11.73	0.45	1.44	13.62	21.1	41816	440629
LPG	10^4t				0	17.2	50179	0
Refinery gas	10^4t	8.55		4.27	12.82	15.7	46055	339888
Natural gas	10^8M^3		0.19	2.1	2.29	15.3	38931	500143
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								229226818

China Energy Statistical Yearbook 2007

Table A-8: OM factor of Northeast Power Grid

Years	Thermal generation delivered to NEPG	The emissions from NEPG	OM
	A	B	C=B/A
2004	158425475	199708287	1.260582
2005	164164426	207254040	1.262478
2006	183890005	229226818	1.246543
Average OM	506479906	636189145	**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
						(tc/TJ)	(MJ/t,km3)	(tCO_2e)
		A	B	C	D=A+B+C	E	F	G=D*E*F*44/12/100(quantity)
Coal	10^4t	4681.99	2738.24	3698.29	11118.52	25.8	20908	219912851
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	6238691
Coke	10^4t	3.32			3.32	29.2	28435	101075
Sub-total								**226253365**
Crude oil	10^4t	0.49			0.49	20	41816	15026
Diesel	10^4t	0.75	0.39	0.3	1.44	20.2	42652	45491
Fuel oil	10^4t	11.73	0.45	1.44	13.62	21.1	41816	440629
Other oil product	10^4t					20	38369	0
Sub-total								**501146**
Natural gas	10^7M^3		1.9	21	22.9	15.3	38931	500143
Coke oven gas	10^7M^3	26.8	1.6	14.4	42.8	12.1	16726	317609
Other gas	10^7M^3	552.6	14.3		566.9	12.1	5227	1314667
LPG	10^4t				0	17.2	50179	0
Refinery gas	10^4t	8.55		4.27	12.82	15.7	46055	339888
Sub-total								**2472307**
Total								**229226818**

China Energy Statistical Yearbook 2007

With the above table and formula (4), (5), and (6), 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 from 1999 to 2006 in the Northeast Power Grid

	Installed capacity in 1999（MW）	Installed capacity in 2000（MW）	Installed capacity in 2006（MW）	Addition capacity(1999-2006)（MW）	Addition share
	A	**B**	**C**	**D=C-A**	**E**
Thermal Power	27136.9	28932.5	36216	9079.1	88.91%
Hydro Power	5522.7	5600	6126	603.3	5.91%
Nuclear power	0	0	0	0	0.00%
Wind Power	22.9	43.9	552	529.1	5.18%
Total	**32682.5**	**34576.4**	**42894**	**10211.5**	**100%**
Share of 2006 installed capacity	76.19%	80.61%	100.00%		

Data sources: China Electric Power Yearbook 2000-2007

$EF_{grid,BM,y} = EF_{Thermal,Adv} \times CAP_{Thermal,addition} / CAP_{Total,,addition}$ = 0.9074×88.91%=**0.8068 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)	1.2561
BM factor (tCO2/MWh)	0.8068
CM factor (tCO2/MWh) **CM**=0.75×**OM**+0.25×**BM**	**1.1438**

Annex 4

MONITORING INFORMATION

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