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

CONTENTS

SECTION A. General description of project activity

A.1. Title of the project activity:

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Jilin Tongyu Xinglongshan 1F Wind Power Project
PDD version:3.0
Date: 27/07/2012

A.2. Description of the project activity:

>>
Jilin Tongyu Xinglongshan 1F Wind Power Project (hereafter refers to the proposed project) which developed by Tongyu Xinfa Wind Power Co.,Ltd. locates in Tongyu County, Baicheng City, Jilin Province, P.R.China.

1. The objective of the proposed project
   (1) For the proposed project, the scenario existing prior to the start of the implementation of the project activity is NEPG(Northeast China Power Grid) provides the same electricity service as the proposed project.
   (2) The proposed project involves the installation of 33 turbines, each of which has a rated output of 1500kW, providing a total capacity of 49.5MW. The purpose of the proposed project is to generate zero-emission wind power and deliver it to NEPG. The implementation of the proposed project will achieve CO_2 emission reductions by replacing electricity generated by fossil fuel fired power plants.
   (3) The baseline scenario is the same as the scenario existing prior to the start of implementation of the project activity.

2. The approach that the proposed project achieves the GHG emission reductions

   The annual operation hours of the proposed project is 2283h, and the annual output of the proposed project is estimated to be 113,004MWh. The proposed project will reduce GHG emissions generated from the high-growth, coal-dominated power generation. The estimated annual GHG emission reductions are 108,890t CO_2.

3. Contributions to the sustainable development

   The proposed project will contribute to the sustainable development of the host country through the following aspects:

- Reducing the emission of other pollutants resulting from local coal-based power plants compared to a business-as-usual scenario;
- Generating electricity to supplement the increasing local energy demand, boosting local economy development;
- Increasing the proportion of renewable energy in the Northeast China Power grid which would improve the grid structure;
- Creating working opportunities during the project operation period and construction period

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)
P.R.China (host)	Tongyu Xinfa Wind Power Co., Ltd.	No
the Netherlands	EDF Trading Limited	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

>>
P.R.China

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

>>
Jilin Province

A.4.1.3. City/Town/Community etc.:

>>
Tongyu County, Baicheng City

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

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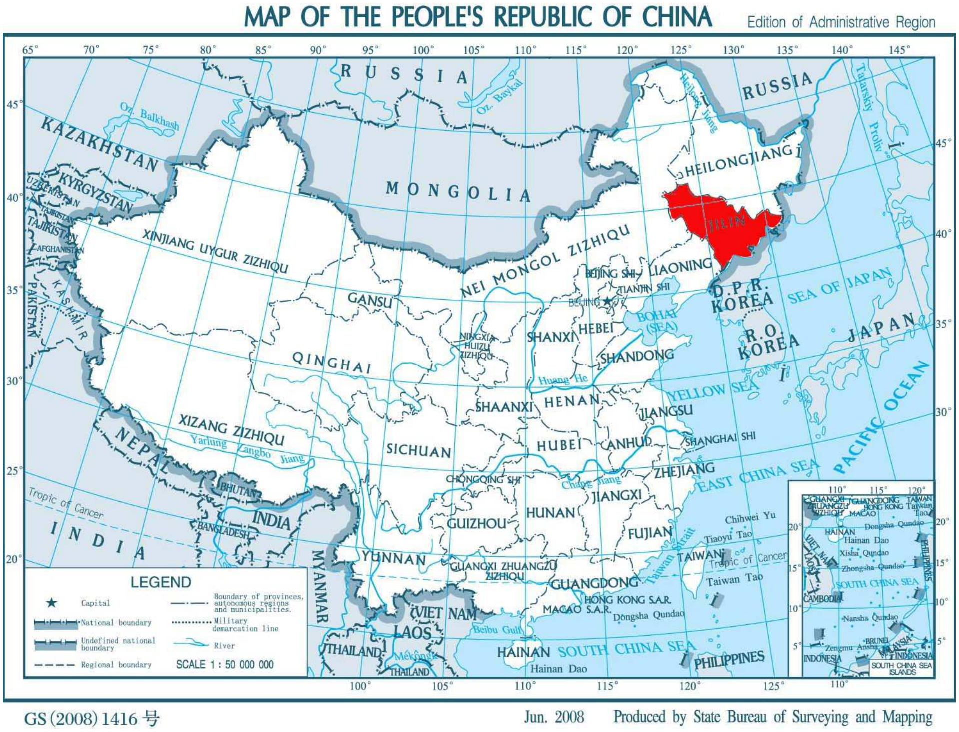
The proposed project locates in Tongyu County, Baicheng City, Jilin Province, P.R.China, its center point geographical coordinates are east longitude 122.3624° and north latitude 44.6766°. Figure 1 shows the geographical location of the proposed project.



The proposed project

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

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The project activity falls under the following scope and category.
Sectoral scope: 1. Energy industries(renewable/non-renewable sources)
http://cdm.unfccc.int/methodologies/DB/UB3431UT9I5KN2MUL2FGZXZ6CV71LT

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

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The purpose of the proposed project is to generate zero-emission wind power and supply it to Northeast China Power Grid. For the proposed project,

(a) The scenario existing prior to the start of the implementation of the project activity is that Northeast China Power Grid providing the same electricity supply as the proposed project;
(b) The project scenario is the implementation of the proposed project (with CDM as an indispensible consideration), i.e., the installation and operation of 33 sets of 1500 kW wind turbines which will supply an average annual generation of 113,004MWh to Northeast China Power Grid and replace the same amount of electricity generated by fossil fuel fired power plants connected into Northeast China Power Grid.

Totally 33 wind turbines with a nominal capacity of 1500 kW will be installed, providing a total capacity of 49.5 MW. The load factor for the proposed project is 0.261, which is determined by China Fulin Wind Power Engineering Co., Ltd. as an independent third party contracted with the project owner.

Table 1 Technical Characteristics of Wind Turbines for the proposed project

• Number of blades:	3
• Life time	20
• Nominal output:	1500 kW
• Cut-in wind speed:	3 m/s
• Cut-out wind speed:	20 m/s
•Load factor	0.261

Each wind turbine will have a box transformer which transforms the voltage to 35kV from which the 35kV line will link into the on-site 220kV switchgear at the substation. By the 220kV line, the electricity generated by the proposed project is delivered to the power grid. The wind turbines and transmission facility could be monitored and controlled by onsite central control room. The electricity supplied to the power grid will be measured by the metering equipment installed at project site.

(c) The baseline scenario is the same as the scenario existing prior to the start of implementation of the project activity. In the absence of the proposed project, the same types and levels of services, i.e., an average annual generation of 113,004MWh, would have been easily provided by Northeast China Power Grid, as it meets the requirements of China's mandatory regulations and laws and has no economic barriers.

The development of the proposed project will contribute to promoting application of wind turbines adopted by the proposed project, accelerating the accumulation of experiences and absorption of the kind of technology and advancement of domestic wind power technology.

The proposed project does not involve technology transfer.

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

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A renewable crediting period 7 years×3 is adopted for the proposed project activity. The first crediting period is from 01/10/2012 to 30/09/2019, annual emission reduction is 108,890tCO_2e, as shown in the table below.

Years	**Annual estimation of emission reductions(in tons of CO_2e)**
01/10/2012-31/12/2012	27,222
2013	108,890
2014	108,890
2015	108,890
2016	108,890
2017	108,890
2018	108,890
01/01/2019-30/09/2019	81,668
Total estimated reductions(tons of CO_2e)	762,230
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tons of CO_2e)	108,890

A.4.5. Public funding of the project activity:

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There is no public funding from Annex I Parties for this 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:

Approved methodology: *ACM0002 Consolidated methodology for grid-connected electricity generation from renewable sources* (Version12.3.0)

Tools referenced in this methodology:

◆Tool to calculate the emission factor for an electricity system (version 02.2.1);

◆Tool for the demonstration and assessment of additionality (version 06.0.0);

Reference:UNFCCC website:
http://cdm.unfccc.int/UserManagement/FileStorage/4W1SCKX3EMPO6AYGRJUTD7BQ8IVN0H

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

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The proposed project can meet the applicability criteria of the baseline methodology (ACM0002 version12.3.0); therefore, the methodology is applicable to the proposed project.

- The proposed project is to install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity;
- and
- The proposed project is not an activity that involves switching from fossil fuels to renewable energy sources at the site of the project activity; and
- The proposed project is not a biomass project

The proposed project accords with the requirements of ACM0002(version 12.3.0)

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

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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.

Spatial boundary:

The spatial extent of the project boundary includes the project site and all power plants connected to NEPG. NEPG 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 DNA[1], NEPG consists of Heilongjiang, Jilin and Liaoning power grids. The electricity transmission between different provinces in NEPG is very large and it is reasonable for the project to regard NEPG as the project boundary.

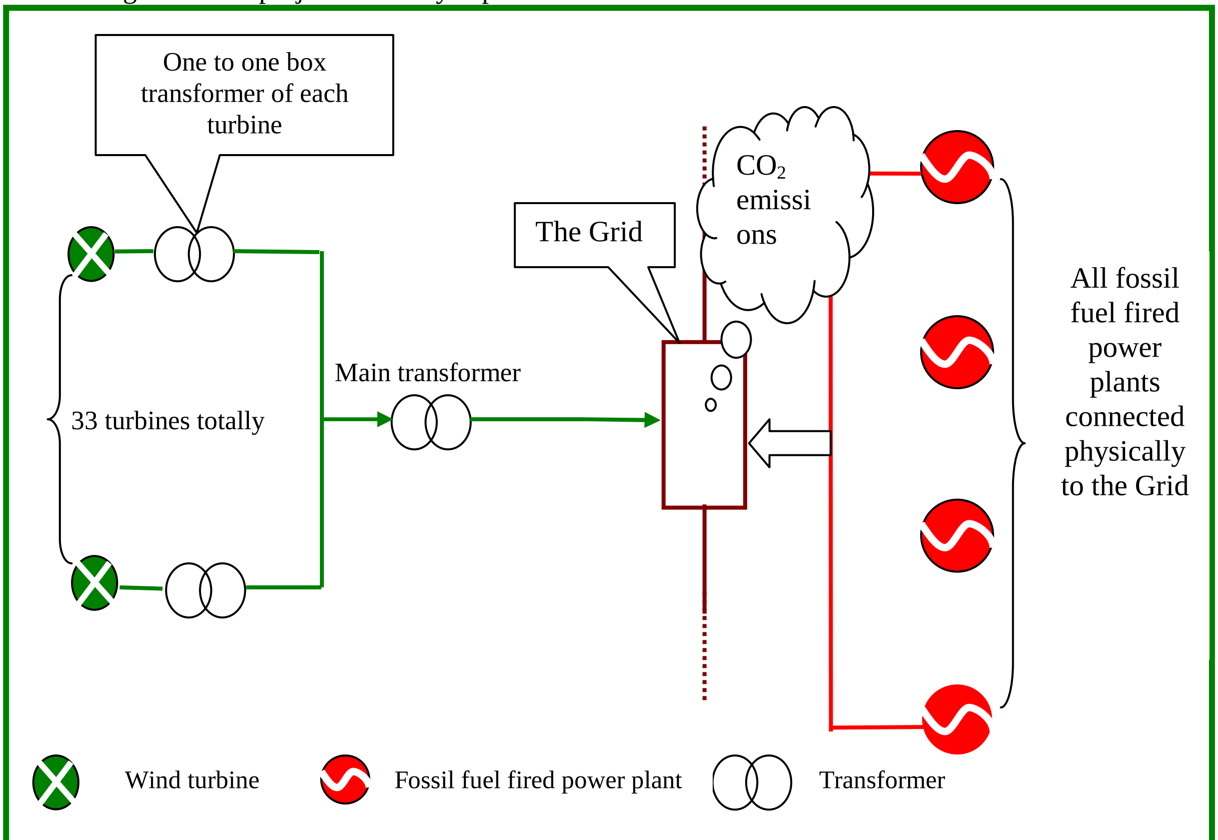
The greenhouse gases and emission sources included in or excluded from the project boundary are shown in the following table:

	Source	Gas	Included?	Justification / Explanation
Baseline	CO2 emissions from electricity generation in fossil fuel fired power plants that is displaced due to the project activity	CO_2	Yes	Major emission sources
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Project Activity	Wind power	CO_2	No	According to ACM0002, the project emission of wind power project activity is not considered.
		CH_4	No	

[1] Notification on Determining Baseline Emission Factor of China's Grid 2011 issued by China's DNA. http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2720.pdf

		N_2O	No	

A flow diagram of the project boundary is presented below:



The flow diagram of the project boundary

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

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According to the consolidated baseline methodology ACM0002(version 12.3.0), if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

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

The proposed project is the installation of a new grid-connected renewable power plant that connects with and delivers electricity to the Jilin Power Grid which is a part of Northeast China Power Grid. According to the “Tool to calculate the emission factor for an electricity system”, the delineation of grid boundaries of the Project is the Northeast China Power Grid.

According to the consolidated baseline methodology ACM0002(version 12.3.0), the baseline scenario of the proposed project is“ the provision of an equivalent amount of annual power output by the Northeast China Power Grid which the proposed project is connected to”. Detailed analysis please refers to Section B.5.

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

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The FSR of the proposed project was finished in 01/2011, and it was approved by Jilin Development and Reform Committee of Jilin Province on 27/05/2011. Considering the low income of the proposed project, the project owner started to consider CDM in the preparation of the project and it was also mentioned in the FSR.

The loan contract was signed on 01/06/2011, thus, the starting date of the proposed project was 01/06/2011. The starting date of the proposed project was after 02/08/2008, and the starting GSP time of the proposed project was on 19/11/2011 which was after the starting date, thus the project owner has been reported to Chinese DNA and EB about seeking CDM status of the proposed project within six months of the starting date, and the notification was confirmed by Chinese DNA and EB on 22/09/2011 and 08/10/2011.

So, in conclusion, it is clearly that CDM had been seriously considered by the project owner prior to the start date of the proposed project.

The time line of the proposed project is showed as table below:

No.	Timeline	Milestone
1	12/2010	EIA report finished
2	20/12/2010	EIA approval
3	01/2011	Feasibility completed, taking CER revenue into account
4	27/05/2011	FSR approval
5	29/05/2011	Board meeting to decide to apply for CDM.
6	01/06/2011	CDM consultancy contract
7	01/06/2011	Loan contract was signed.
7	06/06/2011	Stakeholders’ meeting held.
8	03/06/2011-06/06/2011	Questionnaires
9	24/08/2011	ERPA signed.
11	22/09/2011	Notification to Chinese DNA was confirmed.
12	08/10/2011	Notification to EB was confirmed.
13	18/07/2012	EPC contract signed.

The project uses the Tool for the Demonstration and Assessment of Additionality (version 06.0.0) to demonstrate the additionality of the proposed project. It is including the steps as follows:

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

The baseline scenario of the proposed project is:

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

Therefore, there is no analysis required.

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. The investment analysis is conducted in the following steps:

Sub-step 2a. Determine appropriate analysis method

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

The simple cost analysis is not applicable for the proposed project because the project activity will have revenue (from electricity sales) other than CDM related income. The investment comparison analysis is also not applicable for the proposed project because the baseline scenario, providing the same annual electricity output by the Northeast China Power Grid, is not an investment project.

To conclude, the benchmark analysis will be used to identify whether the financial indicators (Project IRR in this case) of the proposed project is better than relevant benchmark value.

Sub-step 2b. Apply benchmark analysis

The financial benchmark Internal Return Rate (after tax) on total investment (Project IRR) of China power industry is 8%, which has been used widely for Feasibility Study of the power project investment[2].

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

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

(1) Basic parameters for calculation of financial indicators

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

[2] Interim Rules on Economic Assessment of Electric Engineering Retrofit Projects (trial), the State Power Corporation of China, 03/2003.

Table 2 Main parameters for the calculation of financial indicators

Items	Unit	Amount	Remark
Capacity	MW	49.5	FSR-page 152
Static Total Investment	10000 Yuan	49,995	FSR-page 152
Liquid capital	10000 Yuan	149	FSR-page 152
Annual electricity supplied	MWh/year	113,004	FSR-page 152
Long term loan	10000 Yuan	39,784	FSR-page 152
Interest rate	%	6.80	"Benchmark Rate of RMB Loans" issued by People's Bank of China on 06/04/2011
Electricity Tariff (incl. VAT)	RMB/kWh	0.58	FSR-page 154
VAT rate	%	17	FSR-page 154
Income tax rate	%	25	FSR-page 154
Rate of residual value of fixed assets	%	5	FSR-page 153
Rate of city maintenance and construction tax	%	5	FSR-page 154
Rate of additional education fee	%	3	FSR-page 154
O&M cost	Million Yuan/year	13.88	FSR-page 153
Interest incurred during construction	Million Yuan	16.58	FSR-page 152
Project life time (including one construction year)	Year	21	FSR-page 152

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

Without income from selling CERs, the Project IRR of the proposed project is 6.51% which is lower than the benchmark IRR and the proposed project is financially unattractive because of its low profitability. While considering such income, the financial acceptance will be changed, the Project IRR of the proposed project is 9.25% which is better than the benchmark and the proposed project is financially acceptable.

Sub-step 2d. Sensitivity analysis

The parameters used in sensitivity analysis (total investment, Tariff, annual electricity supply and O&M costs) constitute more than 20% of either total project costs or total project revenues, and there are no other parameters having significant impact on the sensitivity analysis that are not included in the sensitivity analysis.

1) Total investment.
2) Tariff
3) Annual electricity supply

4) O&M cost.

The four 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 Sensitivity of total investment IRR to static total Investment

	-10%	-5%	0%	5%	10%	Critical point
Total investment	8.03%	7.24%	6.51%	5.82%	5.18%	-9.80%
Tariff	4.97%	5.75%	6.51%	7.24%	7.95%	10.30%
Annual electricity supply	4.97%	5.75%	6.51%	7.24%	7.95%	10.30%
O&M cost	6.85%	6.68%	6.51%	6.34%	6.16%	44.80%

The static total investment is an important factor affecting the financial attractiveness of the proposed project. In the case that total investment decreases by about 9.80%, the IRR of the proposed project begins to exceed the benchmark. Considering the majority of total investment is due to wind turbines whose price tends to increase for its demand booming.[3] At the same time, recently the material price (especially the steel price) are gradually increasing in China[4], as a result, it is very difficult to lower the total investment the proposed project. Hence within the reasonable range of total investment, the proposed project is always lack of financial attractiveness.

The next important factor for financial attractiveness is the tariff. In the case that the expected power tariff increases by about 10.30%, the IRR of the proposed project begins to exceed the benchmark. However there is extremely unlikely for the tariff of the proposed project to have an increase of 10.30% According to the tariff approval issued by NDRC in 2009[5], the tariff for the area where the proposed project located is 0.58RMB/kWh(incl.VAT), and the tariff used in the calculation of FSR is the same with the tariff approval. Even applying the highest tariff 0.63 RMB/kWh(incl.VAT)[6] in the Jilin Province for the whole operational life of the proposed project, the IRR is still below the benchmark. As a result, the proposed project is always lack of financial attractiveness.

The annual electricity supply is also an important factor affecting the financial attractiveness of the proposed project. The annual electricity supply is based on the PLF which was determined by a third party contracted with the project owner, and the PLF was estimated on long term weather data ,the value of the PLF was not supposed to change significantly. In the case that the annual electricity supply increases by 10.30%, the IRR of the proposed project begins to exceed the benchmark. According to the feasibility study report of the proposed project, the annual electricity supply 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

[3] http://www.newenergy.org.cn/html/01012/12131037681_1.html

[4] http://info.bm.hc360.com/2010/12/270829261923.shtml

[5] http://www.sdpc.gov.cn/zcfb/zcfbtz/2009tz/t20090727_292827.htm

[6] Highest applicable wind tariffs in China applied by the Executive Board, EB54

using software WindFarmer to optimize the location of each turbine for maximize power generation. Moreover, the annual electricity supply is positive correlation with the wind speed, and the annual average wind speed of the project site has no tendency for increasing over the past 30 years for which data are available recently[7]. Therefore, the probability that the annual electricity supply is 10.30% higher than the estimated value is very small, and within the reasonable range of the annual electricity supply, the proposed project is always lack of financial attractiveness.

The impact of the annual O&M cost is the slightest, as the IRR of the proposed project begins to exceed the benchmark when the annual O&M cost decreases by 44.80%. Since the wind turbines operate in high latitude and cold area, such reduction of O&M cost lacks possibility for the proposed project. Moreover, the price of material and salaries of the employees are gradually increasing in China, which leads annual O&M cost gradually increasing[8], therefore, the proposed project always lacks financial attractiveness within the reasonable range of annual O&M cost.

Step 3. Barrier analysis.

Not applicable.

Step 4. Common practice analysis

According to Tool for demonstration and assessment of additionality (Version 06.0.0) and" Clarification request on application of common practice analysis with Tool for the demonstration and assessment of additionality (version 6.0)", the measure of the proposed project belongs to "Switch of technology with or without change of energy source (including energy efficiency improvement as well as use of renewable energies)". Thus, four sub-steps are adopted to take the common practice analysis.

Sub-step 4a. Calculate applicable output range as +/-50% of the design output or capacity of the proposed project activity.

The installed capacity of the proposed project is 49.5MW and the applicable output range as +/-50% of the capacity range is from 24.75MW to 74.25MW.

Sub-step 4b. In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in step 4a, as the proposed project activity and have started commercial operation before the start date of the project. Note their number N_{all}. Registered CDM project activities and projects activities undergoing validation shall not be included in this step.

According to the tool, the applicable geographical area covers the entire host country as a default. However, in China, provincial governments are authorized to regulate wind projects in the province by the NDRC[9]. So, the investment climate, tariff and regulations are usually similar for wind power projects in the same province. Therefore, the applicable geographical area is defined as Jilin Province where the proposed project locates.

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[7] The feasibility study report of the proposed project, page 26

[8] http://www.caijing.com.cn/2011-03-13/110664391.html

http://www.usc.cuhk.edu.hk/PaperCollection/Details.aspx?id=8445

[9] http://www.sdpc.gov.cn/nyjt/nyzywx/t20050810_41378.htm

The power industry in China undertook a significant policy reform in 2002, under which the investment environment and tariff setting mechanism were changed. On February 10, 2002, the State Council issued the Notice on Issuing Electric Power Sector Reform Programme (Guofa [2002] No.5) and the monopoly of the electricity investment was broken down by separating electric power plants from electric power grids and netting by price-bidding. Diversification of investment body was realized, which brought the private enterprises and private funds investment into power industry.

The starting date of the proposed project is 01/06/2011. Therefore, all plants with the installed capacity from 24.75MW to 74.25MW and the starting commercial operation between 10/02/2002 and 01/06/2011 in Jilin Province are identified as N_{all}.

$N_{all} = N_{all\text{-}wind} + N_{all\text{-}other}$

Where,

N_{all}: Number of all power plants not registered as CDM project or undergoing validation and delivering the same capacity within the range of 24.75MW-74.25MW as the proposed project with commercial date between 10/02/2002 and 01/06/2011 in Jilin Province;

$N_{all\text{-}wind}$: Number of all wind power plants not registered as CDM project or undergoing validation and delivering the same capacity within the range of 24.75MW-74.25MW as the proposed project with commercial date between 10/02/2002 and 01/06/2011 in Jilin Province;

$N_{all\text{-}other}$: Number of other kinds of power plants, except for wind power plants(contained coal power plants, hydropower projects, biomass-based power plants, solar plants, nuclear plants and geothermal plants, tidal plants, waste heat recovery power and so on), not registered as CDM project or undergoing validation and delivering the same capacity within the range of 24.75MW-74.25MW as the proposed project with commercial date between 10/02/2002 and 01/06/2011 in Jilin Province.

With reference to *China Electric Power Yearbook 2011*, *Statistics on China Wind Farm Installed Capacity 2009-2010* ,UNFCCC CDM website, Chinese DNA website, all wind farm projects in Jilin province that have been put into operation with capacity in the range of 24.75MW-74.25MW are developed as CDM projects. So, no similar activities are identified with above criteria.

Hence, $N_{all\text{-}wind}=0$

Therefore, $N_{all} = N_{all\text{-}other}$

Sub-step 4c: Within plants identified in Sub-step 4b, identify those that apply technologies different that the technology applied in the proposed project activity. Note their number N_{diff}.

According to the tool, different technologies are technologies that deliver the same output and differ by at least one of the following (as appropriate in the context of the measure applied in the proposed CDM project and applicable geographical area):

(i) Energy source/fuel;
(ii) Feed stock;
(iii) Size of installation (power capacity):
(iv) Investment climate in the date of the investment decision
(v) Other features

Hydropower plants, biomass power plants and other kinds of power plants((contained coal power plants, solar plants, nuclear plants and geothermal plants, tidal plants, waste heat recovery power and so on)) are apparently different from the proposed project with respect to energy source/fuel and feed stock, so all these kinds of power plants are identified as plants applying different technologies. Hence,

$N_{diff}= N_{diff-wind} +N_{diff-other}$

N_{diff}: Number of all power plants not registered as CDM project or undergoing validation delivering the same capacity within the range of 24.75MW-74.25MW as the proposed project activity with commercial date between 10/02/2002 and 01/06/2011 in Jilin Province;

$N_{diff-wind:}$ Number of plants that use the same energy source with the proposed CDM project activity, but apply different technologies

$N_{diff-other}$: Number of plants that are including in N_{diff} but not included in $N_{diff-wind}$

With reference to *China Electric Power Yearbook 2011*, *Statistics on China Wind Farm Installed Capacity 2009-2010* ,UNFCCC CDM website, Chinese DNA website, all wind farm projects in Jilin province that have been put into operation with capacity in the range of 24.75MW-74.25MW are developed as CDM projects. So, no similar activities are identified with above criteria.

Hence, $N_{diff-wind}=0$

Therefore, $N_{diff}= N_{diff-other}$

Sub-step 4d: Calculate factor $F=1-N_{diff}/N_{all}$ representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity.

According to the analysis of Sub-step 4b and Sub-step4c, all plants using different energy source/fuel with the proposed project ($N_{all-other}$) are considered different from the proposed CDM project activity. Thus, $N_{all-other} =N_{diff-other}$

Therefore, $N_{all}= N_{diff}$

Thereby, $F=1-N_{diff}/N_{all}=1-1=0$ and $N_{all}-N_{diff}=0$

According to "tool for demonstration and assessment of additionality (Version 06.0.0)" and "Clarification request on application of common practice analysis with Tool for the demonstration and assessment of additionality (version 6.0)", if the factor F is greater than 0.2 and $N_{all}-N_{diff}$ is greater than 3, the proposed project activity is a "common practice".

For the proposed project, F=0 and $N_{all}-N_{diff}=0$, so the proposed project is not common practice within the region. Hence, the proposed project is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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

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

Baseline emissions

Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

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

Where:
BE_y = Baseline emissions in year *y* (tCO_2).
$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh).
$EF_{grid,CM,y}$ = 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" (tCO_2/ MWh).

Since the proposed project is the installation of a new grid-connected renewable power plant, then $EG_{PJ,y}$ is calculated using the following formula:

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

Where:
$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh).
$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh).

$$EG_{facility,y} = EG_{export,y} - EG_{import,y} \quad (3)$$

Where:
$EG_{export,y}$ = Quantity of electricity generation exported by the proposed project to the grid in year y (MWh).
$EG_{import,y}$ = Quantity of electricity generation imported by the proposed project from the grid in year y (MWh).

The methodological tool "Tool to calculate the emission factor for an electricity system" (version 02.2.1) determines the CO_2 emission factor for the displacement of electricity generated by power plants in an electricity system, by calculating the “combined margin” emission factor (CM) of the electricity system. The CM is the result of a weighted average of two emission factors pertaining to the electricity system: the “operating margin” (OM) and the “building margin” (BM). The operating margin is the emission factor that refers to the group of existing power plants whose current electricity generation would be affected by the proposed CDM project activity. The build margin is the emission factor that refers to the group of power plants whose construction and future operation would be affected by the proposed CDM project activity.

The methodological tool “Tool to calculate the emission factor for an electricity system” (version 02.2.1) 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 the project electricity system in year y
$EF_{grid,BM,y}$	tCO_2/MWh	Build margin CO_2 emission factor for the project electricity system in year y
$EF_{grid,OM,y}$	tCO_2/MWh	Operating margin CO_2 emission factor for the project electricity system in year y

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

Step1. Identify the relevant electricity systems;
Step2 Choose whether to include off-grid power plants in the project electricity system (optional);
Step3.Select a method to determine the operating margin (OM);
Step4. Calculate the operating margin emission factor according to the selected method;
Step5. Calculate the build margin (BM) emission factor;
Step6. Calculate the combined margin (CM) emission factor.

Step1: Identify the relevant electricity systems

According to ACM0002(Version 12.3.0)and the definitions of power grid published by DNA of China[10], the spatial extent of the project boundary includes Proposed Project and all power plants connected physically to the Northeast China Power Grid that the CDM project power plant is connected to.
Northeast China Power Grid that the CDM project power plant is connected to Northeast China Power Grid is defined as the project electricity system, which consists of independent province-level electricity systems including Liaoning, Jilin and Heilongjiang province that can be dispatched without significant transmission constraints.

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**.Since the Northeast China Power Grid has no electricity import, the spatial extent is limited to the project electricity system (Northeast China Power Grid).

Step2: Choose whether to include off-grid power plants in the project electricity system (optional)

Project participants may choose between the following two options to calculate the operating margin and

[10] Notification on Determining Baseline Emission Factor of China’s Grid 2011 issued by China’s DNA.
http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2720.pdf

build margin emission factor:

Option I: Only grid power plants are included in the calculation.
Option II: Both grid pants and off-grid power plants are included in the calculation.

The proposed project calculation only included grid power plants. Therefore, Option I is selected.

Step3: Select a method to determine an operating margin (OM)

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

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

The simple OM method (option a) can only be used if low-cost/must-run resources [11] 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.

The dispatch data analysis (option d) cannot be used if off-grid power plants are included in the project electricity system as per Step 2 above.

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: If the *ex ante* option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation. For off-grid power plants, use a single calendar year within the 5 most recent calendar years prior to the time of submission of the CDM-PDD for validation.

- Ex post option: If the *ex post* option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required to calculate the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year $y-1$ may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year $y-2$ may be used. The same data vintage (y , $y-1$ or $y-2$) should be used throughout all crediting periods.

For the dispatch data analysis OM, use the year in which the project activity displaces grid electricity and

[11] 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.

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 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 constitute8.28% , 5.73%, 5.51% 5.78% and 6.89% of total generation of Northeast China Power Grid from the year 2005 to 2009, respectively (China Electric Power Yearbooks 2006-2010). 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 the Northeast China Power Grid by using the simple OM method (option a) for the proposed project.

Step 4: 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.

The simple OM may be calculated:

Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit[12]; or

Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

Option B can only be used if:
(a) The necessary data for Option A is not available; and
(b) Only 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; and
(c) Off-grid power plants are not included in the calculation (i.e., if Option I has been chosen in Step 2).

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 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, 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, and, off-grid power plants are not included in the calculation which means Option I has been chosen in Step 2, therefore, Option B can be used.

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

$$EF_{grid,OMsimple,y} = \frac{\sum_i \left(FC_{i,y} \times NCV_{i,y} \times EF_{CO_2,i,y}\right)}{EG_y} \quad (4)$$

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)

$EF_{CO_2,i,y}$ = 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 relevant year as per the data vintage chosen in Step 3

[12] Power units should be considered if some of the power units at the site of the power plant are low-cost/must-run units and some are not. Power plants can be considered if *all* power units at the site of the power plant belong to the group of low-cost/must-run units or if *all* power units at the site of the power plant do *not* belong to the group of low-cost/must-run units.

For this approach (simple OM) to calculate the operating margin, the subscript m refers to the power plants/units delivering electricity to the grid, not including low-cost/must-run power plants/units, and including electricity imports[13] to the grid. Electricity imports should be treated as one power plant m.

Regarding parameter selection, local values of $NCV_{i,y}$ and $EF_{CO_2,i,y}$ 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 2008-2010. Emission factors ($EF_{CO_2,i,y}$) of each type of fossil fuel come from IPCC 2006 default values.

As chosen in step 3, 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. And the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required.

The data of installed capacity, electricity generation and fuel consumptions are all from China Energy Statistical Yearbooks 2008-2010 and China Electric Power Yearbooks 2008-2010.

Given the above, the simple operating margin CO_2 emission factor ($EF_{grid,OMsimple,y}$) of Northeast China Power Grid is **1.0852 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 DNA, the website is Notification on Determining Baseline Emission Factor of China's Grid 2011 issued by China's DNA. http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2720.pdf

Step 5: Calculate the build margin (BM) emission factor

The sample group of power units m used to calculate the build margin consists of either[14]:

(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[15].

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

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[13] As described above, an import from a connected electricity system should be considered as one power source.

[14] If this approach does not reasonably reflect the power plants that would likely be built in the absence of the project activity, project participants are encouraged to submit alternative proposals for consideration by the CDM Executive Board.

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

(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 third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2: For the first crediting period, the build margin emission factor shall be updated annually, ex-post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated *ex ante*, as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

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

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units *m* during the most recent year *y* for which power generation data is available, calculated as follows:

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

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 5 was adopted for the proposed project; the same issue on data availability must be addressed. Currently, it is very difficult to get the capacity margin data of power plants in China, since these data as well as net quantity of electricity generated and delivered to the grid and fuel consumption data in power unit m are regarded as commercial secrets or only for internal usage.

According to "Tool to calculate the emission factor for an electricity system" and EB accepts[16], the following deviation was adopted to calculate the Build Margin emission factor.

1) 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).
2) Use of capacity additions during last 1 - 3 years for estimating the build margin emission factor for grid electricity.
3) Use of weights estimated using installed capacity in place of annual electricity generation.

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. 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:

$$\lambda_{Coal,y} = \frac{\sum_{i \in COAL, j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \qquad (6)$$

$$\lambda_{Oil,y} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \qquad (7)$$

$$\lambda_{Gas,y} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \qquad (8)$$

Where:
$F_{i,j,y}$ = 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);

[16] Deviation for projects in China (DNV, 7 Oct 2005) http://cdm.unfccc.int/Projects/deviations/87512

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

$COAL$, OIL & 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:

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

Where:
$EF_{Coal,Adv,y}$, $EF_{Oil,Adv,y}$ & $EF_{Gas,Adv,y}$ 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).

3. 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):

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

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

Following the four steps above, the build margin emission factor $EF_{grid,BM,y}$ of the Northeast China Power Grid is calculated to be **0.5986tCO_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 DNA, the website is Notification on Determining Baseline Emission Factor of China's Grid 2011 issued by China's DNA. http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2720.pdf
Step 6: Calculate the combined margin emissions factor

The combined margin emissions factor is calculated as follows:

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

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:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} = \mathbf{0.9636\ tCO_2/MWh}$$

Project emissions

For the proposed wind power project activities, there are no emissions from fossil fuel consumption, operation of geothermal power plants or water reservoirs of hydro power plants.

$$PE_y = 0 \tag{12}$$

Leakage

No leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, and transportation). These emissions sources are neglected.

Emission reductions

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y \tag{13}$$

Where:

ER_y = Emission reductions in year y (t CO_2e).

BE_y = Baseline emissions in year y (t CO_2e).

PE_y = Project emissions in year y (t CO_2).

BE_y is calculated using the following formula:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y} \tag{14}$$

Where:

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

$EF_{grid,CM,y}$ = The combined margin emissions factor.

$EG_{PJ,y}$ is calculated using the following formula:

$$EG_{PJ,y} = EG_{facility,y} \tag{15}$$

Where:

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y

Then, the annual emission reduction of the proposed project is:

$$ER_y = BE_y - PE_y = BE_y = EG_{facility,y} \times EF_{grid,CM,y} = \left(EG_{exported,y} - EG_{imported,y}\right) \times EF_{grid,CM,y} \qquad (16)$$

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

Data / Parameter:	$FC_{i,y}$ $F_{i,j,y}$
Data unit:	Mass or volume unit
Description:	Amount of fossil fuel type i (in a mass or volume unit) consumed by power plant/unit (or in the project electricity system in case of $FC_{i,y}$) in year y, or the amount of fuel type i (in a mass or volume unit) consumed by province j
Source of data used:	China Energy Statistical Yearbook 2008-2010
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistical data
Any comment:	/

Data / Parameter:	$EG_{m,y}, EG_y$
Data unit:	MWh
Description:	Net electricity generated and delivered to the grid by power plant / unit *m* (or in the project electricity system in case of EG_y) in year y
Source of data used:	China Electric Power Yearbook 2008-2010
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistical data
Any comment:	-

Data / Parameter:	$NCV_{i,y}$
Data unit:	kJ/kg or kJ/m^3
Description:	Net calorific value (energy content) of fossil fuel type i in year y
Source of data used:	China Energy Statistical Yearbook 2008-2010
Value applied:	See Annex 3
Justification of the choice	Official statistical data

of data or description of measurement methods and procedures actually applied :	
Any comment:	/

Data / Parameter:	$EF_{CO_2,i,y}$ $EF_{CO_2,i,j,y}$
Data unit:	tCO_2/TJ
Description:	CO_2 emission factor of fossil fuel type i in year y (consumed by province j)
Source of data used:	2006 IPCC default values
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC default value
Any comment:	/

Data / Parameter:	$CAP_{j,y}$
Data unit:	MW
Description:	Installed capacity of relevant power source j connected to the grid in year y
Source of data used:	China Electric Power Yearbook 2008-2010
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistical data
Any comment:	/

Data / Parameter:	$\eta_{coal,adv}$
Data unit:	%
Description:	Best electricity supply efficiency for coal fired plant
Source of data used:	http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2720.pdf
Value applied:	39.45
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistical data
Any comment:	/

Data / Parameter:	$\eta_{oil,adv}$
Data unit:	%

Description:	Best electricity supply efficiency for oil fired plant
Source of data used:	http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2720.pdf
Value applied:	51.77
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistical data
Any comment:	/

Data / Parameter:	$\eta_{gas,adv}$
Data unit:	%
Description:	Best electricity supply efficiency for gas fired plant
Source of data used:	http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2720.pdf
Value applied:	51.77
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistical data
Any comment:	/

Data / Parameter:	$EF_{grid,CM,y}$
Data unit:	tCO_2/MWh
Description:	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 02.2.1)
Source of data used:	http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2720.pdf
Value applied:	0.9636 (Chinese DNA)
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per the "Tool to calculate the emission factor for an electricity system" (version 02.2.1)
Any comment:	/

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

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

According to the baseline methodology ACM0002, the leakage of the proposed project can be neglected.

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

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

$EF_{grid,CM,y}$ =0.9636 tCO_2/MWh.

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

$EG_{PJ,y} = EG_{facility,y}$ =113,004MWh.

The baseline emission will be:

$BE_y = EG_{PJ,y} \times EF_{grid,CM,y} = EG_{facility,y} \times EF_{grid,CM,y}$ =108,890tCO_2

The annual emission reductions of the proposed project will be:

$ER_y = BE_y - PE_y = BE_y = EG_{PJ,y} \times EF_{grid,CM,y} = EG_{facility,y} \times EF_{grid,CM,y}$ =108,890 tCO_2

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

The starting date of the first crediting period is on 01/10/2012, the finishing date is on 30/09/2019. The annual emission reductions will be 108,890tCO2e.

Year	Estimation of baseline emissions (tons of CO2e)	Estimation of project activity emissions(tons of CO2e)	Estimation of leakage (tons of CO2e)	Estimation of overall emission reductions (tons of CO2e)
01/10/2012-31/12/2012	27,222	0	0	27,222
2013	108,890	0	0	108,890
2014	108,890	0	0	108,890
2015	108,890	0	0	108,890
2016	108,890	0	0	108,890
2017	108,890	0	0	108,890
2018	108,890	0	0	108,890
01/01/2019-30/09/2019	81,668			81,668
Total(tons of CO2e)	762,230	0	0	762,230

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

B.7.1 Data and parameters monitored:

Data / Parameter:	$EG_{facility,y}$
Data unit:	MWh
Description:	Quantity of net electricity generation supplied by the project plant to the grid in year y
Source of data to be used :	Project activity site
Value of data applied for the purpose of calculating expected emission reductions in section B.5	113,004
Description of measurement methods and procedures to be applied:	Electricity meter (accuracy degree will be no less than 0.5, bidirectional) will be installed at the project site, which measure the exported electricity by the project to the grid and imported electricity by the project from the grid, and the net electricity generation supplied by the project to the grid can be calculated. The readings of electricity meter will be measured continuously and recorded every month. The metering equipments will be calibrated annually according to the national standards. Data will be archived for 2 years following the end of the crediting period by means of electronic and paper backup.
QA/QC procedures to be applied:	The Meters used for reading will be calibrated as per industry standards of host country. Cross check measurement results with records for sold electricity.
Any comment:	See also section B.7.2 for more details.

B.7.2. Description of the monitoring plan:

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

1.Monitoring object

The monitoring objects are mainly power generation exported to the grid and imported from the grid which can obtain the net generation supplied by the project to the power grid.

2. Implementation of the monitoring plan

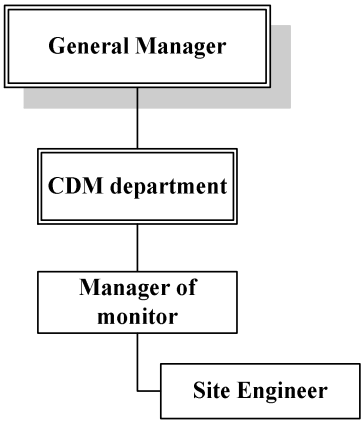

Figure-CDM working structure

The general manager makes the overall policy decision while the CDM department is responsible for the concrete implementation of the Monitoring Plan. The monitor manager is responsible for supervising and checking the whole date record process and the calibration of meters. Another main task of the monitor manager is facilitating the verification through providing the DOE with all required necessary information. The site engineer will collect monitoring data (e.g. electric meter data), keep records for sold electricity, calculate emission reduction and prepare the monitor report.

3. Monitoring equipments

The electricity exported to the grid will be monitored by the meter installed at the project site, the meter will be continuously measured and monthly recorded.

4. Monitoring procedure

All relevant parameters listed in Section B 7.1 will be monitored according to the methodology requirements and description of measurement methods and procedures to be applied. The results and data will be recorded and well documented. Data will be archived for 2 years following the end of the crediting period by means of electronic and paper backup. The data and meter reading will be readily accessible for DOE.

If in the future, some other wind power projects share the same transformer, substation or transmission line with the proposed project, the appropriate separate meters will be installed in the project site so that the electricity generation can be monitored respectively. Any on-site parasitic losses will be deducted.

5. Quality assurance and Quality control

The quality assurance and quality control procedures for recording, maintaining and archiving data shall be improved as part of this CDM project activity. 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 this PDD and the CDM manual.

The project employs high accuracy monitoring and control equipment that will measure, record, report, and monitor and control various key parameters. The monitoring and controls will be the part of the Distributed Control System (DCS) of the entire wind farm. Necessary check meter will be installed, to operate in standby mode when the key meter is not working. All meters will be calibrated and sealed as per the industry practices at regular intervals. Hence, high quality is ensured with the above parameters. Records for sold electricity will be used and kept for checking consistency of the recorded data.

6. Emergency management and reporting procedure

An agreement should be signed between the project owner and Grid Power Company that defines the metering arrangements and the required quality control procedures to ensure accuracy.

- The metering equipment will be properly configured and calibrated annually according to the requirement of the host country. The metering equipment will be checked by the project owner and local Power Company before operation.
- The verification of electricity meter should be periodically carried out according to relevant national electric industry standards or regulations. After verification, the meter should be sealed. The meter shall be jointly inspected and sealed on behalf of the parties concerned and shall not be accessible by either party except in the presence of the other party or its accredited representatives.
- The meter installed shall be tested by the qualified metrical organization co-authorized by the Northeast China Power Grid and the project owner within 10 days after:

1) The detection of a difference larger than the allowable error in the reading of the meter, when considering the reactive loss of electrical wire,

2) The repair of all or part of the meter caused by the failure of one or more parts to operate in accordance with the specifications,

If any errors are detected, the party owning the meter shall repair, recalibrate or replace the meter and give the other party sufficient notice to allow a representative to attend during any corrective activity.

7. 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):

>>

The baseline study of the proposed project was completed on 27/07/2012

The persons involved in baseline study are listed as follows:

Shi Jin,

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(Not the project participants listed in Annex 1)

SECTION C. Duration of the project activity / crediting period

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

>>
01/06/2011(Loan contract was signed.)

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

>>
20y

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

The project will use a renewable crediting period

C.2.1. Renewable crediting period:

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

>>
01/10/2012 or the registration date whoever is late.

C.2.1.2. Length of the first crediting period:

>>
7y

C.2.2. Fixed crediting period:

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 laws and regulations, an environmental impact assessment (EIA) report of the proposed project was completed and approved by the Environment Protection Bureau of Jilin Province on 20/12/2010 referred as "Jihuanshenbiaozi[2010]611". The potential environmental impacts of the proposed project include:

- **Main Potential Environmental Impacts Associated with the project**

– Impacts from the construction, including dust, waste, noise, wastewater etc;

– Impacts from noise and the electromagnetism pollutions of the wind turbines during the operation period;

– Impacts on ecological environment as a result of construction and operation

- **Impacts of Dust**

Wind power projects 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 dust from the construction activities including material transportation, road construction and infrastructure construction etc. The impacts of dust on air environment are temporary as the impact will disappear when the construction is completed. Several measures are recommended to reduce the temporary dust, including prohibiting construction under strong wind condition, minimizing the area of construction, spraying water when undertaking construction, rehabilitation of plants and reducing the speed of vehicles in the field. Therefore, the proposed project will not cause significant air pollution to the surrounding environment.

- **Impacts of Noise**

The noise of the proposed project during construction is from dig blasting, concrete mixing, material procession and vehicles on-site. According to the environment study report of the proposed project, the noise level is below 55 dB(A) 60m from the proposed project in the daytime and 45 dB(A) 200 m from the proposed project at night, which comply with I class-GB12348-90. There are no residents within 1000m around the wind turbines. Therefore, the noise during construction will have barely impacts on local residents. Moreover, the noise during construction only exists temporarily and will disappear at the end of construction.

- **Impacts of Wastewater and Solid Waste**

During the operation phase, the mainly wastewater and solid waste are from the workers of the wind farm, so the quantity is small and it is proposed to construct a sewage tank for the storage and the treated water may use for the irrigation for farmlands, and the sludge may use as fertilizer thus will not pollute the surface water. The domestic waste are produced by the workers, and the waste will be transported to landfill for treatment.

During the construction phase, the possible negative impacts are the household wastewater and solid waste produced by builders and staff, and the waste soil from digging of the foundation during construction. It is proposed that the household wastewater is treated in a dry toilet and used as fertilizer together with domestic waste and wastewater. The household solid waste will be very little in quantity, and will be collected and moved to the nearby landfill site. The waste earth from the digging will be all used for refilling and building roads. Therefore, the solid waste will have no impact on local environment.

- **Impacts of electromagnetism**

Through the investigation of similar wind farms located in Jilin province and nationwide, there is no obvious impact on the surrounding environment, since there are no residents living within 500m of the proposed project. Therefore, no electromagnetism impact is placed on the residents..

- **Impacts on Ecosystem Environment**

A potential concern for wind power projects is their impact on local vegetation, animals and migrating birds. According to the EIA report of the proposed project, the site of the proposed project is mainly wasteland with a little grassland and forestland. The construction of the proposed project will damage the vegetation (a little grass and trees) on the site, but will be recovered with the vegetation recovery and compensation measures to be taken after the construction is completed, which will minimize the impact on local vegetation of the proposed project. Moreover, there are no endangered species on the site of the proposed project, which is not on the migratory path of birds either. Therefore, the proposed project will have no significant impact on local ecological environment. On the contrary, after the completion of the proposed project, it will add new sights to the local tourism industry.

- **Socio-Economic Impacts**

With an estimated annual electricity supply of 113,004MWh, the proposed project will significantly contribute to local power demand and diversify regional power mix. It will provide new employment opportunities and increase local revenues.

- **Conclusion**

The proposed project will have no significant negative impacts on environment during its construction and operation.

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, and the proposed project is definitely an environmentally more friendly way of providing power than other power plants.

SECTION E. Stakeholders’ comments

>>

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

>>

In 06/06/2011, under the support of the local municipal government, the project owner successfully held a stakeholder meeting in the project site. Related stakeholder representatives participated the meeting, respectively from the local Government, grid company, local Environmental Protection Bureau, local Development and Reform Bureau and villagers' representatives.

In addition, the project owner carried out a questionnaire survey among the local villagers and residents of the proposed project in the format of questionnaires in the period of 03/06/3011-06/06/2011. The survey had a 100% response rate (30 questionnaires returned out of 30).

The questionnaire was designed as following table.

Your gender: □Male □Female
Your age: □30 and below □30-40 □40-50 □50 and above
Your educational level:

□Junior middle school and below □High school □College and above
What type of organization you work for? □Government □Enterprise □Agriculture □Others
Do you know CDM before? □Yes □No
The distance from your residence or working unit to the project site: □100-500m □500-1000m □1000m and above
Do you satisfied with the local environment? □Yes □No
What positive impacts on local region are there for the construction of the proposed project? □Economy □Environment □Social □Others
Do you think whether the proposed project will generally help develop local economy and create new job opportunity? □Yes □No
Do you think whether it's beneficial to local residents' income consequently? □Yes □No
What special environmental issues should be considered in the construction of the proposed project? □Ecological environment □Waste water □Waste air □Noise □Solid waste □Soil erosion
To which extent the proposed project will result in nature environmental pollution? □Nothing □Nearly nothing □Slightly □Seriously
To which extent the proposed project has negative impact on visual environment, animals and plants? □Nothing □Nearly nothing □Slightly □Seriously
To which extent the proposed project has negative impact on soil erosion? □Nothing □Nearly nothing □Slightly □Seriously
Do you think whether the proposed project will help to develop local tourism? □Yes □No
Do you satisfied with the method and amount of compensation for the occupied land? □Yes □No
Do you think whether the proposed project will contribute to the mitigation of the GHG emissions? □Yes □No
Do you support the proposed project? □Yes □No
Your other comments:
Your signature: Date:

E.2. Summary of the comments received:

>>

1) Summary of the comments received in the symposium:

The topics discussed in the stakeholders meeting were mainly : 1. Do you know the general information about the proposed project(including installed capacity, location, investment etc)? 2. What is your

opinion on the economic assessment of the proposed project, such as the impact on the local economy, income and employment; 3. What is your opinion on the environment assessment of the proposed project; 4. the impact on the sustainable development of the project site and China; 5. Suggestion on the project owner; 6. Do you support the proposed project?
The feedback to the topics: Representative from local development and reform committee thought that the proposed project would improve the local economy, environment and society ; Representative from local environment protection bureau supported the construction of the proposed project on the basis that it can benefit the local environment and lead in the sustainable development; Representative from local power grid company thought that the propsed project would improve the power supply in the Northeast power grid; Representative from local government agreed that the proposed project would benefit the local economy; Local residents thought that the proposed project would improve the transportation of the project site and bring working opportunities and thus , welcomed the construction of the project.

2) Public survey results:

The survey had a 100% response rate (30 questionnaires returned out of 30) and the following is a summary of the key findings:

Basic information of stakeholders participated in the survey: 1.Gender: Male-77% ,Female-23%; 2.Age: Below 30years old -10%, 30-40 years old-43%, 40-50 years old-26%, Above 50 years old-21%; 3.Career: Enterprise and public institution staff-10%, Self-employed-33%, Farmers-50%, Others-7% ; 4. Eductaion level: Below primary school-26%, Junior school-26%, Senior School-48%.

Answers to each question:1. Do you know CDM before? 100% respondents do not know CDM before; 2.The distance from your residence or working unit to the project site? 100% respondents chose option 3-farther than 1,000m; 3.Do you satisfied with the local environment? 100% respondents satisfied with the local environment and no negative opinion was received; 4. What positive impacts on local region are there for the construction of the proposed project? 73% respondents chose economy, 36% respondents chose society, 30% respondents chose environment, 16% respondents chose other aspects; 5. 100% respondents agreed that the proposed project will generally help develop local economy and create new job opportunity; 6. 100% respondents agreed that it’s beneficial to local residents’ income and living standards; 7. What special environmental issues should be considered in the construction of the proposed project? 43% respondents chose ecological environment, 40% respondents chose solid waste and soil erosion, 26% chose waste water and 10% chose noise; 8. To which extent the proposed project will impact the natural environmental? Only 1 respondent chose slightly impact and other 29 respondents all chose no impact to the natural enviroment; 9. To which extent the proposed project has impact on visual environment, animals and plants? 25 respondents chose no impact on visual environment, animals and plants and 5 respondents chose slightly impact; 10. To which extent the proposed project has impact on soil erosion? 17 respondents chose no impact and 13 respondents chose slightly impact; 11. Do you think whether the proposed project will help to develop local tourism? 100% respondents chose yes; 12. Do you satisfied with the method and amount of compensation for the occupied land? 100% respondents chose yes; 13. Do you think whether the proposed project will contribute to the mitigation of the GHG emissions?100% respondents chose yes; 14. Do you support the proposed project? 100% respondents chose yes.

The conclusion of the Questionnaire Survey is as follows:

The survey shows that the proposed project receives strong support from local people, which is closely linked to the fact that the majority of local villagers have some understandings with wind power projects.

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

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 by the construction of the project, the project owner should guarantee and suitably add the investment of environmental protection. At the same time, the construction processes should be strictly implemented according to the followings:

- It is prohibited that the construction is implemented at night.
- The construction should be strictly following the state environment regulations and requirements.
- Establish and improve the mechanism of emergency treatment of environment risk, strict implementation of development plan and measures for any environment risk.

Above all, the local residents highly supported the proposed project. The project owner had comprehensively considered the advices and opinions of the local stakeholders during the implementation of the proposed project, and will continue to maintain communications with the public.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

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

Annex 3

BASELINE INFORMATION

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

Table A-1, A-2, and A-3 provide annual thermal power electricity generation in NEPG from 2007 to 2009. The main data sources come from China Electric Power Yearbook 2008, 2009 and 2010.

Table A- 1 Annual thermal power electricity generation in NEPG in 2007

Province	Electricity generation （MWh)	Self usage rate （%）	Electricity delivered to the grid （MWh)
Liaoning	106,500,000	7.00	99,045,000
Jilin	43,700,000	7.68	40,343,840
Heilongjiang	68,400,000	7.67	63,153,720
Total			**202,542,560**

Data source：China Electric Power Yearbook 2008.

Table A- 2 Annual thermal power electricity generation in NEPG in 2008

Province	Electricity generation （MWh)	Self usage rate （%）	Electricity delivered to the grid （MWh)
Liaoning	108,500,000	7.18	100,709,700
Jilin	46,400,000	7.76	42,799,360
Heilongjiang	71,500,000	7.53	66,116,050
Total			**209,625,110**

Data source：China Electric Power Yearbook 2009.

Table A- 3 Annual thermal power electricity generation in NEPG in 2009

Province	Electricity generation （MWh)	Self usage rate （%）	Electricity delivered to the grid （MWh)
Liaoning	113,500,000	6.94	105,623,100
Jilin	47,300,000	7.89	43,568,030
Heilongjiang	69,400,000	7.29	64,340,740
Total			**213,531,870**

Data source：China Electric Power Yearbook 2010

The key parameters in OM and BM calculation include the net caloric values (NCV_s) and CO_2 emission factor per unit of energy (EF_{CO_2s}) of various types of fuels, which are shown in the table below:

Table A-4: NCV_s and EF_{CO_2s} of various types of fuels

Fuel	NCV_s	**IPCC fuel EF_{CO2s}**
	（MJ/t,km³）	**The lowest limit of 95% confidence interval**
		($kgCO_2$/TJ)
Coal	20,908	87,300
Washed coal	26,344	87,300
Moulded coal	20,908	87,300
Other Washed Coal[1]	8,363	87,300
Coke	28,435	95,700
Other coke products	28,435	95,700
Crude oil	41,816	71,100
Gasoline	43,070	67,500
Diesel	42,652	72,600
Fuel oil	41,816	75,500
Other petroleum products	41,816	72,200
Natural gas	38,931	54,300
Coke Oven Gas[2]	16,726	37,300
Other Coal Gas[3]	5,227	37,300
LPG	50,179	61,600
Refinery gas	46,055	48,200
Other energy	0	0

Data sources:

NCV_s are from China Energy Statistical Yearbook 2010

EF_{CO_2s} are from 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Chapter 1, table 1-3 and table 1-4.

[1] 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.

[2] 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 2008-2010.

[3] 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 2008-2010.

Firstly, the data using in calculations of OM of NEPC are shown in several tables:

Table A-5: The fuel consumption and total emissions of Northeast China Power Grid in 2007

Fuel types	unit	Liaoning	Jilin	Heilongjiang	Sub-Total	Carbon content	Carbon Oxid	Fuel Emission Factor	Net caloric value	CO_2 emission（tCO_2e）
						(tc/TJ)	(%)	(kgc/TJ)	MJ/t,km^3	I=D*G*H/100000(quantity)
		A	B	C	D=A+B+C	E	F	G	H	I=D*G*H/10000(volume)
Coal	10^4t	4869.32	2873.45	3736.11	**11478.88**	25.8	100	87,300	20908	209,520,369
Washed coal	10^4t	0	0	0	**0**	25.8	100	87,300	26344	0
Other Washed Coal	10^4t	747.85	16.52	106.81	**871.18**	25.8	100	87,300	8363	6,360,397
Moulded coal	10^4t	0	0	0	**0**	25.8	100	87,300	20908	0
Coke	10^4t	4.99	0	0	**4.99**	26.6	100	95,700	28435	135,789
Coke oven gas	10^8M^3	5.53	1.44	1.89	**8.86**	12.1	100	37,300	16726	552,758
Other gas	10^8M^3	68.38	9.06	0	**77.44**	12.1	100	37,300	5227	1,509,825
Crude oil	10^4t	0.24	0	0	**0.24**	20	100	71,100	41816	7,135
Gasoline	10^4t	0	0	0	**0**	18.9	100	67,500	43070	0
Diesel	10^4t	0.96	0.39	0.47	**1.82**	20.2	100	72,600	42652	56,357
Fuel oil	10^4t	8.43	0.45	1.48	**10.36**	21.1	100	75,500	41816	327,076
LPG	10^4t	0	0	0	**0**	17.2	100	61,600	50179	0
Refinery gas	10^4t	7.33	0	1.99	**9.32**	15.7	100	48,200	46055	206,890
Natural gas	10^8M^3	0	0.02	2.03	**2.05**	15.3	100	54,300	38931	433,360
Other oil product	10^4t	0.01	0	0	**0.01**	20	100	72,200	41,816	302
Other coked product	10^4t	0.46	0	0	**0.46**	25.8	0	95,700	28435	12,518
Other energy	10^4t	12.41	2.43	51.35	**66.19**	0	0	0	0	0
Total										219,122,778

China Energy Statistical Yearbook 2008

Table A-6: The fuel consumption and total emissions of Northeast China Power Grid in 2008

Fuel types	unit	Liaoning	Jilin	Heilongjiang	Sub-Total	Carbon content	Carbon Oxid	Fuel Emission Factor	Net caloric value	CO_2 emission（tCO_2e）
						(tc/TJ)	(%)	(kgc/TJ)	$MJ/t,km^3$	I=D*G*H/100000(quantity)
		A	B	C	D=A+B+C	E	F	G	H	I=D*G*H/10000(volume)
Coal	10^4t	4973.05	3289.16	3873.45	12135.66	25.8	100	87,300	20,908	221,508,367
Washed coal	10^4t	0	0	0	0	25.8	100	87,300	26,344	0
Other Washed Coal	10^4t	791.96	15.58	112.97	920.51	25.8	100	87,300	8,363	6,720,551
Moulded coal	10^4t	0	0	0	0	26.6	100	87,300	20,908	0
Coke	10^4t	5.77	0	0	5.77	29.2	100	95,700	28,435	157,015
Coke oven gas	10^8M^3	4.12	1.06	5.54	10.72	12.1	100	37,300	16,726	668,799
Other gas	10^8M^3	61.11	7.63	0	68.74	12.1	100	37,300	5,227	1,340,204
Crude oil	10^4t	0.37	0	0	0.37	20	100	71,100	41,816	11,001
Gasoline	10^4t	0.02	0	0	0.02	18.9	100	67,500	43,070	581
Diesel	10^4t	0.84	1.07	0.37	2.28	20.2	100	72,600	42,652	70,601
Fuel oil	10^4t	10.64	1.06	1.29	12.99	21.1	100	75,500	41,816	410,108
LPG	10^4t	0	0	0	0	17.2	100	61,600	50,179	0
Refinery gas	10^4t	7.54	0	3.77	11.31	15.7	100	48,200	46,055	251,065
Natural gas	10^8M^3	0	0.39	1.85	2.24	15.3	100	54,300	38,931	473,526
Other oil product	10^4t	0	0	0	0	20	100	72,200	41,816	0
Other coked product	10^4t	0	0	0	0	25.8	100	95,700	28,435	0
Other energy	10^4t	16.9	3.04	68.19	88.13	0	0	0	0	0
Total										231,611,818

China Energy Statistical Yearbook 2009

Table A-7: The fuel consumption and total emissions of Northeast China Power Grid in 2009

Fuel types	unit	Liaoning	Jilin	Heilongjiang	Sub-Total	Carbon content	Carbon Oxid	Fuel Emission Factor	Net caloric value	CO_2 emission（tCO_2e）
						(tc/TJ)	(%)	(kgc/TJ)	MJ/t,km^3	I=D*G*H/100000(quantity)
		A	B	C	D=A+B+C	E	F	G	H	I=D*G*H/10000(volume)
Coal	10^4t	5297.77	2999.09	3691.92	11988.78	25.8	100	87,300	20,908	218,827,413
Washed coal	10^4t	0	0	0	0	25.8	100	87,300	26,344	0
Other Washed Coal	10^4t	662.76	19.67	98.77	781.2	25.8	100	87,300	8,363	5,703,462
Moulded coal	10^4t	0	0	1.18	1.18	26.6	100	87,300	20,908	21,538
Coke	10^4t	4.19	0	0	4.19	29.2	100	95,700	28,435	114,020
Coke oven gas	10^8M^3	4.97	1.77	2.51	9.25	12.1	100	37,300	16,726	577,089
Other gas	10^8M^3	75.72	13.88	0.11	89.71	12.1	100	37,300	5,227	1,749,050
Crude oil	10^4t	0.79	0	0	0.79	20	100	71,100	41,816	23,488
Gasoline	10^4t	0	0	0	0	18.9	100	67,500	43,070	0
Diesel	10^4t	0.44	0.42	0.43	1.29	20.2	100	72,600	42,652	39,945
Fuel oil	10^4t	3.32	0.79	1.39	5.5	21.1	100	75,500	41,816	173,641
LPG	10^4t	0	0	0	0	17.2	100	61,600	50,179	0
Refinery gas	10^4t	7.78	0	3.21	10.99	15.7	100	48,200	46,055	243,962
Natural gas	10^8M^3	0	1.97	1.86	3.83	15.3	100	54,300	38,931	809,644
Other oil product	10^4t	0.44	0	0	0.44	20	100	72,200	41,816	13,284
Other coked product	10^4t	0	0	0	0	25.8	100	95,700	28,435	0
Other energy	10^4t	18.24	15.93	107.82	141.99	0	0	0	0	0
Total										228,296,535

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Based on the data of 2007, 2008 and 2009, OM factor of NEPG in weighted average of thermal generation are shown in Table A-8.

Table A-8: OM factor of Northeast China Power Grid

Years	Thermal generation delivered to NEPG	The emissions from NEPG	OM
	A	**B**	**C=B/A**
2007	202542560	219122778	1.081860412
2008	209625110	231611818	1.104885851
2009	213531870	228296535	1.069145019
Average OM			**1.0852**

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} (kgc/TJ)	Oxid	Emission factor (tCO_2/MWh)
	A	**B**	**C**	**D=3.6/A/1000000*B*C**
Coal fired plant	39.45%	87300	1	0.7967
Oil fired plant	51.77%	75500	1	0.5250
Gas fired plant	51.77%	54300	1	0.3776

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	Net caloric value	EF_{CO2}	Oxid	CO_2 emission（tCO_2e）
		A	B	C	D=A+B+C	H	G	F	I=D*G*H/100000
Coal	10^4t	5,297.77	2,999.09	3,691.92	11,988.78	20,908	87,300	1	218,827,413
Washed coal	10^4t	0	0	0	0	26,344	87,300	1	0
Other Washed Coal	10^4t	662.76	19.67	98.77	781.2	8,363	87,300	1	5,703,462
Moulded Coal	10^4t	0	0	1.18	1.18	20,908	87,300	1	21,538
Coke	10^4t	4.19	0	0	4.19	28,435	95,700	1	114,020
Other Coking Product	10^4t	0	0	0	0	28,435	95,700	1	0
Sub-Total									224,666,433
Crude Oil	10^4t	0.79	0	0	0.79	41,816	71,100	1	23,488
Gasoline	10^4t	0	0	0	0	43,070	67,500	1	0
Diesel	10^4t	0.44	0.42	0.43	1.29	42,652	72,600	1	39,945
Fuel Oil	10^4t	3.32	0.79	1.39	5.5	41,816	75,500	1	173,641
Other Oil Product	10^4t	0.44	0	0	0.44	41,816	72,200	1	13,284
Sub-Total									250,358
Natual Gas	10^7M^3	0	19.7	18.6	38.3	38,931	54,300	1	809,644
Coke Oven Gas	10^7M^3	49.7	17.7	25.1	92.5	16,726	37,300	1	577,089
Other Gas	10^7M^3	757.2	138.8	1.1	897.1	5,227	37,300	1	1,749,050
LPG	10^4t	0	0	0	0	50,179	61,600	1	0
Refinery Gas	10^4t	7.78	0	3.21	10.99	46,055	48,200	1	243,962
Sub-Toal									3,379,744
Total									228,296,535

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With the above table and formula (6), (7), and (8), the following results are achieved:

λ_{Coal} =98.41% λ_{Oil} =0.11% λ_{Gas} =1.48%

$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv}$ =**0.7902 tCO_2/MWh**

Table A-11: Capacity addition from 2007 to 2009 in the Northeast China Power Grid

	Installed capacity in 2007（MW）	Installed capacity in 2008（MW）	Installed capacity in 2009（MW）	Addition capacity(2007-2009)（MW）	Addition capacity(2008-2009)（MW）	Addition share
	A	B	C	D	E	F
Thermal Power	41380	44820	49840	10772	6646	75.76%
Hydro Power	6170	6260	6300	130	40	0.91%
Nuclear power	0	0	0	0	0	0.00%
Wind Power and Other	1103	2230	4420	3317	2181	23.33%
Total	48653	53320	60560	14219	8867	100.00%
Share of 2009 installed capacity				23.48%	14.64%	

Data sources: China Electric Power Yearbook 2008-2010

$EF_{grid,BM,y} = EF_{Thermal,Adv} \times CAP_{Thernal,addition} / CAP_{Total,addition}$ = 0.7902×75.76%=**0.5986 tCO_2/MWh**

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

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

OM factor (tCO_2/MWh)	1.0852
BM factor (tCO_2/MWh)	0.5986
CM factor (tCO_2/MWh) **CM**=0.75×**OM**+0.25×**BM**	**0.9636**

4. Emission reduction calculation of the proposed project

$ER_y = BE_y - PE_y$ =113,004 MWh*0.9636 tCO_2/MWh = **108,890 tCO_2**

Annex 4

MONITORING INFORMATION

No appended information.