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

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

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The title of the project: Jilin province Zhenlai Heiyupao 49.5MW the first phase wind farm project
Version: 06.1
Date: 19/12/2012

PDD version 01	10/11/2008	Submitted to NDRC for approval
PDD version 02	05/12/2008	Revised according to the latest version of ACM0002(Version 8, EB44)
PDD version 03	15/01/2009	PDD version for GSP, revised according to the new emission factors published by NDRC
PDD version 04	03/03/2009	Revised according to the latest version of ACM0002(Version 9, EB45)
PDD version 05	28/10/2009	PDD submitted for registration
PDD version 06	09/11/2012	PDD with updated monitoring plan
PDD version 06.1	19/12/2012	PDD updated after incomoleteness of MP1and revised according to the findings raised by DOE

A.2. Description of the project activity:

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Jilin province Zhenlai Heiyupao 49.5MW the first phase wind farm project (hereafter referred to as “the proposed project”) is a newly built wind-farm project, located in the Zhenlai County, Jilin Province, P. R. China. Totally 33 wind turbines with a nominal capacity of 1500 KW will be installed, providing a total capacity of 49.5MW. The annual electricity supplied by the proposed project is about 100,120 MWh, which will be delivered to the Northeast China Power Grid.

The purpose of the proposed project is to generate electricity by using clean wind resources in Zhenlai area to alleviate electricity shortage in Northeast China. The proposed project will contribute to the reduction of GHG emission by displacing part of the electricity from Northeast China Power Grid, which is dominant of fossil fuel fired power plants. Through the application of the Tool for the demonstration and assessment of additionality, the baseline scenario is identified to be the equivalent annual electricity supplied by the Northeast China Power Grid, which is the same as the situation prior to the implementation of the proposed project activity. The proposed project is estimated to deliver 114,515 tCO_2e emission reductions annually in the first crediting period, which will contribute to the alleviation of climate change.

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

(1) The project will increase the tax income to promote local economic development and alleviate local poverty.

(2) The project will provide high quality clean electricity to Northeast China Power Grid, which can decrease the GHGs emission and at the same time alleviate the environment pollution caused by the combustion of the fossil fuels.

(3) The project can increase the proportion of the renewable energy sources for generation and improve the energy structure of the Northeast China Power Grid.

(4) The project activity can increase the employment opportunities for local residents during construction

and operation of the project, which will increase income of the local residents. It is beneficial to local socio-economic development.

A.3. Project participants:

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Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
P.R.China (host)	Jilin Taihe Windpower Development Co., Ltd	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):

>> People's Republic of China (Host)

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

>>Jilin Province

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

>>Zhenlai County, Baicheng City

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

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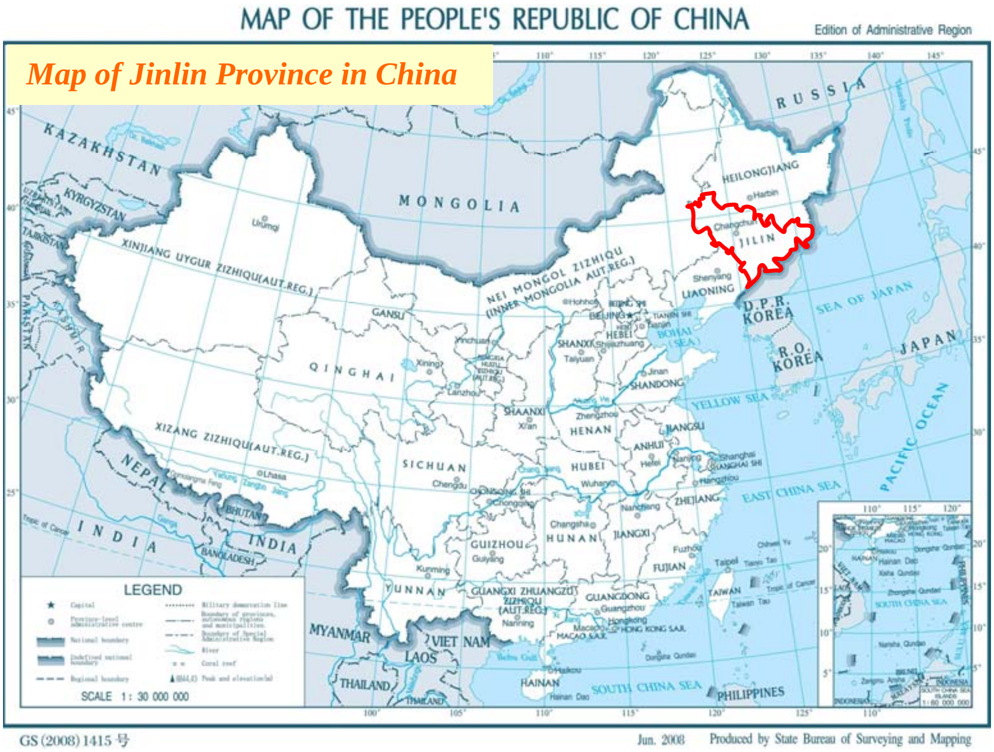
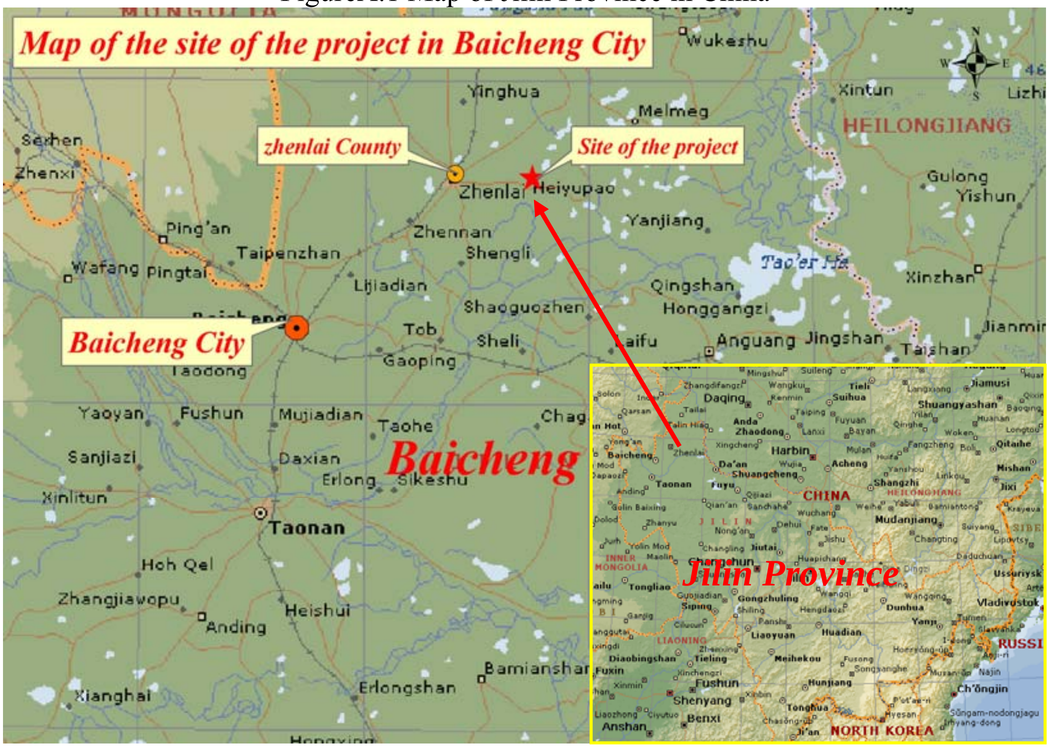
The project is located in Zhenlai County, Baicheng City, Jilin Province, P. R. China. he geographical coordinates of project are 123°25′—123°29′ E and 45°50′— 45°53′ N. The location of the proposed project is shown in FigureA.1 and FigureA.2 as following.



FigureA.1 Map of Jilin Province in China



FigureA.2 Map of the site of the project in Jilin Province

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

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The project falls into:
Sectoral Scope 1: energy industries (renewable sources)

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

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The proposed project activity aims at generating electricity through renewable wind resources in Zhenlai County, Baicheng City, Jilin Province, P.R.China. Prior to the start of the implementation of the proposed project activity, the equivalent annual electricity was supplied by the Northeast China Power Grid, dominated by thermal power, which is the same as the baseline scenario identified in the section B.

(1) The electricity generating equipment

The type and specification of chosen machine: upper drift, three blades, speed variable regulation system with variable propeller distance. The technical design of the wind turbines is deemed to reflect current good practice, and the key technoloby parameters are listed as below:

N/C	Type of wind turbine	Number	Unit capacity
Specification	SL-1500/82Model	33	1.5MW
N/C	Rotor diameter	Sweeping area	Hub height
Specification	82m	$4657m^2$	70m
N/C	Cut-in wind speed	rated wind speed	Cut-out wind speed
Specification	3m/s	12m/s	20m/s
N/C	voltage rating	Lifetime	
Specification	690V	20	

(2) The electric transmission and transformation equipment.

The primary boost of the wind farm use generator - box transformer connection mode. The entire 33 generator - box transformers are divided into three groups and use 35 kV overhead lines connect to the 35 kV generatrix of the 220 kV booster substation.The electricity generated by the proposed project activity will be transmitted to 220KV Zhenlai substation, which is connected with Northeast China Power Grid via transmission line. A set of tranformers and transmission lines from the wind farm to the substation of the grid company will be installed.

Parameter	Value
Type	SFZ11
Capacity	100MVA
Nominal voltage	220KV

It is noted that the proposed project generates electricity from wind energy, thus involves no greenhouse gas emissions and no emission resources.

The wind turbines are estimated by the Jilin Province Power Exploration and Design Institute, a professional technical design instute contracted by the project owner to carry out the feasibility study for

the proposed project activity, to generate on average 100,120MWh of electricity supply annually. And the power generation is monitored by the control and monitoring system in the wind farm.
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 100,120MWh, 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 main equipments, such as the turbines and other equipments are made in China. There is no international technology transfer for the project.

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

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The renewable crediting period is chosen for the proposed project. The ex-ante estimated amount of emission reductions over the first crediting period of the project is listed in Table A.1 below:

Table A.1 Ex-ante estimation of emission reductions over the first crediting period

Years	**Annual estimation of emission reductions in tonnes of CO_2 e**
2010	114,515
2011	114,515
2012	114,515
2013	114,515
2014	114,515
2015	114,515
2016	114,515
Total estimated reductions (tonnes of CO_2e)	801,605
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	114,515

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:

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Title of the approved consolidated baseline and monitoring methodology: ACM0002-Consolidated baseline methodology for grid connected electricity generation from renewable sources (Version 09, EB45)

Reference: Tool for the demonstration and assessment of additionality (Version 05.2, EB39)
Tool to calculate the emission factor for an electricity system (Version 01.1, EB35)
Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion (Version 02, EB41)

Please click on following link for more information about the methodology and reference:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

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

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The project is a grid-connected renewable power generation project activity, which meets all the applicability criteria stated in methodology ACM0002 version 09:

1. The project is a new built wind-farm project that uses clean wind resources to generate electricity that is delivered to Northeast China Power Grid.

2. The project does not involve switching from fossil fuels to renewable energy at the site of the project activity.

3. The geographic and system boundaries for Northeast China Power Grid can be clearly identified and information on the characteristics of the grid is available.

So the baseline and monitoring methodology ACM0002 are applicable to the project.

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

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According to methodology ACM0002, the spatial extent of the proposed project boundary also includes the proposed project site and all power plants physically connected to Northeast China Power Grid, which covers Liaoning Province, Jilin Province and Heilongjiang Province, using the boundary definitions of the Chinese DNA. The main emission sources and type of GHGs in the project boundary are listed in Table B.1 and the figure below:

Table B.1. Sources and gases in the project boundary

	Source	Gas	Included?	Justification / Explanation
Baseline	Plants that are displaced due to the project activity.	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification. This is conservative.

		N_2O	Excluded	Excluded for simplification. This is conservative.
Project Activity	The Project	CO_2	Excluded	According to ACM0002, the project emission of wind power project is not considered.
		CH_4	Excluded	According to ACM0002, the project emission of wind power project is not considered.
		N_2O	Excluded	According to ACM0002, the project emission of wind power project is not considered.
	For all renewable energy plants, CO_2 emissions from backup power generation.	CO_2	Excluded	No backup power generation equipment.
		CH_4	Excluded	According to ACM0002, the project emission of wind power project is not considered.
		N_2O	Excluded	According to ACM0002, the project emission of wind power project is not considered.

A flow diagram of the project boundary, physically delineating the project activity, based on above stated description is shown in Figure B.1 below:

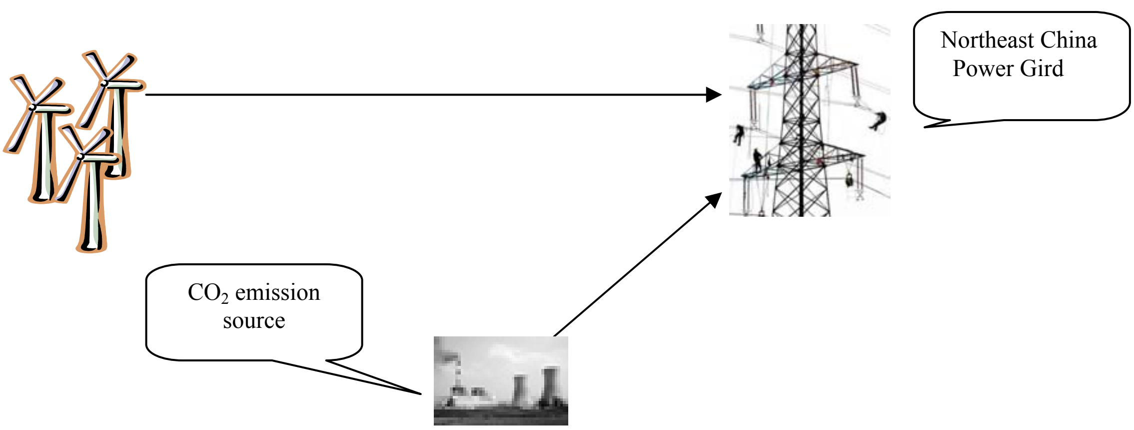

Figure B.1 flow diagram of project boundary

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

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According to the description in the approved baseline methodology ACM0002, if the project activity is the installation of a new renewable power plant, 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 electricity generated by the proposed project will be connected to Northeast China Power Grid through Zhenlai substation, So Northeast China Power Grid is considered as the “connected electricity system”, which is defined as the “project boundary” of the proposed project. The Northeast China Power grid is connected to the North China Power Grid, but there is no electricity imported from the North China Power Grid, therefore, being a project with the boundary of Northeast China Power Grid that is a

new renewable power plant, the baseline scenario of the proposed project can be identified as the following:

> Electricity delivered to the grid by the proposed project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources within the Northeast China Power Grid, as reflected in the combined margin (CM) calculated described in the "Tool to calculate the emission factor for an electricity system"(Version 01.1, EB35).

According to ACM0002, baseline emissions are equal to the power generated by the project that is delivered to the Northeast China Power Grid, multiplied by the baseline emission factor. The baseline emission factor ($EF_{grid,y}$) is calculated as a Combined Margin (CM), which consists of the weighted average of Operating Margin (OM) emission factor and Build Margin (BM) emission factor. The key parameters used for emission reductions calculation are as follow:

Parameter	Unit	Value
$EF_{grid,OM,y}$	tCO_2e/MWh	1.2561
$EF_{grid,BM,y}$	tCO_2e/MWh	0.8068
$EF_{grid,y}$	tCO_2e/MWh	1.1438

The emission reductions calculations are specified in Section B.6. and Annex 3.

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):

Prior consideration of CDM

After all the approval letters from the government were obtained, the project owner signed the wind turbine contract on 1st September 2008, which is the earliest date of the real action of the project activity. According to the CDM Glossary Term, this date is deemed to be the start date of the project activity.

As the starting date of the project activity is later than 02 August 2008, according to the guidance on the demonstration and assessment of prior consideration of the CDM approved in the EB41, "the Board decided that for project activities with a starting date on or after 02 August 2008, the project participant must inform a Host Party DNA and/or the UNFCCC secretariat in writing of the commencement of the project activity and of their intention to seek CDM status. Such notification must be made within six months of the project activity start date and shall contain the precise geographical location and a brief description of the proposed project activity." The notification confirmed from the NDRC has been provided to DOE at the time of validation.

Below table is the project development timeline:

Time	**Events and Comments**
2008-04	Feasiblity study report was started
2008-04-09	Approval of Environmental Impact Assessment Table
2008-08-07	Approval of FSR
2008-08-18	The board meeting, where the decision of CDM application was made
2008-09 -01	**The wind turbine contract date, which is defined as the start date of the project activity.**
2008-09-05	Contract of turbine tower signed
2008-09-10	Contract of construction signed

2009-09-29	Contract of main generator transformer signed
2008-10-1	Contract of transformer chamber signed
2008-10-10	The construction lauched.
2009-02	**Notification to the DNA**
2009-08	Commissioning

Additionality Demonstration

The proposed project uses the *Tool for the Demonstration and Assessment of Additionality* (version 5.2), which was approved in the EB 39, to demonstrate its additionality. The tool includes the following steps:

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

The objective of this step is to identify realistic and credible alternatives to the project that can be the baseline scenario through the following sub-steps:

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

Realistic and credible alternative(s) available to the proposed project that provides outputs or services comparable with the proposed CDM project activity include:

Alternative 1: The proposed project activity not undertaken as CDM project activity

Alternative 2: Construct a fossil fuel-fired power plant with equivalent annual power supply

Alternative 3: Construct a power plant using other renewable energy with equivalent annual power supply

Alternative 4: Equivalent annual electricity supplied by Northeast China Power Grid

In the Northeast China Power Grid, other renewable energies including hydropower, solar PV, biomass and geothermal are the possible grid-connected technologies. However, the proposed project is located in a heavily semiarid region of Jilin province, where there is no commercially exploitable hydro power resource which can provide the same electricity generation output of the proposed project activity [1]. Therefore, it isn't suit for development of hydro power projects in Zhenlai County. And in China, solar PV, biomass and geothermal generation technology is still in the demonstration stage and it has little economic attraction to investor, which is difficult to be operated without policies& financial support [2,3]. Moreover, as a power company specialized in developing wind power project, the project owner has no experience and ability to develop other renewable energy power plants. Hence, the alternative 3 is unrealistic.

Outcome of Step 1a:

Four realistic and credible alternatives to the proposed project activity are selected and one is excluded.

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

Alternative 1: The proposed project activity not undertaken as CDM project activity

Alternative 1) is in compliance with Chinese legal and regulatory requirements, Therefore, the alternative 1 is a possible baseline scenario.

[1] http://www.jl.gov.cn/zwxx/zfwj/szfbgtfw/t20050720_16669.htm
[2] http://nyj.ndrc.gov.cn/nydx/t20061103_91653.htm ; http://www.newenergy.org.cn/html/0067/2006710_10767.html ;
[3] http://nyj.ndrc.gov.cn/gjdt/t20060324_64126.htm; http://www.sdpc.gov.cn/zjgx/t20071123_174054.htm

Alternative 2: Construct a fossil fuel-fired power plant with equivalent annual power supply

For the average annual utilization hours of the fossil fuel plants are larger than the average annual utilization of the proposed project. Thus, the installed capacity of the fossil fuel-fired plants with equivalent annual power supply as the proposed project will be lower than 49.5 MW. However, according to the current laws and regulations in China, the thermal power plants with installed capacity of 135 MW or below are prohibited for construction in the areas covered by large power grids[4]. Therefore, the alternative 2 is not a possible baseline scenario.

Alternative 3: Construct a power plant using other renewable energy with equivalent annual power supply

The alternative is to construct renewable power plants whose annual power supply is equivalent to the proposed projects. It is in compliance with legal and regulatory requirements; however, it is excluded from alternative in sub-step 1a with reasonable explanation.

Alternative 4: Equivalent annual electricity supplied by Northeast China Power Grid

Alternative 4 is in compliance with legal and regulatory requirements. To meet the increase of the electricitydemand, the power grid company can either increase the output generation from operating units or build some new power plants. As reflected in the baseline calculation, most of recently added capacity is thermal power. Therefore, continuation of the current situation, the electricity generated by the operation of grid-connected power plants and by the addition of new generation plants on Northeast China Power Grid can be taken as a realistic alternative for the proposed project activity. So the alternative 4 is realistic and credible choice.

Outcome of Step 1b:

Mandatory legislation and regulations to each alternative are taken into account in sub-step 1b.Based on the above analysis, the proposed project activity is not the only alternative amongst the proposed project participants that is in compliance with mandatory regulations with which there is general compliance. Therefore, the proposed CDM project activity may be additional.

Step 2. Investment analysis

The following sub-steps are used for determining whether the proposed project activity is economically or financially less attractive than other alternatives without the revenue from the sale of certified emission reductions (CERs).

Sub-step 2a. Determine appropriate analysis method

According to "Tool for the demonstration and assessment of additionality", there are three analysis methods recommended, including simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III).

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

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[4] General Office of the State Council [Decree No. 2002-6]: <Notice on Strictly Prohibiting the Construction of Thermal Power Plants with Installed Capacity of 135 MW or Below>

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

Sub-step 2b. –Option III. Apply benchmark analysis
According to ***Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects,*** issued by former State Power Corporation of China, the financial internal rate of return of total investment (after tax) as benchmark in China's power generation industry is 8% considering economic assessments of wind farm projects, fossil fuel fired projects, transmission and substation projects, especially the interest rate of commercial loans over five years[5]. Nowadays this is widely used in China.

Sub-step 2c. Calculation and comparison of financial indicators
The main assumptions for the investment analysis are shown in Table B.2. below:

Table B.2. Basic parameters for financial evaluation

Parameter	Unit	Value	Data
Installed capacity	MW	49.5	FSR
Net electricity generation	MWh	100,120	FSR
Total investment	RMB￥10,000	52,310	FSR
Static investment	RMB￥10,000	50,629.97	FSR
Electricity tariff (VAT Incl.)	RMB￥/kWh	0.6112	FSR
Electricity tariff without VAT	RMB￥/kWh	0.5633	FSR
Annual O&M costs	RMB￥10,000	1213.39	FSR
Value added tax (VAT)	/	8.5%	FSR
Income tax	/	25%	FSR
The expected price of CERs	€ /tCO2e	13	Prediction
Project cycle	Year	20	FSR

All the data above we use from FSR, which was performed by Jilin Province Power Reconnaissance Design Institute, which is qualified design institute with the highest grade, Grade A, has been approved by Development and Reform Commission of Jilin province on Aug. 7th 2008. Time difference between the FSR finished and approval issuance is no longer than 1 year. Thus the IRR process is reasonable and the all data input are relied on values from the approved FSR which was carried out by an authorized third party. According to the decision of paragraph 54 of 38th EB meeting report, data we adopted from FSR for IRR calculation is reasonable. Besides, according to the guidance on plant load factor issued by EB 48 meeting, the load factor defined ex-ante PDD when applying the project activity for implementation approval can be considered as reasonable. Plant load factor of this project was from FSR, which was approved by the authorized government. Thus we can conclude that the input from FSR is reasonable.

Without CERs revenue, the project IRR (considered the interest) is only 5.68%, which is lower than

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

benchmark IRR of 8%. The project is not financially attractive. With CERs revenue, the project IRR is 8.78%. The project is financially attractive.

Sub-step 2d. Sensitivity analysis

The sensitivity analysis is used to show whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions. For the project, four parameters are selected as sensitive factors to check out the financial attractiveness, the sensitivity analysis is shown in Table B.3.:

Table B.3. Sensitivity analysis

Change scope / **Critical assumption**	**-10%**	**0%**	**+10%**
Total investment	7.14%	5.68%	4.37%
Tariff	2.61%	5.68%	8.63%
Annual O&M costs	6.01%	5.68%	5.35%
Electricity amount	4.11%	5.68%	7.15%

It can be found from Table B.3. that when total investment, Net electricity generation and annual O&M costs fluctuate within the range of –10% to +10% (without CERs revenue), the project IRR varies to different extent. The fluctuations of total investment and net electricity generation have great impact on project IRR and the total investment is considered to be the most sensitive factor to impact the project. However, the project IRR is always lower than benchmark IRR of 8% whatever the critical assumptions vary.

In order to further demonstrate the additionality of the proposed project activity, the situation at which the benchmark would be reached will be taken into account as below:

(1) When the static investment reduces 15.6%, the IRR of the project would reach 8%, the benchmark of the project. For a wind farm project, the cost of turbines, engineering construction and related accessories make up the main static investment. According to the contracts supplied by the project owner, investment on turbine, wind tower, main transformer, transformer chamber and construction is 49190.6×10^4 RMB, which consist 97.2% of total static investment. It is impossible to hit the benchmark by decrease the investment.

(2) When the electricity amount increase 16.2%, the IRR of the project would reach 8%, the benchmark of the project. However, according to the Feasibility Study Report, carried out by Jilin Province Power Exploration and Design Institute, which is quilified design institute with the highest grade, Grade A, the annual power generation is estimated by using professional software WasP (www.wasp.dk) designed for wind energy, which is used by developers, consultants and turbine manufacturers worldwide. Besides, the expected net supplied power from the FSR is based on long term meteorological data of the wind resource in local area (from 1988 to 2007) and onsite wind resources measurement. Therefore, it is impossible to increase annual electricity generation by 16.2%;

(3) When the tariff increase 7.8%, the IRR of the project would reach 8%. According to China's

Management Rules on Tariff issued by NDRC[6], the tariff of the un-tendering projects should be determined by the government with reference to the tariff of tendering wind projects. Once it is approved by government, the tariff will be fixed as assumed in the FSR, and the project owner would not be able to make assumption of a tariff increase for investment decision making. The tariff of other latest wind farms in Jinlin province approved in 2008 is 0.61RMB/kWh (including VAT), which is equal to the one in the FSR and PDD of the proposed project activity. Furthermore, according to the power purchase agreement (PPA) signed between project owner and local grid company in year 2010, tariff of proposed project is to be 0.61 RMB/kWh (VAT incl.). As we know, highest tariff of wind farm projects located in Jilin province started after year 2002 is 0.63 RMB/kWh (VAT incl.)[7], even the highest tariff is applied to proposed project, IRR is 6.14%, still below the benchmark. Therefore, it is not feasible for the tariff to increase 7.8% to hit the benchmark.

(4) When the annual O&M costs reduce 75%, the IRR will reach the benchmark. According to the approved FSR, the O&M cost consists of the raw material cost, repairing cost and wages for the workers etc. Percentage of O&M cost to total investment of registered wind farm projects located in Jilin province is from 1.2% to 3.4%[8]. The value of proposed project is 2.3%, which has fallen in the reasonable range. Furthermore, statistic data from the JSB shows that, compared with the last year, the purchasing price of the raw material, fuel and power has increased 13.2%[9], So it is impossible that the O&M fee to reduce 75% to hit the benchmark.

Outcome of Step 2:

The sensitivity analysis shows that without CER revenue, IRR of the project is difficult to reach the benchmark, which supports the conclusion that the proposed project is unlikely to be financially attractive. Hence, alternative 1 the proposed project activity not undertaken as CDM project activity is excluded.

Step 3. Barrier analysis

This step is not used for this project activity.

Step 4. Common practice analysis

Common practice analysis is a credibility check to complement the investment analysis. The common practice analysis is identified and discussed through the following sub-steps:

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

According to the guidance of "Tool for the demonstration and assessment of additionality" (Version 05.2, EB39), the other activities similar to the proposed project activity are defined as wind projects in the same region (Jilin province), rely on a broadly similar technology (wind projects), are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing.

China is a big country, the policies and regulations in Chinese provinces are different. Common practice analysis is limited to the provincial level due to different investment environment for each province

[6] Interim Regulation for Tariff of Renewable Energy Power Generation and Appointment of Expenses, Fagai Jiage(2006) No.7.
[7] Register project, Ref. No.: 0771.
[8] PA0238, 0256, 0483, 0544, 0599, 0771, 0869, 0879,1129, 2068, 2083, 2586, 2598, 2685.
[9] http://tjj.jl.gov.cn/sjfb/200807/t20080731_425981.html

differs. For example, the electricity tariff for different province is much different under the control of National Development and Reform Commission[10]. Besides, the difference of wind resources in different area is relatively large[11]. As the proposed project activity is located in Jilin Province, the selected geographical area for the project is Jilin province.

There was a significant reform in 2002 on the electric power sector approved by the State Council[12]. After 2002 the power generation enterprises and power grid companies are separated and private capital providers were allowed to invest in power plants. The investment climate was different compared to the situation before the reform. So wind power projects commissioned after 2002 are chosen to do common practice analysis.

According to the analysis above, we select the projects constructed after 2002 in Jilin province to do common practice analysis (the registered CDM projects and projects under GSP are not included according to EB's guidance.).

According to *China's wind farm installed capacity statistics* 2003-2007, in Jilin province, the wind power projects that have been running with the similar investment environment are shown in table below:

Table B.4. Wind farms in Jilin province[13],[14]

Project Title	Commissioning Date	Capacity(MW)	Turbine Model	Remark
Tongyu Gengshengtun 30.06MW (Jilin Wind-power)	1999-08	7.26	made-660	Without CDM support for its high electricity prices[15]
	2000-12	22.8	nordex-600	
Tongyu Dongxinrong 100.5MW (Huaneng)	2006-12	21	sinovel-1500	Registered CDM Project[16]
	2007-11	79.5	sinovel-1500	
Tongyu Dongxinrong 2×100.3MW (Longyuan)	2006-12	20.4	gamesa-850	Registered CDM Project[17] Appling for CDM project[18]
	2007-10	130.05	gamesa-850	
Taobei Qingshan 49.5MW (Fuyu)	2005-12	4.5	goldwind-750	Registered CDM project[19]
	2006-01	10.5	goldwind-750	
	2007-10	15	Dec-1500	
Taobei Qingshan 49.3MW (Huaneng)	2005-12	49.3	gasema-850	Registered CDM Project[20]
Shuangliao Baoshitu 49.3MW (Datang)	2006-11	49.3	gasema-850	Registered CDM Project[21]

[10] http://www.sdpc.gov.cn/zfdj/jggg/dian/t20080813_230724.htm
[11] http://www.showchina.org/zgdl/sylm/200701/t104908.htm
[12] http://www.chinapower.com.cn/article/1000/art1000014.asp
[13] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1837.doc
[14] http://cdm.unfccc.int/Projects/registered.html
[15] http://www.lianghui.org.cn/economic/zhuanti/2007nyfz/2007-05/25/content_8303200.htm
[16] http://cdm.unfccc.int/Projects/DB/TUEV-RHEIN1149172847.67/view
[17] http://cdm.unfccc.int/Projects/DB/DNV-CUK1169716720.28/view
[18] http://cdm.unfccc.int/Projects/DB/DNV-CUK1218468288.41/view
[19] http://cdm.unfccc.int/Projects/DB/DNV-CUK1154585806.56/view
[20] http://cdm.unfccc.int/Projects/DB/TUEV-RHEIN1144664461.33/view
[21] http://cdm.unfccc.int/Projects/DB/DNV-CUK1169448721.03/view

Changling Xin'an 49.5MW (Zhongshui Construction)	2006-12	1.5	sinovel-1500	Registered CDM Project[22]
	2007-10	48	sinovel-1500	
Chaganhaote Lingxia 30MW (Zhongshui)	2006-12	7.5	goldwind-750	Registered CDM Project[23]
	2007-02	22.5	goldwind-750	
Da'an Shuanggangshan 49.5 MW (Zhongguanghe)	2007-11	49.5	Dec-1500	Appling for CDM project[24]

Sub-step 4b. Discuss any similar options that are occurring:
Tongyu Gengshengtun 30.06MW wind power project is the first wind power plant in Jilin Province, and the first stage of the project was operated from 1999 and second stage from 2000. Before 2003, China's wind power industry was just in the initial demonstration period and the industrialization period, which was strongly supported by China's financial policies, i.e. a favorable electricity price, a longer loan payment period, and a much lower value-added tax, and obtained the help of soft loan[25]. The interest of investors was ensured by the government. Therefore, as the first and demonstration wind power project in Jinlin Province, the electricity tariff of Tongyu Gengsheng 30.06MW project reach up to 0.9Yuan/kWh, which is the fifth of the wind power price ranking in China[26], and much higher than the electricity price of the proposed project. Hence the Tongyu 30.06MW wind project is not a similar project to the proposed project activity.

However, the other operated projects shown in Table B.4 have the same conditions as the proposed project, which is, facing financial obstacles and lack of financial support. All the projects have overcome such obstacles through the CDM financial support. So, the operated projects listed in the table B.4 will not result in the additionality changes of the proposed project. Thus, the project is not a common practice.

To summarize, it can be proved that the proposed project activity is additional and not (part of) baseline scenario. Without the CDM revenues, the project activity would not be implemented smoothly. Instead, the equivalent electricity service will be provided by the Northeast China Power Grid. As a result, the reduction of GHG emissions would not be realized. The above additionality analysis provides sufficient evidence that the registration of the CDM revenues can enable the project to overcome the barriers it faces.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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Project Emissions

According to ACM0002, the project emission is zero, thus PE_y=0
There is no backup power generation for this project. In case there is a emergency situation which electricity import is needed, electricity will be supplied by the connected Northeast China Power Grid.

[22] http://cdm.unfccc.int/Projects/DB/TUEV-SUED1179316153.17/view
[23] http://cdm.unfccc.int/Projects/DB/TUEV-SUED1179316153.17/view
[24] http://cdm.unfccc.int/Projects/DB/DNV-CUK1218522155.27/view
[25] Page 5, China Wind Power Report in 2007, by Li junfeng, China Environment Science press
[26] http://www.lianghui.org.cn/economic/zhuanti/2007nyfz/2007-05/25/content_8303200.htm

Baseline Emissions

According to baseline methodology ACM0002, the baseline emissions are the CO_2 emissions from the equivalent electricity generation in Northeast China Power Grid that are displaced by the project activity. So the baseline emissions by the project activity during a given year *y* is obtained from the formula below. According to ACM0002, the baseline emission should be calculated as:

$$BE_y = EG_y \cdot EF_y$$

Where:
EG_y is electricity supplied by the project activity to the grid in year *y*, in MWh;
EF_y is baseline emission factor in year y, in tCO_2e/MWh.

Calculation of EF_y

According to "Tool to calculate the emission factor for an electricity system", the baseline emission factor ($EF_{grid,y}$) is calculated as a combined margin (CM) of $EF_{grid,OM,y}$ and $EF_{grid,BM,y}$, based on the following six steps:

Step 1: Identify the relevant electric power system
According to the announcement of Grid Boundary by DNA of China, *Northeast China Power Grid covers Liaoning province, Jilin province, and Heilongjiang province*[27], the project activity is located in Jilin Province and it is appropriate to select the Northeast China Power Grid as project system boundary.

Step 2: Select an operating margin (OM) method
Calculation of OM emission factor should be based on one of the following four methods:
(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch Data Analysis OM, or
(d) Average OM.
Each method is analyzed as below.

The simple OM method can only be used where 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 normal 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. From 2002 to 2006, the low cost must run resources constitute less than 50% of total amount grid generation output. (Table B.5). Therefore, method (a) is applicable for the project.

Table B.5 Constitution of low-cost/must run resources in Northeast China Power Grid during year 2002～2006[10]

Year	2002	2003	2004	2005	2006
Percentage (%)	5.43	4.72	6.53	8.28	5.25

[27] http://cdm.ccchina.gov.cn/web/index.asp
[10] *China Electric Power Yearbook 2003～2007*

In conclusion, method (a) is the only reasonable and feasible method among the four methods for calculating the Operating Margin emission factor ($EF_{grid,OM,y}$) of the Northeast China Power Grid.

Step 3: Calculate the operating margin emission factor according to the selected method

According to the "Tool to calculate the emission factor for an electricity system", the Simple OM emission factor ($EF_{grid,OMsimple,y}$) is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO2/MWh) of all generating power plants serving the system, not including low-operating cost and must-run power plants/units, It may be calculated:

- Option A: Based on data on fuel consumption and net electricity generation of each power plant/unit, or
- Option B: Based on data on net electricity generation, the average efficiency of each power unit and the fuel type used in each power unit, or
- Option C: Based on data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

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

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

Where:

$FC_{i,y}$	is the amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit)
$NCV_{i,y}$	is net calorific value (energy content) of fossil fuel type I in year y (GJ/mass or volume unit)
$EF_{CO2,i,y}$	is the CO2 emission factor of fossil fuel type i in year y (tCO2/GJ)
EG_y	is the 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	is all fossil fuel types combusted in power sources in the project electricity system in year y
y	is either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex-ante option) or the applicable year during monitoring (ex post option), following the guidance on data vintage in step 2. As for the proposed project, data of the three most recent years

	is available and then will be used.

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 to the grid. Electricity imports should be treated as one power plant m.

In the project activity, the data of net calorific values of the fuels is from the China Energy Statistical Yearbook and the data of emission factors of the fuels are from IPCC 2006 default.

The Simple OM Emission Factor of the project activity is calculated ex ant on the basis of the fuel consumption data from Northeast China Power Grid, excluding those of low operating cost and must-run power plants, such as wind power, hydropower and nuclear etc. These data are obtained from the *China Electric Power Yearbook* (2000~2007, published annually) and *China Energy Statistical Yearbook* (2000~2007). Based on these data, the Simple OM Emission Factor ($EF_{grid,OMsimple,y}$) of the Northeast China Power Grid is calculated as 1.2561 tCO2e/MWh (see Annex 3 for details).

Step4: Identify the cohort of power units to be included in the build margin

The sample group m consists of either the five power plants that have been built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently, and if 20% falls on part capacity of a plant, that plant is fully included in the calculation. The latter method will be used in the proposed project.

"Tool to calculate the emission factor for an electricity system" allows project participants to choose between two given options for calculating the Build Margin for the project, one is ex-ante calculation, and the other is annual ex-post updating in the first crediting period. For this project the first option is chosen in the first crediting period. For the second crediting period, the build margin emission factor would 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 would be used. The Build Margin Emission Factor therefore is based ex-ante on the most recent information available on plants already built at the time of PDD submission.

Step5: Calculation the Build Margin emission factor ($EF_{grid,BM,y}$)

According to "Tool to calculate the emission factor for an electricity system", $EF_{grid,BM,y}$ is determined by the formula as follow:

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

Where:

$EF_{grid,BM,y}$	is Build margin CO2 emission factor in year y (tCO2/MWh)
$EG_{m,y}$	is Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$	is CO2 emission factor of power unit m in year y (tCO2/MWh)

m	is Power units included in the build margin
y	is Most recent historical year for which power generation data is available

As plant specific fuel consumption and electricity generation data is not publicly available in China, EB guidance[11] is used to calculate $EF_{grid,BM,y}$. While the request for deviation was submitted relating to AM0005, the guidance has also widely been used for "Tool to calculate the emission factor for an electricity system"as this replaces reference to ACM0002 which directly replaces AM0005 and all OM and BM calculations in these two methodologies are the same:

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

The calculation of the Build Margin for the proposed project makes use of aggregated data to identify the 20% most recent capacity additions (sample group). This is identified by direct comparison of the total installed capacity on Northeast China Power Grid in the most recent year for which data is available, in this case 2006, with historical data from preceding years until the 20% addition is reached. BM is determined by selecting the year since which the new capacity additions are equal to or greater than 20%.

Based on the method issued by China's DNA on 30/12/2008, the $EF_{Thermal,y}$ is calculated as following:

Firstly, use the following equations to calculate weights of CO_2 emissions by coal-fired, oil-fired and gas-fired plants in total CO_2 emissions of Northeast China Power Grid.

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

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

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

Where:

$F_{i,j,y}$	is the total amount of fuel i (in a mass or volume unit) consumed by Province j in Northeast China Grid for power generation in year y;
$NCV_{i,y}$	is the net calorific value of fuel i during year *y*(in GJ/t unit for solid and liquid or GJ/m^3 for gas);

[11] The EB guidance was given in a response letter entitled "Several projects in China (application of approved methodology AM0005), see http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_QEJWJEF3CFBP1OZ AK6V5YXPQKK7WYJ. The guidance can be used for "Tool to calculate the emission factor for an electricity system" (EB 35)

$EF_{CO2,i,j,y}$	is the emission factor of fuel i (tCO_2/GJ).

Secondly, the EF thermal power is calculated as a weighted emission factor as the following formula:

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

Where:

$EF_{Coal,Adv,y}$ $EF_{Oil,Adv,y}$ and $EF_{Gas,Advy}$ are the emission factors of the best technology for coal, oil, gas fired power plants commercially available in China, which are calculated based on the efficiency level of the best technology for each fuel type commercially available in China (see details in Annex 3)

Third, BM of the grid is calculated as follows:

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

Where:

$CAP_{Total,y}$ is the additional capacity which is close to but not more than 20% of the existing capacity,
$CAP_{Thermal,y}$ is the additional capacity of thermal plants

In conclusion, the procedure to be used for calculating the build margin using the most recent additional capacity follows steps below:

- Using the latest statistical data available (from the China Electric Power Yearbook 2007) determine the year from which the added generation capacity is equal to or just exceeds 20% of the capacity of the latest statistic year 2006. The year selected is 1999, since which about 23.81% capacity has been added
- Of the added capacity since 1999, 88.91% is thermal capacity.
- The CO_2 emission weights by coal-fired, oil-fired and gas-fired plants of total CO_2 emission of Northeast China Power Grid in 2006, namely $\lambda_{coal,y}$,$\lambda_{oil,y}$,$\lambda_{gas,y}$ is calculated as 98.70%, 0.22%, 1.08%.
- According to the data issued by China DNA, the efficiency levels of domestic sub-critical 600MW coal power unit and the efficiency level of 200MW combined cycle power unit are taken as the efficiency level of the best technology for coal-fired power plants, oil and gas fired power pleants commercially available in China, which are at 37.28%,48.81%, 48.81%, respectively.

The emission factor is calculated as follows:

EF thermal power =98.70%*0.9135+0.22%*0.5706+1.08%*0.4138=0.9074 tCO_2e/MWh

The Build Margin emissions factor is now calculated as the percentage of thermal plant additions and thermal plant emissions factor.

Based on the formula above, the BM emission factor of Northeast China Power Grid for the proposed project in the crediting period is calculated as:

$$EF_{BM} = 0.8068 tCO_2/MWh.$$

The details of $EF_{grid,BM,y}$ calculation are given in Annex 3.

Step 6. Calculate the combined margin emission factor $EF_{grid,y}$

Based on "Tool to calculate the emission factor for an electricity system", the baseline emission factor $EF_{grid,y}$ should be calculated as the weighted average of the Operating Margin emission factor ($EF_{grid,OM,y}$) and the Build Margin emission factor ($EF_{grid,BM,y}$), where the weights W_{OM} and W_{BM}, are 75% and 25% by default, and ($EF_{grid,OM,y}$) and ($EF_{grid,BM,y}$) are calculated as described in Step 3 and 5.

$$EF_{grid,y} = 0.75*1.2561+0.25*0.8068=1.1438(tCO_2e/MWh)$$

Using operating margin and build margin emission factors that are fixed for the duration of the first crediting period, the baseline emissions factor is also fixed for the first crediting period. These parameters will be recalculated at the second and third crediting period using the same steps 1-6 in the tool and the lastest data available at that time.

Leakage

According to baseline methodology ACM0002, there is no need for the project to consider leakage (*Ly*).

Emission Reductions

The annual emission reduction (ER_y) of the project is the difference between baseline emission and project activity emission. The final GHG emission reduction is calculated as follows:

$$ER_y \text{ (tCO2e/yr)} = BE_y - PE_y - L_y$$

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

Data / Parameter:	NCV_i
Data unit:	*kJ/kg or kJ/m3*
Description:	The net calorific value (energy content) per mass or volume unit of fuel i
Source of data used:	*China Energy Statistical Yearbook 2007*.
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	Official data, used for OM and BM calculation.

Data / Parameter:	$OXID_i$
Data unit:	/
Description:	Oxidation factor of the fuel i
Source of data used:	*Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	100%
Justification of the choice of data or description of measurement methods and procedures actually	No specific local value available, adopt the IPCC default value.

applied :	
Any comment:	Official data, used for OM and BM calculation.

Data / Parameter:	$F_{i,j,y}$
Data unit:	10^4 t, 10^8 m^3
Description:	The quantity of fuel i (in a mass or volume unit) consumed for power generation by the relevant provinces j in year(s) y
Source of data used:	*China Energy Statistical Yearbook 2005-2007*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	Official data, used for OM and BM calculation.

Data / Parameter:	*Electricity generation of power plants in Northeast China Power Grid*
Data unit:	*MWh*
Description:	Electricity generated by province *j* in Northeast China Power Grid in year *y*.
Source of data used:	*China Electric Power Yearbook 2005-2007*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	Official data, used for OM and BM calculation.

Data / Parameter:	*Internal use rate of power plant*
Data unit:	*%*
Description:	The internal power consumption rate of power plants in province j in Northeast China Power Grid in year y.
Source of data used:	*China Energy Statistical Yearbook 2005-2007*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	Official data, used for OM and BM calculation.

Data / Parameter:	$EF_{CO2,i}$
Data unit:	tCO_2/TJ
Description:	The CO_2 emission factor per unit of fuel i
Source of data used:	*Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories*

Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	No specific local value available, adopt the IPCC default value.
Any comment:	Official data, used for OM and BM calculation.

Data / Parameter:	$CAP_{i,j,y}$
Data unit:	MW
Description:	Installed capacities of power plant category *i* of province *j* in years *y*.
Source of data used:	*China Electric Power Yearbook 2001-2007*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	Official data, used for OM and BM calculation.

Data / Parameter:	$GENE_{best,coal,}$
Data unit:	/
Description:	The power supply efficiency of most advanced commercialized coal-fired power plants
Source of data used:	Chinese DNA's Guideline of emission factors of Chinese grids
Value applied:	37.28%
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	Official data, used for OM and BM calculation.

Data / Parameter:	$GENE_{best,oil/gas}$
Data unit:	/
Description:	The power supply efficiency of most advanced commercialized oil-fired power plants and gas-fired power plants
Source of data used:	Chinese DNA's Guideline of emission factors of Chinese grids
Value applied:	48.81%
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.

Any comment:	Official data, used for OM and BM calculation.

B.6.3 Ex-ante calculation of emission reductions:

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Project Emissions

According to baseline methodology ACM0002, project emissions, PE_y do not need to be calculated.

Baseline Emissions

According to formula in section B.6.1, the calculation results of $EF_{grid,OM,y}$, $EF_{grid,BM,y}$ and $EF_{grid,y}$ are listed in Table 6, the detailed calculation processes are shown in Annex 3.

Table 6 $EF_{grid,OM,y}$,$EF_{grid,BM,y}$ and $EF_{grid,y}$ of Northeast China Power Grid (tCO_2e/MWh)

$EF_{grid,OM,y}$	$EF_{grid,BM,y}$	$EF_{grid,y}$
1.2561	0.8068	1.1438

According to formula in section B.6.1, the annual baseline emission (BE_y) of the project in a typical year is calculated as follows:

$$BE_y=EG_y \times EF_y = 100,120 \times 1.1438 = 114,515 \text{ tCO2e/yr}$$

Leakage

According to baseline methodology ACM0002, $L_y = 0$

Emission Reductions

According to formula in section B.6.1, the annual emission reduction (ER_y) of the project in typical year is calculated as follows:

$$ER_y = BE_y - PE_y - L_y = 114,515-0-0 = 114,515 \text{ tCO2e/yr}$$

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

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The summary of the ex-ante estimation of emission reductions are listed in Table 7 below:

Table7 Summary of the ex-ante estimation of emission reductions

Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
2010	0	114,515	0	114,515
2011	0	114,515	0	114,515
2012	0	114,515	0	114,515
2013	0	114,515	0	114,515
2014	0	114,515	0	114,515
2015	0	114,515	0	114,515
2016	0	114,515	0	114,515

Total (tonnes of CO_2e)	0	801,603	0	801,605

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

B.7.1 Data and parameters monitored:

Data / Parameter:	*EG_y*
Data unit:	MWh
Description:	Electricity delivered to Northeast China Power Grid by the project in year y.
Source of data to be used:	Monitored by the electricity meters, monitoring electricity supply to the grid and imports from the grid
Value of data applied for the purpose of calculating expected emission reductions in section B.5	100,120
Description of measurement methods and procedures to be applied:	Eletricity supply by the project activity will be monitored through metering equipments installed in the 35 kV lines of the wind farm. Meter 1#, Meter 2#, Meter 3# have two-way metering, recording electricity both export to the grid and import from the grid; the net electricity supplied to the grid EGy is calculated as export minus import. The data will be continuously measured and monthly recorded.
QA/QC procedures to be applied:	Monthly net generation data will be approved by CDM manager. The data will be double checked by receipt of sales or commercial data. The data will be kept during the crediting period and two years after. The accuracy of the electricity is 0.5 or above. The meters will be calibrated annually or according to the industry standard by a qualified organization to ensure accuracy.
Any comment:	

B.7.2 Description of the monitoring plan:

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An overall monitoring plan will be applied to the project. The project owner compiled a monitoring and management manual aiming to make sure that the net generated electricity monitored and evaluated during the project activity operation period is completed, consistent, and precise. It has identified the duties of the related responsibilities. The details are summarized as follows:

1. Monitoring management structure

In order to obtain effective monitored data, the project owner established a monitoring management structure that identified the relative staffs for data recording, collection and preservation. The detailed structure is as follows:

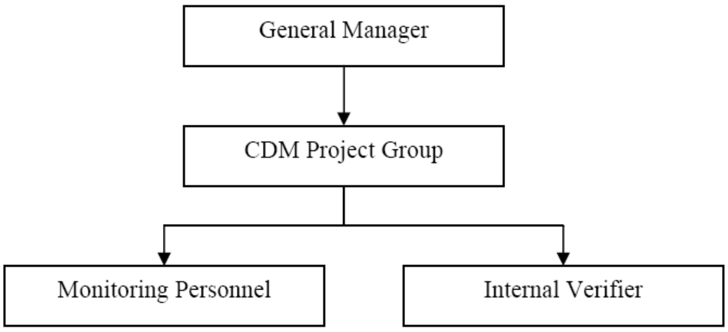


Figure B.3. Monitoring and management structure

(1) Responsibility of General Manager:

All the affairs related to CDM project monitoring is managed by general manager.

(2) Responsibility of CDM Project Group:

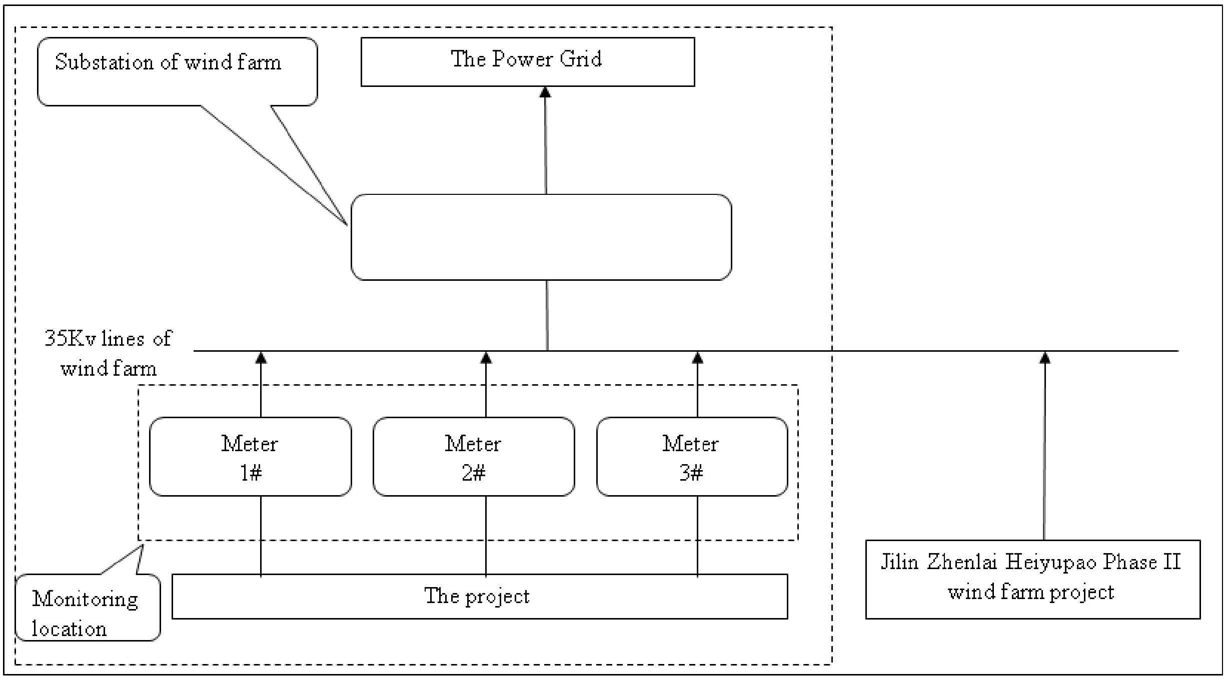
CDM Project Group will be in charge of all process of the CDM project directly. The tasks include Meters calibration and training affairs; Check the daily operation report forms; Archive emergency situation disposal report.

(3) Responsibility of Monitoring Personnel and Internal Verifier:

Monitoring Personnel is in charge of data archivement; Executive emergency plan; Draft operation report forms and emergency situation disposal report; Internal Verifier is in charge of data supervision, identification, and cross check the data reported and archived.

2. Meters installation

As per the new power purchase agreement (PPA) signed between the Grid Company and wind farm company, the location of main meter was changed from the substation of wind farm to the 35 kV lines of the wind farm on 24:00 of 24/03/2011. Electricity supplied to the grid will be measured by the main meters located in the 35 kV lines of the wind farm. The accuracy of the meters is 0.5, which is consistent with the registered PDD (version 05, dated 28/10/2009).In case there’s some problem with meters, a temporary solution would be agreed together with the Grid Company. Data can be cross-checked against relevant electricity sale receipts or records from the grid.



Note: The project owner of Jilin Zhenlai Heiyupao Phase II wind farm project is different from the project owner of this project.

Figure B.4 Monitoring system

3. Meters calibration and maintenance

An agreement should be signed between the project owner and the grid company that defines the metering arrangements and the quality control procedures to ensure accuracy.

The metering equipments shall be properly calibrated according to the industrial standards by qualified entity and according to professional standard or national regulation to make sure the meters are accurate and working properly. Copy of calibration records shall be kept by the project owner in a certain place.

All the meters shall be jointly inspected and sealed on behalf of the parties concerned and shall not be interfered with by either party except in the presence of the other party or its accredited representatives.

The metering equipments will be properly maintained and checked according to the national or professional requirement by qualified third party designated if being out of work. These records for meters maintenance will be archived by the project owner.

4. Data monitoring

The EG_y is used for calculating the emission reductions when the meters are in normal operation state. The monitoring steps are as follows:

(1) The readings of the electricity meters will be measured continuously and recorded monthly. The difference of exported and imported data is the net power generation of the project;

(2) The Power Grid Company provides the project owner with receipt of sales or commercial data on a monthly basis;

(3) The project owner provides the Power Grid Company with invoices for exported electricity.

5. Emergency procedure

Should any reading of meters be inaccurate by more than the allowance error, or the meters be otherwise functioned improperly, the malfunctioning meters will be recalibrated, repaired or replaced and the net electricity supplied to the gird shall be determined by:
(a) The project owner and the grid company negotiate to determine a reasonable and conservative estimate of the meter reading and the memorandum should be signed between the project and the grid company as evidence to clarify the whole process.
(b) If the grid company and the project owner fail to agree then the matter will be referred for arbitration according to agreed procedures.

6. Quality Assurance and Quality Control

(1) For Monitoring Process——Computer Execution with Human Supervision

The Monitoring Process will be arranged and supervised by persons, meanwhile executed by computer, which will avoid artificial errors. In addition, the operators will copy the data in paper according to the working procedure formulated by the project owner to supervise whether the meters and the computer are working normally. The operation report forms should be archived. The monthly data will be checked and approved by the supervisor.

(2) For Human Resource Management——Training Plan

The training course should be conducted appropriately by CDM manager. Relative documentation or other materials such as: the training plan or training materials should be archived and provided to DOE.

7. Data management

The measured data will be recorded both in electronic way and in paper way day-to-day, and all the data will be recorded by Monitoring Personnel and checked by Internal Verifier. All monitoring data and records will be archived in electronic way and paper document monthly. The electronic documents will be saved and backed up in Compact Disc or Hard Disc. The recorded data in paper way will also be archived by the project owner monthly. The project owners will also keep copies of sales receipt.
All the electronic and paper documents will be archived during the crediting period and two years after.

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)

>>

Final Date of completion of the baseline study and monitoring methodology: 28/10/2009

The persons and entity completing the application of the baseline and monitoring methodology are:

Carbon Asset Management Sweden AB,
Tel: +86-10-65305930
Email: co2@tricorona.se
Carbon Asset Management Sweden AB is the project participant.

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:

>>01/09/2008 (the accurate date of purchasing contract of wind turbine was not clearly defined on the contract. To be conservative, Sep 1st of 2008 was adopted to be the starting date of this project, which is the earliest date of the real action of the proposed project activity accroding to the CDM Glossary Term.)

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

>>20years 0 month

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

C.2.1. Renewable crediting period

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

>>
01/01/2010 or the registration date, whichever is later

C.2.1.2. Length of the first crediting period:

>>
7 years 0 month

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>> Not applicable

C.2.2.2. Length:

>> Not applicable

SECTION D. Environmental impacts

>>

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

>>

According to China Environmental Protection Law, the Environmental Impact Assessment (EIA) must be completed before the development and construction of the proposed project. Thus, the project owner authorized a third party to carry out the EIA report in March, 2008. And Jilin Environmental Protection Bureau approved the EIA report on April 9, 2008, indicating that the project meets all the national environmental protection regulations. The analysis and measures to be taken to mitigate the impacts are demonstrated in the following:

- **Construction period**

The waste gas in construction period is mainly tail gas and dust caused by transportation and equipments operation. The influence of waste gas to local air quality can be eliminated by watering and prohibiting construction when the wind blows hard; the sanitary sewage is discharged into the anti-seepage dry latrine outside; the noise pollution shelter distance is about 300m. Besides, as there are no people living within 300m around the project site, the noisy pollution is comparatively less to the local resident; The land temporarily occupied, which will destroy ground vegetation, will be restoration ecologically to minimize ecological impact.

- **Operation period**

There is no waste gas pollution in operation period; the waste water is mainly sanitary sewage which will be discharged into the anti-seepage dry latrine outside and will not cause pollution to surface water body; the sound level beyond 50m away from the wind turbine generators in the daytime and 250mm in the night satisfies the requirements of GB3096-1993, the I Standard of Environmental Noise of Urban Area. Besides, as there are no residential area, hospital and school located within 300m around the project site, no noise pollution will be caused during operation period; the methods of ecological protection adopted in operation period is vegetation restoration and compensation by afforestation to ensure that less regional ecological impact is caused by the project.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>

According to the results of EIA and the reply from the Environmental Protection Bureau, this project is in line with the national industry development policy and the development planning of Jilin province. It also meets the requirement of local environmental protection and the principle of cleaner production. The biodiversity and regional eco-environment will not be impacted after the measures of pollution treatment and ecological restoration mentioned in the EIA report are adopted. In conclusion, this project is feasible in terms of environmental protection and sustainable development.

SECTION E. Stakeholders' comments

>>

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

>>

As stated in the EIA report, at the time of conducting environmental impact assessment by the EIA institute, a public hearing is organized by the project owner and the institute on March 20, 2008 at the meeting room of Zhenlai County Government. Project and Influence introductions are issued to the inhabitants presented at first. Then, the questionnaires are handed out to them to collect their opinion. 30 questionnaires (100%) are collected. The statistic results showed in the EIA report that the inhabitants all support the construction of proposed project.

To further investigate the impacts on local ecological environment and the comments by the local stakeholders, a survey was made among the potential stakeholders by the project owner, mostly including residents and government of Zhenlai County. Project owner put posters on the wall of the residence area to call for public input. Also, they went to the government offices to invite local regulators to invite them to give comments. Questionnaires were handed out to stakeholders before interview started. On September 11th 2008, the project owner conducted interviews and received comments from local stakeholders on September 12th 2008 in the form of questionaire. A two-pages questionnaire was designed to be easily filled in with the following sections:

1. Project introduction
2. Basic information of the stakeholders
3. Questions on:
- Do you have any knowledge or understanding about wind farm projects?
- Do you think the project will promote local economy?
- What is your opinion on the negative impacts on local environment?
- Will the Project construction bring noise pollution to your livelihoods?
- Will the Project construction lead to some problems on birds migration?
- Will the Project do some goods to local natural landscape?
- Will the Project lead to some problems on your livelihoods?
- Do you think the project will increase job opportunity among local people?
- Do you think the project will increase local income?
- Do you think the project will perfect local infrastructure construction?
- Do you have any suggestion on the Project construction?
- To the Project, what problem do you most concern?
- Generally speaking, do you support the Project construction or not?

4. Space for the respondents' signature and date

Analysis of the people being surveyed:
- Careers: farmer 78.9%; doctor2.6%; accountant 2.6%; teacher 5.3%; officer 10.5%;
- Age: 20-30(including 20) 7.9%; 30-40(including 30) 44.7%; 40-50(including 40)31.6%; 50-60(including 50) 15.8%;
- Education level: middle school and below: 65.8%; high school: 15.8%; college level: 18.4%
- Sex: male 94.7%; female 5.3%.

E.2. Summary of the comments received:

>>

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 residents have some understandings with wind power projects. Open questions are available for stakeholders to fill in their comments on this project but no comments were received. All the respondents believe that the Project will have overall positive impacts on their livelihoods with increase of job opportunities, increase of income and others. 100% of the investigated people (38 questionnaires returned out of 38) are supportive to the project construction. The government and authorities at all levels support the project construction actively, confirm its social and environmental benefits, and wish the construction could be started early and accelerated.

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

>>

No negative comments have been received on the project. Moreover, the local community possesses strong positive comments on the effects that the proposed project will make on the local economy and infrastructure. There has therefore been no need to modify the project due to comments received. And meanwhile, the project owner will concern much on the suggestions from stakeholders and put all of the measures listed in the EIA into effect during construction and operation, so as to achieve environmental, social and economic benefits.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Jilin Taihe Windpower Development Co., Ltd
Street/P.O.Box:	
Building:	Science and Technology Office Building
City:	Zhenlai county
State/Region:	Jilin province
Postfix/ZIP:	
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Telephone:	+86-436-7281101
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E-Mail:	
URL:	
Represented by:	
Title:	Mr.
Salutation:	
Last Name:	Zhou
Middle Name:	
First Name:	Yaozong
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Direct tel:	+86-436-7281101
Personal E-Mail:	shizp@chinawindpower.com.hk

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding for the project.

Annex 3

BASELINE INFORMATION

Table 1 Low calorific values, CO_2 emission factors and oxidation factors of fuels

Fuel	Low Calorific Value	Emission Factor (tC/TJ)	Oxidation Factor
Raw coal	20908	25.80	1
Clean coal	26344	25.80	1
Other washed coal	8363	25.80	1
Coke	20908	26.60	1
Moulded coke	28435	29.20	1
Crude oil	41816	20.00	1
gasoline	43070	18.90	1
kerosene	43070	19.60	1
Diesel oil	42652	20.20	1
Fuel oil	41816	21.10	1
Others	38369	20.00	1
Natural gas	38931	15.30	1
Coke oven gas	16726	12.10	1
Other coal gas	5227	12.10	1
LPG	50179	17.20	1
Refinery dry gas	46055	15.70	1

Data Source:
The net calorific values are quoted from <China Energy Statistical Yearbook 2007>.

The following tables summarize the numerical results from the equations listed in the “Tool to calculate the emission factor for an electricity system”. The information listed in the tables includes data, data sources and the underlying computations.

Table 2 Fuel consumption and emission of Northeast China Power Grid in 2004

Fuel type	unit	Liaoning	Jilin	Heilongjiang	Fuel Consumption	Emission factor	Oxidation	average low Caloric value	CO_2 emission(tCO_2)
						(tc/TJ)	**(%)**	**(MJ/t,km3)**	**H=G*D*E*F*44/12/10000((Quality unit)**
		A	**B**	**C**	**D=A+B+C**	**E**	**F**	**G**	**H=G*D*E*F*44/12/1000 (Volume Unit)**
Raw coal	10^4tonne	4144.2	2310.9	3084.8	9539.9	25.8	100	20908	188,689,377
Clean coal	10^4tonne	84.75	1.09	4.88	90.72	25.8	100	26344	2,260,872
Other washed coal	10^4tonne	577.67	14.26	61	652.93	25.8	100	8363	5,165,589
Coke	10^4tonne				0	29.2	100	28435	0
Coke oven gas	10^8m^3	4.83	2.91		7.74	12.1	100	16726	574,367
Other coal gas	10^8m^3	57.33	4.19		61.52	12.1	100	5227	1,426,677
Crude oil	10^4tonne				0	20	100	41816	0
Gasoline	10^4tonne					18.9	100	43070	0
Diesel oil	10^4tonne	2.04	1.16	0.24	3.44	20.2	100	42652	108,673
Fuel oil	10^4tonne	12.81	1.78	2.86	17.45	21.1	100	41816	564,536
LPG	10^4tonne	2.19			2.19	17.2	100	50179	69,305
Refinery gas	10^8m^3	9.79		1.14	10.93	15.7	100	46055	289,780
Natural gas	10^4tonne		0.03	2.53	2.56	15.3	100	38931	559,111
Other petroleum product	10^4tonne				0	20	100	38369	0
Other coke product	10^4tonne				0	25.8	100	28435	0
Other energy	10^4tonne tce	26.97	5.07		32.04	0	100	0	0
Total								Subtotal	199,708,287

Data source: China Energy Statistic Yearbook 2005

Table3 The fossil-fired electricity generation of Northeast China Power Grid in 2004

Province	Electricity Generation	Auxiliary Power Ratio	Supplied Electricity
	(10^8KWh)	**(%)**	**(MWh)**
Liaoning	845.43	7.21	78,447,450
Jilin	332.42	7.68	30,689,014
Heilongjiang	534.82	7.84	49,289,011
Total			158,425,475

Data source: China Electric Power Yearbook 2005

Total emission (tCO_2e): 199,708,287
Total electricity supply (MWh): 158,425,475
$EF_{(2004)}$: 1.260582 tCO_2e/ MWh

Table4 Fuel consumption and emission of Northeast China Power Grid in 2005

Fuel type	unit	Liaoning	Jilin	Heilongjiang	Fuel Consumption	Emission factor	Oxidation	average low Caloric value	CO_2 emission(tCO_2e)
						(tc/TJ)	(%)	(MJ/t,km3)	H=G*D*E*F*44/12/10000(Quality unit)
		A	B	C	D=A+B+C	E	F	G	H=G*D*E*F*44/12/1000 (Volume Unit)
Raw coal	10^4tonne	4305.41	2446.13	3383.21	10134.75	25.8	100	20908	200,454,896
Clean coal	10^4tonne				0	25.8	100	26344	0
Other washed coal	10^4tonne	524.74	19.26	24.16	568.16	25.8	100	8363	4,494,940
Coke	10^4tonne				0	29.2	100	28435	0
Coke oven gas	10^8m^3	1.03	3.57	0.68	5.28	12.1	100	16726	391,817
Other coal gas	10^8m^3	12.62	8.37		20.99	12.1	100	5227	486,768
Crude oil	10^4tonne	1.16			1.16	20	100	41816	35,571
gasoline	10^4tonne				0	18.9	100	43070	0
Diesel oil	10^4tonne	1.18	1.48	0.57	3.23	20.2	100	42652	102,039
Fuel oil	10^4tonne	9.32	2.46	1.55	13.33	21.1	100	41816	431,247
LPG	10^4tonne	0.12			0.12	17.2	100	50179	3,798
Refinery gas	10^8m^3	5.48		1.32	6.8	15.7	100	46055	180,284
Natural gas	10^4tonne		0.84	2.24	3.08	15.3	100	38931	672,681
Other petroleum product	10^4tonne				0	20	100	38369	0
Other coke product	10^4tonne				0	25.8	100	28435	0
Other energy	10^4tonne tce	16.18			16.18	0	100	0	0
Total								Subtotal	207,254,040

Data source: China Energy Statistic Yearbook 2006

Table5 The fossil-fired electricity generation of Northeast China Power Grid in 2005

Province	Electricity Generation	Auxiliary Power Ratio	Supplied Electricity
	(10^8KWh)	(%)	(MWh)
Liaoning	836.97	7.03	77,813,101
Jilin	352.94	6.59	32,968,125
Heilongjiang	580	7.96	53,383,200
Total			164,164,426

Data source: China Electric Power Yearbook 2006

Total emission (tCO_2e): 207,254,040
Total electricity supply (MWh): 164,164,426
$EF_{(2005)}$: 1.262478 tCO_2e/ MWh

Table6 Fuel consumption and emission of Northeast China Power Grid in 2006

Fuel type	unit	Liaoning	Jilin	Heilongjiang	Fuel Consumption	Emission factor	Oxidation	average low Caloric value	CO_2 emission(tCO_2e)
						(tc/TJ)	(%)	(MJ/t,km3)	H=G*D*E*F*44/12/10000 (Quality unit)
		A	B	C	D=A+B+C	E	F	G	H=G*D*E*F*44/12/1000 (Volume Unit)
Raw coal	10^4tonne	4681.99	2738.24	3698.29	11118.52	25.8	100	20908	219,912,851
Clean coal	10^4tonne	0.03			0.03	25.8	100	26344	748
Other washed coal	10^4tonne	674.74	17.83	96	788.57	25.8	100	8363	6,238,691
Coke	10^4tonne	3.32			3.32	29.2	100	28435	101,075
Coke oven gas	10^8m^3	2.68	0.16	1.44	4.28	12.1	100	16726	317,609
Other coal gas	10^8m^3	55.26	1.43		56.69	12.1	100	5227	1,314,667
Crude oil	10^4tonne	0.49			0.49	20	100	41816	15,026
gasoline	10^4tonne				0	18.9	100	43070	0
Diesel oil	10^4tonne	0.75	0.39	0.3	1.44	20.2	100	42652	45,491
Fuel oil	10^4tonne	11.73	0.45	1.44	13.62	21.1	100	41816	440,629
LPG	10^4tonne				0	17.2	100	50179	0
Refinery gas	10^8m^3	8.55		4.27	12.82	15.7	100	46055	339,888
Natural gas	10^4tonne		0.19	2.1	2.29	15.3	100	38931	500,143
Other petroleum product	10^4tonne				0	20	100	38369	0
Other coke product	10^4tonne				0	25.8	100	28435	0
Other energy	10^4tonne tce	12.16	17.6	82.77	112.53	0	100	0	0
Total								Subtotal	229,226,818

China Energy Statistic Yearbook 2007

Table7 The fossil-fired electricity generation of Northeast China Power Grid in 2006

Province	Electricity Generation	Auxiliary Power Ratio	Supplied Electricity
	(10^8KWh)	(%)	(MWh)
Liaoning	962.82	6.62	89,908,132
Jilin	385.76	6.78	35,960,547
Heilongjiang	629.64	7.85	58,021,326
Total			183,890,005

Data source: China Electric Power Yearbook 2007

Total emission (tCO_2e): 229,226,818
Total electricity supply (MWh): 183,890,005
EF (2006): 1.246543 tCO2e/ MWh

The Simple OM emission factor ($EF_{grid,OM,y}$): 1.2561 tCO2e/ MWh

Explain of calculating the BM emission factor of the Northeast China Power Grid

Step 1: Calculating of percentages of CO_2 emissions from the coal-fired, gas-fired and oil-fired power plants in total fuel-fired CO_2 emissions
The conservative calculation of the build margin emission factor of the Northeast China Grid has been explained in Section B in the PDD. The data, sources and calculation process of the build margin emission factor and combined emission factor of the Northeast China Grid are shown in Table 7, Table 8 and Table 9.

Table 8 Percentages of CO_2 emissions from the coal-fired, gas-fired and oil-fired power plants in total fuel-fired CO_2 emissions

Fuel type	unit	Liaoning	Jilin	Heilongjiang	Total	average low Caloric value(MJ/t,km^3,tce)	Carbon Possession(tc/TJ)	Oxidation	CO_2 emission(tCO_2e)
		A	B	C	D=A+B+C	E	F	G	H=G*D*E*F*44/12/100
Raw coal	10^4tonne	4681.99	2738.24	3698.29	11118.52	20908	25.8	1	219,912,851
Clean coal	10^4tonne	0.03			0.03	26344	25.8	1	748
Other washed coal	10^4tonne	674.74	17.83	96.00	788.57	8363	25.8	1	6,238,691
Moulded coke	10^4tonne				0.00	20908	26.6	1	0
Coke	10^4tonne	3.32			3.32	28435	29.2	1	101,075
								Subtotal	226,253,365
Crude oil	10^4tonne	0.49			0.49	41816	20.0	1	15,026
gasoline	10^4tonne				0.00	43070	18.9	1	0
kerosene	10^4tonne				0.00	43070	19.6	1	0
Diesel oil	10^4tonne	0.75	0.39	0.30	1.44	42652	20.2	1	45,491
Fuel oil	10^4tonne	11.73	0.45	1.44	13.62	41816	21.1	1	440,629
Other petrol product	10^4tonne				0.00	38369	20.0	1	0
Other coke product	10^4tonne				0.00	28435	25.8	1	0
								Subtotal	501,146
Natural gas	10^8m^3		1.90	21.00	22.90	38931	15.3	1	500,143
Coke oven gas	10^8m^3	26.80	1.60	14.40	42.80	16726	12.1	1	317,609
Other coal gas	10^8m^3	552.60	14.30		566.90	5227	12.1	1	1,314,667
LPG	10^4tonne				0.00	50179	17.2	1	0
Refinery dry gas	10^4tonne	8.55		4.27	12.82	46055	15.7	1	339,888
								Subtotal	2,472,307
Total									229,226,818

Data source: China Energy Statistic Yearbook 2007

According to the data in the table above, $\lambda_{coal,y}$=98.70%,$\lambda_{Oil,y}$ =0.22%,$\lambda_{Gas,y}$ = 1.08%(λ is the ratio of CO_2 emission by burning coal, oil, gas to the total emission).
Step 2: Calculating the emission factor of thermal plant.

Table 9 Emission Factor of best advanced commercial power technologies

	variable	Power generation efficiency	Emission factor	oxidation	Emission factor
		A	B	C	D=3.6/A/1000*B*C*44/12
Coal-fire power plant	$EF_{coal,adv,y}$	37.28%	25.8	1	0.9135
Gas-fired power plant	$EF_{gasadv,y}$	48.81%	15.3	1	0.4138
Oil-fired power plant	$EF_{oil,adv,y}$	48.81%	21.1	1	0.5706

According to Table 8,

$EF_{Thermal,y} = \lambda_{coal,y} \times EF_{coal,adv,y} + \lambda_{oil,y} \times EF_{oil,adv,y} + \lambda_{gas,y} \times EF_{gas,adv,y}$ = **0.9074 tCO_2e/MWh**

Step 3: Calculating the BM emission factor of Northeast Power Grid.

Table 10: The installed capacity of Northeast China Power Gird in 2006

Installed capacity	Unit	Liaoning	Jilin	Heilongjiang	Total
Thermal	MW	16721	7039	12456	36216
Hydro	MW	1401	3872	853	6126
Nuclear	MW	0	0	0	0
Wind and other	MW	216	221	115	552
Total	MW	18338	11132	13424	42894

Data source: China Electric Power Yearbook<2007>

Table 11: The installed capacity of Northeast China Power Gird in 1999

Installed capacity	Unit	Liaoning	Jilin	Heilongjiang	Total
Thermal	MW	12425.7	4583.1	10128.1	27136.9
Hydro	MW	1240	3508.2	774.5	5522.7
Nuclear	MW	0	0	0	0
Wind and other	MW	22.9	0	0	22.9
Total	MW	13688.6	8091.3	10902.6	32682.5

Data source: China Electric Power Yearbook<2001>

Table 12: The installed capacity of Northeast China Power Gird in 2000

Installed capacity	Unit	Liaoning	Jilin	Heilongjiang	Total
Thermal	MW	13937.9	4924.7	10069.9	28932.5
Hydro	MW	1248.5	3536.7	814.8	5600
Nuclear	MW	0	0	0	0
Wind and other	MW	43.9	0	0	43.9
Total	MW	15230.3	8461.4	10884.7	34576.4

Data source: China Electric Power Yearbook<2000>

Table 13: BM emission factor of Northeast China Power Grid

	Installed capacity in 1999	Installed capacity in 2000	Installed capacity in 2006	Newly installed capacity addition	Percentage to newly-added capacity
	A	B	C	D=C-A	E
Thermal(MW)	27136.9	28932.5	36216	9079.1	88.91%
Hydro(MW)	5522.7	5600	6126	603.3	5.91%
Nuclear(MW)	0	0	0	0	0.00%
Wind(MW)	22.9	43.9	552	529.1	5.18%
Total(MW)	32682.5	34576.4	42894	10211.5	100.00%
Percentage of newly installed capacity to 2006	76.19%	80.61%	100.00%		

$EF_{grid,BM,y}$= 0.9074×88.91% = 0.8068 tCO_2/MWh

Annex 4

MONITORING INFORMATION

No more information.