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

CONTENTS

Annexes

SECTION A. General description of project activity

A.1. Title of the project activity:

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Liaoning Zhangwu Pingandi Wind Farm Project
Current version of the PDD: 2.0
Date of completion: 18/07/2011

PDD revision history

PDD version	Time	Note
Version 1.1	21/12/2010	Submission to DOE for GSP after internal QA (ACM0002 v12.1.0)
Version 2.0	18/07/2011	Revision after DOE draft validation report (ACM0002 v12.1.0)

A.2. Description of the project activity:

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The proposed Liaoning Zhangwu Pingandi Wind Farm Project (the proposed project activity) is located in Fuxin City, Liaoning Province, People's Republic of China. The proposed project activity is developed by Fuxin Juyuan Wind Power Generation Co., Ltd.. The proposed project activity is to install and operate 33 wind turbines with a capacity of 1,500 kW each; the total installed capacity will be 49.5 MW. The proposed project activity is expected to deliver on 98,100 MWh of electricity per year to the Northeast Power Grid (NEPG). The purpose of the proposed project activity is the generation of electricity from wind and the supply of this electricity to the NEPG.

The project scenario is the installation of 49.5 MW of renewable energy power generation capacity, and the supply to NEPG of 98,100 MWh of electricity generated from renewable energy.

The baseline scenario, which is the same as the scenario existing prior to the implementation of the proposed project activity, is the generation of electricity by grid-connected power plants.

As the NEPG is dominated by thermal power generation, the establishment of the proposed project activity will lead to greenhouse gas (GHG) emission reductions. Following the baseline methodology, the emission reductions are estimated to be approximately 99,110 tonnes of CO_2 equivalent (tCO_2e) per year once the proposed project activity is fully operational.

Sustainable development

The proposed project activity will help the local government to promote economic development and to improve the air quality. The project will assist China in stimulating and accelerating the commercialisation of grid-connected wind power technologies and markets which are an important objective of the Chinese government. The project will therefore help reduce GHG emissions versus the high-growth, coal-dominated business-as-usual scenario. The project will improve air quality and local livelihoods, promote sustainable renewable energy industry development.

The proposed project activity will contribute to sustainable development in the following ways:

- It will promote local economic development by creating local employment opportunities during both the construction and operational phase of the proposed project activity.

- It will generate electricity from renewable sources.
- It will promote technology development, through the use of advanced technology.
- It will reduce GHG emissions in China compared to the baseline/business-as-usual scenario.
- It will reduce the emissions of other pollutants associated with the operation of fossil fuel-fired thermal power plant, including SO_2 and soot, as well as reducing thermal pollution from cooling water in the baseline/business-as-usual scenario.

A.3. Project participants:

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Name of Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Party involved wishes to be considered as project participant (Yes/No)
P.R. China (host)	Fuxin Juyuan Wind Power Generation Co., Ltd.	No
United Kingdom of Great Britain and Northern Ireland	Carbon Resource Management S.A.	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

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People's Republic of China

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

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Liaoning Province

Figure 1 Liaoning Province

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

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Houxinqiu Town, Zhangwu County, Fuxin 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 center coordinates of proposed project activity will be located at longitude of 122°43′ East and latitude 42°38′ North. Figure 2 shows the location of the project site. Table 1 displays the detailed coordinates of 33 wind turbines.

Figure 2 Location of the project activity in Fuxin city

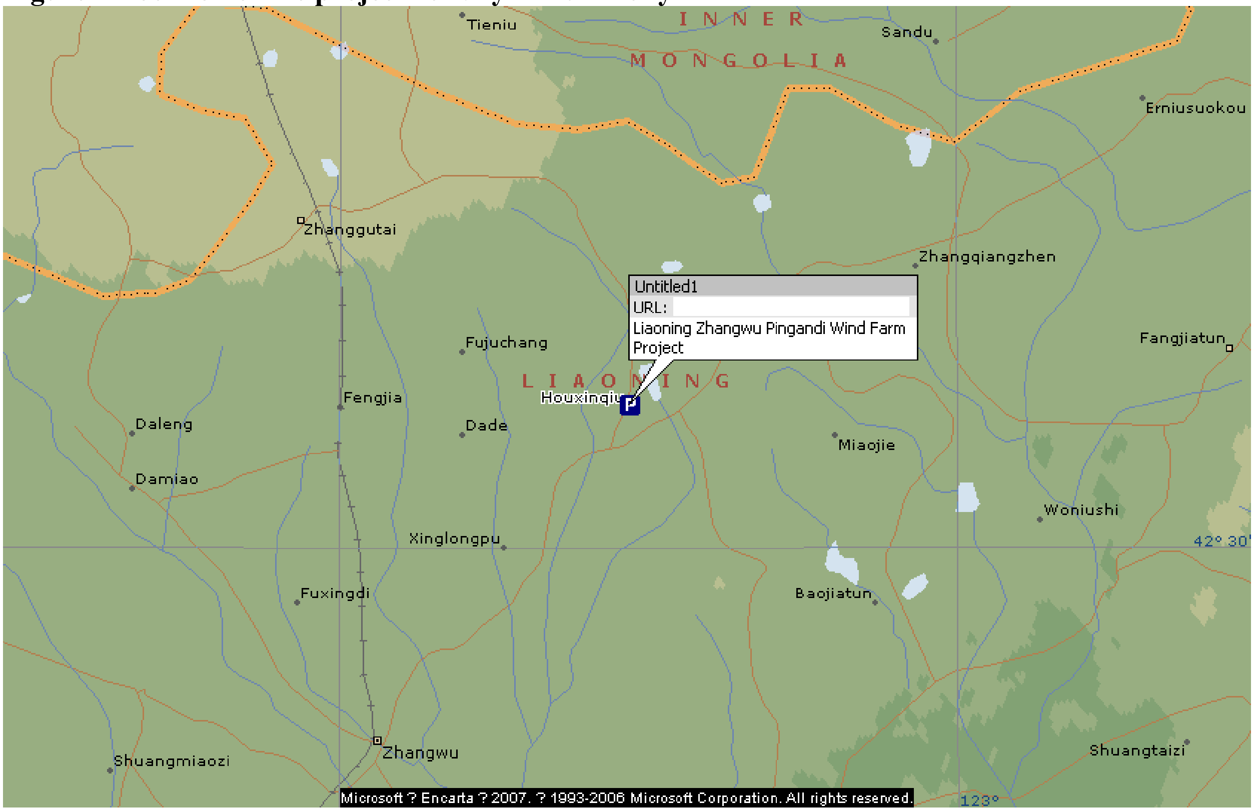

Table 1 coordinates of 33 wind turbines

No.	East longitude	North latitude	No.	East longitude	North latitude
1	122°41'24.21"	42°37'27.72"	18	122°41'09.55"	42°37'48.86"
2	122°42'15.31"	42°37'30.24"	19	122°41'24.55"	42°37'52.1"
3	122°42'28.75"	42°37'24.20"	20	122°41'18.39"	42°37'40.68"
4	122°42'02.94"	42°37'39.15"	21	122°42'02.58"	42°37'52.9"
5	122°45'31.34"	42°38'02.53"	22	122°39'57.41"	42°37'20.81"
6	122°45'11.2"	42°38'04.82"	23	122°44'16.39"	42°38'30.63"
7	122°44'45.08"	42°38'04.37"	24	122°44'31.85"	42°38'24.31"
8	122°41'25.37"	42°37'13.59"	25	122°44'49.65"	42°38'21.07"
9	122°41'14.63"	42°36'54.41"	26	122°45'22.43"	42°38'41.93"
10	122°41'11.63"	42°37'05.1"	27	122°45'30.11"	42°38'29.49"
11	122°42'18.55"	42°37'12.28"	28	122°45'47.11"	42°38'37.3"
12	122°40'43.82"	42°37'37.91"	29	122°45'53.66"	42°38'28.6"
13	122°40'18.38"	42°37'34.88"	30	122°46'13.28"	42°38'32.53"
14	122°40'28.9"	42°38'05.82"	31	122°46'41.09"	42°38'32.34"
15	122°40'40.02"	42°38'19.8"	32	122°46'51.92"	42°38'20.77"
16	122°40'51.97"	42°38'05.8"	33	122°46'11.37"	42°38'09.53"
17	122°40'59.67"	42°37'56.68"			

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

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Category: Renewable electricity in grid connected applications
Sectoral scope: 01 Energy industries

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

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The purpose of the Proposed Project Activity is the generation of electricity from wind and the supply of this electricity to the Grid. The project involves the installation of wind turbine generators of GW82/1500 produced by Xinjiang Gold Wind Technology Co., Ltd.. The technology is considered good practice in China. The main turbine parameters of the 1500kW wind turbines are shown in Table 2.

Table 2 Technology specifications

Item	Unit	Specification[1]
Manufacturer		Xinjiang Gold Wind Technology Co., Ltd.
Type		GW82/1500
Power Rating	kW	1500
Rotor Diameter	M	82
Hub height (Centre)	M	70
Cut-in Wind Speed	m/s	3
Rating Wind Speed	m/s	11.6
Cut-out Wind Speed	m/s	22
Designed Life	year	20

Each turbine will have a transformer from 690 V to 35 kV, and are connected with the 35 kV-220 kV Zhangdong substation on the wind farm. Zhangdong substation is connected to the grid substation. All the electricity generated by the wind farm will be transferred to the NEPG.

The project scenario is the installation of 33 wind turbines with an aggregate capacity of 49.5 MW. The wind turbines are estimated to generate on average 98,100 MWh of electricity annually once fully operational, with an average load factor of 22.6%. The expected load factor is determined by an independent qualified design institute in the FSR using detailed onsite information and long-term local wind data, in accordance with EB guidance on plant load factors (EB48 Annex 11).

The generation and consumption of the Proposed Project Activity is monitored continuously through an electronic control and monitoring system in the onsite office, using meters in the onsite substation. For the purpose of invoicing for generation and consumption, electricity meters in Zhangdong substation are used. The data from Zhangdong substation is used for the calculation of emission reductions, and measurement results with records for sold electricity are used for cross-referencing.

Prior to the implementation of the project activity, the electricity was generated by grid-connected power plants. Without the implementation of the project, this scenario would have continued and is considered

[1] Wind Turbine Purchase Contract

the baseline scenario. As the grid is dominated by thermal power generation, the establishment of the proposed project activity will lead to greenhouse gas (GHG) emission reductions, estimated following the baseline methodology below.

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

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Applying the baseline methodology and estimated annual net electricity supply, the ex-ante estimated emission reductions over the chosen 7-year crediting period are presented below.

Table 3 Estimated amount of emission reductions over the chosen crediting period

Years*	Annual estimation of emission reductions in tonnes of CO_2e
2011	99,110
2012	99,110
2013	99,110
2014	99,110
2015	99,110
2016	99,110
2017	99,110
Total estimated reductions (tonnes of CO_2e)	693,770
Total number of crediting years	7 years
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	99,110

*Note: * Using 12-monthly periods from the start of the crediting period*

A.4.5. Public funding of the project activity:

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There is no public funding from Parties included in Annex I involved in 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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Methodology

- ACM0002 version 12.1.0 "Consolidated methodology for grid-connected electricity generation from renewable sources" (valid from 17 Sep 2010 onwards)

Tools

- AM_Tool_01 version 05.2 "Tool for the demonstration and assessment of additionality"
- AM_Tool_02 version 02.2 "Combined tool to identify the baseline scenario and demonstrate additionality" (this tool is not applicable to the project)
- AM_Tool_03 version 02 "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (this tool is not applicable to the project)
- AM_Tool_07 version 02.1.0 "Tool to calculate the emission factor for an electricity system"

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

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This methodology is applicable to grid-connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).

Therefore, the methodology is applicable as the proposed project activity is the installation of a Greenfield, grid-connected wind power plant (a).

The methodology is applicable under the following conditions:

Criteria	Applicability	Conclusion
The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit	The proposed project activity is the installation of a wind power plant.	OK
In the case of capacity additions, retrofits or replacements: the existing plant started commercial operation prior to the start of a	The proposed project activity is a Greenfield plant and does not represent a capacity addition to an existing plant.	OK

minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity		
In case of hydro power plants, one of the following conditions must apply: • The project activity is implemented in an existing reservoir, with no change in the volume of reservoir; or • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m2; or • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m2.	Not applicable. The proposed project activity is a wind power plant.	OK

The methodology is not applicable to the following:

Criteria	**Applicability**	**Conclusion**
Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site;	The proposed project activity does not involve switching from fossil fuels to renewable energy at the site of the project activity	OK
Biomass fired power plants	Not applicable. The proposed project activity is a wind power plant	OK

Hydro power plants that result in new reservoirs or in the increase in existing reservoirs where the power density of the power plant is less than 4 W/m^2	Not applicable. The proposed project activity is a wind power plant	OK

In addition, the applicability conditions included in the tools applied and referred to above apply[2].

Any conditions for the application of the tools are addressed in the sections below where the tools are used, sections B.5 and B.6, showing that the tools are applicable to the proposed project activity. In addition, it is noted that:

- the project is a Greenfield project, therefore the AM_Tool_02 “Combined tool to identify the baseline scenario and demonstrate additionality” is not required to identify the baseline scenario of the proposed project; and
- the project is a wind power project, there are no fossil fuels used for electricity generation, so there are no CO_2 emissions and leakage from combustion of fossil fuels, and thus the AM_Tool_03 “Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion” is not applicable to the proposed project.

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

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Emission sources and gases

Following the methodology, 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 for determining the baseline emissions. According to the methodology, project emissions from geothermal, solar thermal and hydro power plants need to be taken into account; there are no project emissions for a wind power plant, thus $PE_y = 0$.

Table 4 Emission sources and GHG included in the project boundary

	Source	*Gas*	*Included?*	*Justification / Explanation*
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity.	CO_2	Yes	Main emission source.
		CH_4	No	Minor emission source.
		N_2O	No	Minor emission source.
Project Activity	For geothermal power plants, fugitive emissions of CH_4 and CO_2 from non-	CO_2	No	Not applicable to wind.
		CH_4		
		N_2O		

[2] The condition in the “Combined tool to identify the baseline scenario and demonstrate additionality” that all potential alternative scenarios to the proposed project activity must be available options to project participants does not apply to this methodology, as this methodology only refers to some steps of this tool.

	condensable gases contained in geothermal steam.			
	CO_2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants.	CO_2	No	Not applicable to wind.
		CH_4		
		N_2O		
	For hydro power plants, emissions of CH_4 from the reservoir.	CO_2	No	Not applicable to wind.
		CH_4		
		N_2O		

Spatial boundary

The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to.

A connected electricity system is defined as an electricity system that is connected by transmission lines to the project electricity system. Power plants within the connected electricity system can be dispatched without significant transmission constraints but transmission to the project electricity system has significant transmission constraint.

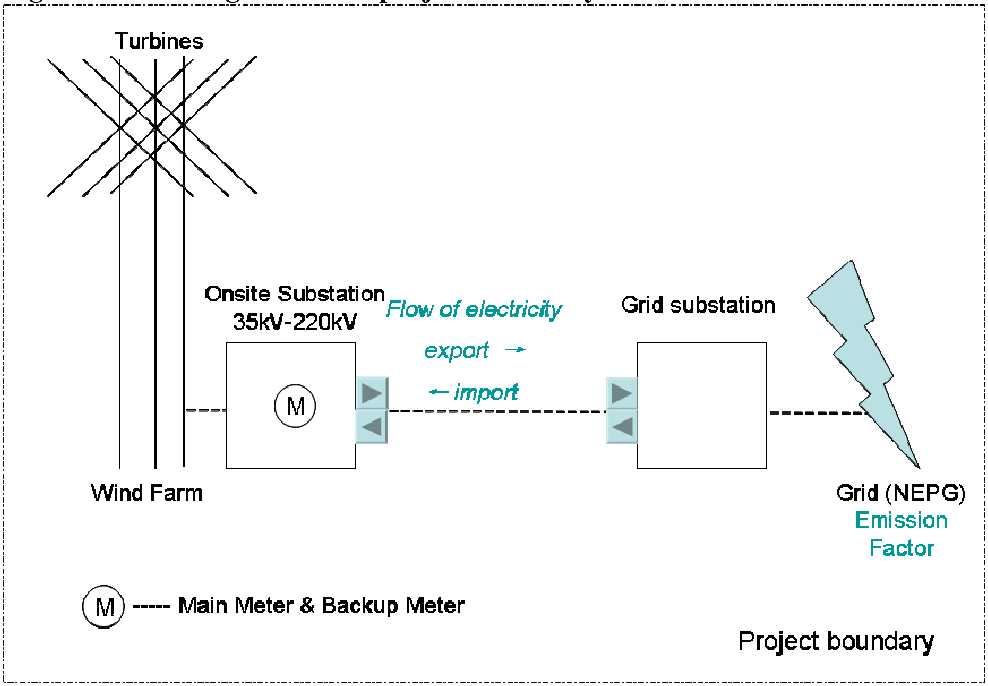
As the DNA of China has published a delineation of the project electricity system and connected electricity systems[3], these delineations are used. According to the delineation of grid boundaries as provided by the DNA of China, NEPG includes Liaoning, Heilongjiang and Jilin. NEPG is the project electricity system, as the power plants that are operated within the NEPG can be dispatched without significant transmission constrains.

In line with the guidelines for completing the PDD (version 07), a flow diagram of the project boundary is presented in Figure 3 below. The flow diagram physically delineates the project boundary, includes the flow of electricity and represents the emissions included (EF: emission factor) and the monitoring variable (EG: net electricity generation).

The project boundary includes NEPG and the proposed project.

[3] Chinese DNA designates it at http://qhs.ndrc.gov.cn/qjfzjz/t20090703_289357.htm

Figure 3 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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Because the project activity is the installation of a new grid-connected renewable power plant, and is not a capacity addition, retrofit or replacement of existing grid-connected renewable power plant/unit, the baseline scenario, according to the methodology, 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 baseline is determined and the combined margin calculated in Section B.6 below.

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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CDM consideration

Following EB guidelines (EB 49 Annex 22) the project participant informed the Host Party DNA and the UNFCCC secretariat in writing of the commencement of the project activity and of the intention to seek CDM status, as the starting date of the project activity is after 02 August 2008. This notification was made within six months of the project activity start date as shown in the timeline below.

In addition to this confirmation of serious prior consideration of the CDM by the project participants, the timeline below indicates continuing and real actions to secure CDM status for the project in parallel with its implementation.

Table 5 Timeline of the implementation of the project

Time	Milestone
Jan-2010	Environmental Impact Assessment (EIA) completed
11-Jan-2010	EIA approved
Feb-2010	Feasibility Study Report (FSR) completed, taking CER revenue into account
10-Feb-2010	FSR approved by Development Reformation Committee of Liaoning Province
13-Mar-2010	Board meeting decides to develop the proposed project as CDM
10-Apr-2010	Emission Reduction Purchase Agreement signed with CRM
17-May-2010	Approval date for notification of the intention to develop this project as CDM to NDRC
17-May-2010	Received date for notification of the intention to develop this project as CDM to EB
18-May-2010	Contract for wind turbine and tower purchase signed *This is considered as the project start date*

Additionality

The methodology requires the use of the latest version of the “Tool for the demonstration and assessment of additionality”. The Tool consists of the steps below.

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

Realistic and credible alternatives to the project activity that can be part of the baseline scenario are defined through the following sub-steps:

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

The PDD shall identify credible alternatives to the project activity in order to determine the most realistic baseline scenario, unless the approved methodology that is selected by the proposed CDM project activity prescribes the baseline scenario and no further analysis is required.[4]

The Proposed Project Activity is the installation of a new grid-connected renewable power plant, and is not a capacity addition, retrofit or replacement of existing grid-connected renewable power plant/unit. Therefore, the selected methodology prescribes the baseline scenario – the baseline scenario according to the methodology 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”.

[4] VVM v1.2 para 105.

The demonstration about the alternative that provides outputs or services comparable with the proposed CDM project activity is as follows:

a) *The proposed project activity undertaken without being registered as a CDM project activity.*
Alternative a) is in compliance with all applicable legal and regulatory requirements. But according to the detailed analysis in step 2, this scenario is less attractive with low IRR and is not realistic without CDM financing.

b) *A fossil fuel-fired power plant with the comparable capacity or electricity generation.*
Taking into account the required capacity for the same annual generation, according to the current laws and regulations, it is not a realistic alternative (please refer to the analysis in sub-step 1b).

c) *A power plant using other source of renewable energy with the comparable capacity or electricity generation, such as PV, biomass and hydro, etc.*
Besides wind energy, other kinds of renewable energy technologies, such as solar PV, geothermal, biomass and hydro are possible grid-connected sources that could be used in China. However, due to the technology development status and the high cost for power generation, solar PV[5], geothermal[6] and biomass[7] of similar installed capacity as the proposed project are not realistic alternatives in China. Biomass power generation also faces barriers and is difficult to be operated without policies & financial support, only hydropower projects can have an investment return rate that competes with that of wind power projects in China. However, due to dry climate and the lack of water resource in the project area[8], there is no commercially exploitable hydro power resource which can provide same electricity generation output of the proposed project activity. Therefore, this alternative is not realistic.

d) *Comparable capacity or electricity generation addition provided by the NEPG.*
Scenario d) is a realistic and feasible alternative which can provide outputs or services comparable with the proposed project and comply with applicable laws and regulations. Added capacity is dominated by thermal (coal-fired) power plants as determined in B.6.

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

For the alternative (b) described in sub-step1a, using comparable thermal power generation, both the installed capacity and the capacity that can generate the same annual electricity generation would be prohibited. According to Chinese regulations, coal-fired power plants of less than 135 MW are prohibited to be built in the areas covered by the large grids such as provincial grids[9]. For these reasons, the possible alternative baseline scenario of building a fuel-fired power plant conflicts with Chinese regulations. So, scenario b) is not feasible as an alternative scenario.

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[5] http://www.newenergy.org.cn/html/00711/3180816088.html

[6] http://www.newenergy.org.cn/Html/0098/870929050.Html

[7] http://www.sdpc.gov.cn/zjgx/t20071123_174054.htm

[8] http://wenku.baidu.com/view/b5c51016866fb84ae45c8db7.html

[9] Notice on Strictly Prohibiting the Installation of Fuel fired Generators with the Capacity of 135MW or below issued by the General Office of the State Council, Decree No. 2002-6.
http://www.gov.cn/gongbao/content/2002/content_61480.htm

According to the analysis in sub-step 1a and 1b, alternative (a) and alternative (d) are the realistic and feasible alternatives which comply with applicable laws and regulations.

Step 2. Investment analysis

The purpose of this step is to determine whether the proposed project activity is not:
(a) The most economically or financially attractive; or
(b) Economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs).

To conduct the investment analysis, use the following sub-steps:

Sub-step 2a. Determine appropriate analysis method

The purpose of this sub-step is to determine whether to apply the simple cost analysis, investment comparison analysis or benchmark analysis (sub-step 2b):

The proposed project activity generates financial benefits by the sales of electricity, so the simple cost analysis (Option I) should not be applied. Following the EB guidance on the assessment of investment analysis[10], if the alternative to the project activity is the supply of electricity from the grid, this is not considered an investment and a benchmark approach is considered appropriate. As the baseline alternative involves the continuation of current practices, supply of electricity from the grid, a benchmark analysis is used to identify whether the project is economically attractive (Option III). The use of a benchmark analysis is also in line with Chinese practice and is followed in the FSR.

Therefore, the benchmark analysis (Option III) is adopted.

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

According to the *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects* issued by former State Power Corporation of China in 2002, the benchmark of total investment financial internal rate of return (project IRR) after tax of electric power industry is 8%, and only if the project IRR is higher than or equivalent to this benchmark, the proposed project is financially feasible. This benchmark is commonly used in the wind power project.

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

The investment estimation in the Feasibility Study Report (FSR) was carried out by an independent design institute. The analysis is based on the national regulation and the material and equipment price level. Therefore, each of the input parameters is valid and applicable at the time of writing the FSR (February 2010), and the FSR has been approved by Liaoning DRC (February 2010). The period of time between the finalisation of the FSR and the Wind Turbine Contract (May 2010) is about three months, and therefore it is not likely that the input values would have materially changed and the decision to proceed with the investment was based on the FSR.

[10] Guidelines on the Assessment of Investment Analysis (version 05), EB 62 Annex 5.

As indicated as a preference in the EB guidance, the period of assessment reflects the full period of expected operation of the underlying project activity (technical lifetime, i.e. 20 years from commissioning). The fair value of the proposed project activity assets at the end of the assessment period has been included as a cash inflow in the final year and, as stated in the FSR, was calculated in accordance with local accounting regulations; as the assessment period covers the full lifetime of the equipment the fair value is taken as the scrap value.

Input values

The key data for the calculation of the financial indicator, all derived from the FSR, are listed below, with more detail in the IRR calculation spreadsheet.

Table 6 Key data for the financial indicator calculation

Item	Value
Static investment	490.01 million RMB
Average annual operation cost	11.65 million RMB
Average annual net supplied power (once fully operational)	98,100 MWh
On-grid tariff (incl. VAT)	0.61 RMB/kWh
Operating life	20 years
Income tax	25%
Value Added Tax	17%

Source: Feasibility Study Report, Shanxi Power Surveying and Designing Institute, February 2010.
Note: FSR approved by the Liaoning DRC on 10 February 2010.

Investment costs

The total investment was estimated by an experienced design institute which has been awarded the highest certificate (grade A). The estimated investment for the proposed project activity is 9,899 RMB/kW, which is comparable to the investment level of previous wind projects by the Developer and in China in general[11] and in the range of the other similar projects in Liaoning, which is 8,150[12]~10,744[13] RMB/kW.

Additionally, these costs are also compared with the values presented by one of the most important wind energy studies in the World, "Wind Energy – The Facts" implemented by a consortium led by the European Wind Energy Association (EWEA) and published in March 2009[14]. According to the study, the investment costs per kW typically varies from around €1000/kW to €1350/kW[15] (9,094 to 12,277

[11] The average investment level of the wind farm is 8,000 to 12,000 RMB/kWh, see http://www.in-en.com/newenergy/html/newenergy-20072007042885858.html.

[12] Project 4067 http://cdm.unfccc.int/Projects/DB/TUEV-SUED1287754830.61/view

[13] Project 3112 http://cdm.unfccc.int/Projects/DB/TUEV-RHEIN1257149129.49/view

[14] http://www.wind-energy-the-facts.org/en/home--about-the-project.html.

[15] Wind Energy – The Facts, Part III, The Economics of Wind Power, page 200, March 2009 (http://www.wind-energy-the-facts.org/documents/download/Chapter3.pdf).

RMB/kW[16]). Therefore, it can be concluded that the estimated investment costs in the FSR are reasonable.

Tariff
The expected on-grid tariff used for the financial analysis in the FSR refers to the most recent tariffs for wind farms in Liaoning (published July 2009) at the time of writing the FSR, which was February of the year after. Besides, Liaoning Province Price Bureau approved 0.61 RMB/kWh for the proposed project on 9 December 2010. Therefore, the tariff in the FSR is appropriate and reasonable.

According to the Interim Measures for Renewable Energy Power Tariff and Cost-sharing[17], issued by NDRC, and affective from 1 January 2006, all wind projects will receive the government guiding tariff. Additionally, NDRC stated in 2007 that the tariffs would remain stable.[18] All public tariff notifications issued for Liaoning Province since the entry into force of the Renewable Energy Law are presented in Table 7 below, showing the tariff is stable.

In April 2002, China implemented power sector reform to establish a more commercialized power market in China, therefore market condition for wind power project development has changed significantly since April 2002. The first tariff notification issued after the power sector reform (Fa Gai Jia Ge [2003]424) was 0.55 RMB/kWh (incl. VAT)[19], then increased to 0.61 after the entry into force of the Renewable Energy Law (Fa Gai Jia Ge [2007] No. 3303), and the tariff in Liaoning province has been maintained at the 0.61 RMB/kWh (incl. VAT) level in recent tariff notifications issued by NDRC (23/07/2008 (Fa Gai Jia Ge [2008]1876) and 20/07/2009 (Fa Gai Jia Ge [2009]1906).

Table 7 public tariff notifications for Liaoning province

Date	Document reference	Tariff (RMB/kWh, including VAT)
3 December 2007	Fa Gai Jia Ge [2007] No. 3303[20]	0.61
23 July 2008	Fa Gai Jia Ge [2008] No. 1876[21]	0.61
20 July 2009	Fa Gai Jia Ge [2009] No. 1906[22]	0.61

The FSR referred to the tariff issued by NDRC in July 2009 (Fa Gai Jia Ge [2009]1906])[23], which indicated that the unified tariff was 0.61 RMB/kWh (incl. VAT). Therefore, given that 0.61 RMB/kWh was the most recent tariff approved at the time of writing the FSR, and that it has been maintained at this same level in all notifications since the Renewable Energy Law, it is appropriate and reasonable to use this value, and no other value could credibly be used.

Indeed, this latest notification clarified that all future projects in these regions would automatically be awarded this tariff upon approval of their FSR. The FSR was approved on 10 February 2010 and the tariff was therefore automatically fixed at the estimated level in line with the NDRC notification. Thus

[16] Using the exchange rate at the time of the publication (31 March 2009), www.x-rates.com.
[17] Fa Gai Jia Ge [2006] No. 7 (1 Jan 2006).
[18] Governor of NDRC at the International Summits for Alternative Energy and Power, 2007, see http://politics.people.com.cn/GB/5752740.html.
[19] http://www.chinalawedu.com/news/1200/22016/22034/22529/2006/3/wa00257132360020-0.htm
[20] http://jgs.ndrc.gov.cn/zcfg/t20080218_193011.htm
[21] http://jgs.ndrc.gov.cn/zcfg/t20080813_230722.htm
[22] http://www.sdpc.gov.cn/xwfb/t20090724_292578.htm
[23] Notification of electricity tariff for wind power projects issued by NDRC (Fa Gai Jia Ge [2009]1906), 20/07/2009.

the tariff was fixed at the estimated level of 0.61 RMB/kWh (incl. VAT) prior to the project start date, 18 May 2010, and is therefore correct.

According to the "Information note on the highest tariffs applied by the Executive Board in its decisions on registration of projects in the People's Republic of China (version 02)", published on 3 June 2011, the highest historical tariff in Liaoning is 0.61 RMB/kWh (incl. VAT). Therefore, the tariff used in the investment analysis is appropriate when taking the highest historical tariff into account.

Generation / load factor
The expected power generation of the proposed project is calculated by an independent qualified design institute with the highest grade (Grade A) in the FSR, based on wind assessment records for recent 30 years and detailed information on the equipment. Therefore, the generation and plant load factor determination are in line with both options of the EB Guidelines for the reporting and validation of plant load factors (EB 48 Annex 11): (a) provided to the government while applying the project activity for implementation approval, and (b) determined by a third party contracted by the project participants.

Operating costs
The O&M costs were estimated by an experienced design institute which has been awarded the highest certificate (grade A). The percentage of O&M costs relative to total investment cost are 2.4%, which is comparable to the percentage of previous wind projects in Liaoning, which ranges from 1.8%[24] to 4.4%[25].

Additionally, these costs are also compared with the values presented by one of the most important wind energy studies in the World, "Wind Energy – The Facts" implemented by a consortium led by the European Wind Energy Association (EWEA) and published in March 2009.[26] The O&M costs of proposed project is 0.119 RMB per kWh. According to the study, the O&M costs are generally estimated to be around 1.2 to 1.5 euro cents per kWh[27] (about 0.109 to 0.136 RMB/kWh[28]) of wind power produced over the total lifetime of a turbine. Therefore, it can be concluded that the estimated average annual O&M costs in the FSR are reasonable.

Residual value
The period of assessment reflects the full period of expected operation of the project activity. The fair value of the proposed project activity assets at the end of the assessment period has been included as a cash inflow in the final year and, as stated in the FSR, was calculated in accordance with local accounting regulations, by an experienced design institute. The estimated rate of residual value is 5%.

Taxes
Each of the tax rates used in the FSR is in accordance with Chinese law as indicated below.

a) Value Added Tax: According to the "Provisional Regulation of Value Added Tax in China" (Regulation No. 134 [1993], 13 Dec 1993) the VAT rate was 17%. The State Council "Provisional regulations of the People's Republic of China on Value Added Tax" (State Council No. 538 [2009], 5 Nov 2008) is the current regulation for VAT, confirming the VAT rate at 17%.

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[24] Project 3934 http://cdm.unfccc.int/Projects/DB/RWTUV1282475700.84/view

[25] Project 1965 http://cdm.unfccc.int/Projects/DB/DNV-CUK1217254016.83/view

[26] http://www.wind-energy-the-facts.org/en/home--about-the-project.html.

[27] Wind Energy – The Facts, Part III, The Economics of Wind Power, page 205, March 2009.

[28] Using the exchange rate at the time of the publication (31 March 2009), www.x-rates.com.

i) The Value Added Tax rate on electricity sales revenue in the FSR is 17%, the normal VAT rate in China. However, as a subsidy for wind projects, half the VAT amount is returned to the developer in accordance with the "Notice of the Ministry of Finance and the State Administration of Taxation about policies regarding the value added tax on comprehensive utilization of resources and other products" (Cai Shui [2008] 156, 9 Dec 2008).[29] Therefore, this policy is taken into account in the assessment.

ii) The Value Added Tax on the purchase of the equipment for energy projects can be recouped from the VAT on sales revenue in accordance with the "Notice about implementation of VAT reform in the whole country" issued by Ministry of Finance and State Administration of Taxation of People's Republic of China (Cai Shui [2008] 170, 19 Dec 2008).

b) Income Tax: According to People's Republic of China Enterprise Income Tax Provisional Regulations issued in March 2007, State Council No. 63, the income tax was approved as 25%[30].

c) Education Tax: According to the Interim Provision on Education Tax Law, the education rate is 3% of VAT[31].

d) City Building Tax: According to the National City Tax Law, the city building tax rate is 5% of VAT[32].

Comparison of the financial indicators

Table 8 shows the project IRR without and with CER revenue. It can be seen that IRR without CER revenue is below the benchmark 8% and with revenue from CDM at the assumed price level, the proposed project would be more financially attractive.

Table 8 Comparison of indicators

without CDM	Benchmark	with CDM
6.26%	8%	9.23%

The revenue from the sale of CERs is expected to have a significant impact on the IRR. Although some uncertainties still exist, investors would gain reasonable financial return to reduce the risk. And the internal return rates, 9.23% for total investment, would appear more financially attractive for prospective investors.

Sub-step 2d. Sensitivity analysis

A sensitivity analysis is used to show whether the conclusion regarding the economic or financial attractiveness is robust to reasonable variations in the critical assumptions. The investment analysis above provides a valid argument in favour of additionality as the sensitivity analysis consistently supports (for a realistic range of assumptions) the conclusion that the project activity is unlikely to be economically or financially attractive.

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[29] http://www.js-n-tax.gov.cn/Page1/StatuteDetail.aspx?StatuteID=8931, State Administration of Taxation, 50%-off discount on VAT for wind power projects.

[30] http://wenku.baidu.com/view/768043eae009581b6bd9ebcd.html.

[31] http://www.law-lib.com/law/law_view1.asp?id=99771.

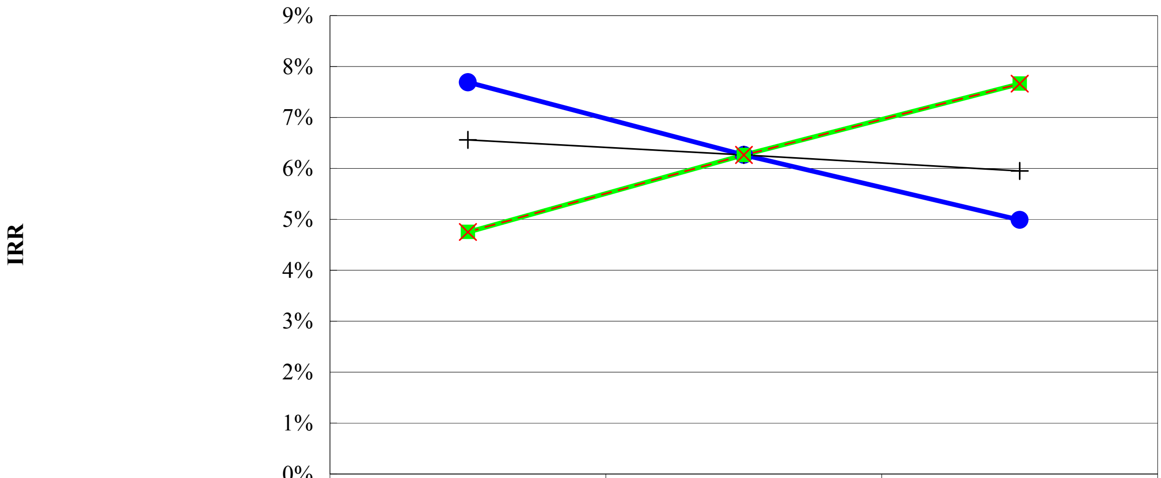
[32] http://202.108.90.130/chinatax/jibenfa/jibenfa0401.htm.

According to EB guidance, only variables that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variations. For the proposed project activity, the key variable analysed are:

1) Investment;
2) Generation / load factor;
3) On-Grid tariff;
4) Annual O&M cost

In line with EB guidance, the range of variations in the sensitivity analysis covers a range of between –10% and +10%, which is also in line with the regulations in China[33]. Greater variations are unlikely, as discussed below, and in line with the regulations are not considered. The result of the sensitivity analysis is presented below, showing that the benchmark is not reached.

Figure 4 Sensitivity analysis



	-10%	0%	10%
Investment costs	7.69%	6.26%	4.99%
O&M costs	6.56%	6.26%	5.95%
Tariff	4.75%	6.26%	7.66%
Generation / load factor	4.75%	6.26%	7.66%

Variation

Investment

For wind farm projects, the costs of turbines, engineering construction and related accessories comprise the main budget of static investment. As prices of turbines and other related equipment have been increasing in recent years, a decrease of the static investment is unlikely.[34] Therefore, it was not realistic

[33] "Codes on Compiling Feasibility Study Report of Wind Farms", issued by NDRC on 25/05/2005, prescribes the –10% to +10% variation range (http://www.windpower.org.cn/news/links/js_2005_0508.htm).

[34] http://energy.people.com.cn/GB/5720709.html. In the last 2 years, the demands for the turbines and its accessories exceeded the supply. Moreover the price of the raw material such as steel and cooper is increasing, which results in

for the developer to assume that investment costs could decrease by 12.0% in order to reach the benchmark.

Indeed, the starting date of the project is the date of the equipment contract and the construction contract was signed a few days later. Therefore, the final price was largely known at the start of the project, and proved to be slightly higher than that expected in the FSR. A reduction in the investment costs can therefore be ruled out as a credible possibility. The financial analysis in this document replicates the data from the FSR, being conservative.

Tariff

The expected on-grid tariff used for the financial analysis in the FSR refers to the most recent tariffs for wind farms in the same region, as available at the time of writing the FSR (February 2010). As shown in Table 7 above, the NDRC issued a tariff notification, in July 2009, which was therefore the latest tariff information available at the time of completing the FSR. The tariffs for wind projects in the region have been the same in all notifications since the Renewable Energy Law, see Table 7 above, and therefore it was reasonable to assume in the FSR that the tariff would eventually be fixed at this level.

Indeed, this latest notification[35] clarified that future projects in these regions would automatically be awarded this tariff upon approval of their FSR. As the starting date of the project is after the approval of the FSR, the tariff was fixed at the time of making the decision to go ahead with the project. Therefore, the tariff for the project activity was agreed and fixed at 0.61 RMB/kWh, the same as estimated in the FSR, prior to the project start date. Any variation from this original assumption, therefore, can not be considered credible, as the tariff has been fixed prior to the project start date.

The tariff would need to be 12.6% higher than the assumed level in the FSR, at 0.687 RMB/kWh (incl. VAT), for the project IRR to reach the benchmark. However, the tariff in the project region has been the same since the entry into force of the Renewable Energy Law and assuming an increase in the tariff is therefore not credible.

Also according to the “Information note on the highest tariffs applied by the Executive Board in its decisions on registration of projects in the People’s Republic of China (version 02)”, published on 3 June 2011, the highest historical tariff in Liaoning is 0.61 RMB/kWh (incl. VAT). Therefore, the tariff used in the investment analysis is appropriate when taking the highest historical tariff into account.

Generation / load factor

The expected power generation of the proposed project is calculated by an independent qualified design institute with the highest grade (Grade A) in the FSR. Therefore, the generation and plant load factor determination are in line with both options of the EB Guidelines for the reporting and validation of plant load factors (EB 48 Annex 11): (a) provided to the government while applying the project activity for implementation approval, and (b) determined by a third party contracted by the project participants.

The electricity report in the FSR is based on wind assessment records for recent 30 years and the output characteristics of the turbines, using a scientific approach applied internationally. The volume of annual

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the price of wind turbines and equipments increasing, as demonstrated in *The Development of Wind Power*, published by People’s Daily.

[35] Fa Gai Jia Ge [2009] No. 1906, 20 July 2009.

generation therefore is expected to accurately represent the long-term average power supply during the lifetime of the wind farm, taking into account yearly variations in power generation, and it is not credible to assume that generation would be significantly higher over the lifetime of the proposed project activity than that which can be expected from the long-term averages.

As per the FSR, the estimated net supplied power is calculated from the turbine availability, grid availability and the wind speed. The calculations for the proposed project are carried out using professional software designed for wind energy. The output is maximised through selection of the most suitable turbines, optimal turbine distribution in the wind farm, considering the specific turbine characteristics, and the grid connection. The method of anticipating power generation is also approved by the government and is widely used in China for wind energy.

Therefore, it is not credible to assume that generation from the proposed project would increase by more than 12.6% each year on average over the lifetime of the project in order the reach the benchmark 8%.

O&M costs
The O&M costs in the approved feasibility study were derived from the extensive experience of the design institute. Past trends show that costs have been rising: as prices, including those of the requirement equipment and commodities, have been increasing in recent years, a significant reduction in the level of costs is particularly unlikely.[36] As O&M costs would need to drop by 59.5% in order to reach the benchmark rate of 8%, this possibility can be ruled out.

Conclusion

The financial analysis shows that the project is not financially attractive, and the sensitivity analysis shows that without CER revenue IRR of the project will not reach the benchmark 8% for any reasonable variation in the main parameters.

In conclusion, the proposed project is not financially feasible without the revenue of CERs. Therefore, the analysis proceeds to step 4.

Step 3. Barrier analysis

Not applied.

Step 4. Common practice analysis

The proposed project activity is not a first-of-its kind project; therefore the above test is complemented with an analysis of the extent to which the proposed project type has already diffused in the relevant sector and region, acting as a credibility check to the analysis above. The existing common practice is identified and discussed through the following sub-steps:

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

In line with the EB guidance on the additionality tool, the common practice analysis is carried out on any

[36] *The Development of Wind Power*, People's Daily, http://energy.people.com.cn/GB/5720709.html, as above.

other activities that are operational and that are similar to the Proposed Project Activity. Projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of similar scale, and take place in a comparable environment with regards to regulatory framework, investment climate etc.

In China, the regulatory framework and investment climate for wind farm projects are only similar and comparable for projects connected to the same grid and located in the same Province. Most wind farm project proposals are approved by the provincial DRC, and the projects' EIAs by the provincial Environmental Protection Bureau. The common practice analysis of the proposed project activity, therefore, covers projects connected to NEPG and located in Liaoning Province.

In April 2002, China implemented power sector reform to establish a more commercialized power market in China[37]. Since market conditions for wind power project development changed significantly as a result of this sector reform, the common practice analysis excluded projects prior to 2002.

The analysis is restricted to large scale project (using the CDM definition of large scale: >15MW) as small scale projects are not comparable in size to the 49.5 MW installed by the proposed project activity.

The appropriate criteria to determine whether other activities are similar to the Proposed Project Activity are summarised in Table 9.

Table 9 Criteria for activities similar to the Proposed Project Activity

Scope	Criterion
Geography	Liaoning
Technology	Wind
Scale	Large-scale project (using the CDM definition of large scale, >15MW)
Regulatory framework	Liaoning, and connected to NEPG
Investment climate	Since the Power Sector Reform (2002)
Other	None

Other CDM projects activities (registered project activities and project activities which have been published on the UNFCCC website for global stakeholder consultation as part of the validation process) are not to be included in this analysis, according to the EB guidance on the additionality tool.

Using the statistics of wind power installed capacity in China as the data source[38], there can be no similar wind farms identified that have been commissioned or are under construction in Liaoning province.

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

Several wind farms are applying for, or have already received, CDM financing support. Many project

[37] Chinese National Development and Reform Commission, Separate Power Plants from Network and Compete in Price to Enter Network, April 11, 2002, http://www.ndrc.gov.cn/xwfb/t20050708_28096.htm.

[38] "Statistics of domestic wind farm installation capacity in 2007" and "Statistics of domestic wind farm installation capacity in 2008", Shi Pengfei; "Statistics of China wind farm installed capacity in 2009" http://www.cwea.org.cn/upload/201006102.pdf

developers have been encouraged by the positive experiences on the CDM registration of other projects, and are now taking the revenue from emission reductions into account in their decisions before construction and are applying for CDM registration.

All the wind farms in Liaoning have already successfully been registered or are applying as CDM projects in EB. Therefore, projects similar to the proposed project activity are not common practice in Liaoning Province.

In conclusion, all the steps above are satisfied, the proposed CDM project is not the baseline scenario, and the project activity is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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Project emissions

According to the methodology**,** for most renewable energy project activities, $PE_y = 0$. However, the methodology prescribes project emission calculations for geothermal, solar thermal and hydro power plant. As a wind power plant, therefore, there are no project emissions according to the methodology:

$PE_y = 0$

Baseline Emission Calculation

According to the methodology**,** the baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity, calculated as follows:

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

Where:
BE_y is Baseline emissions in year y (tCO_2/yr).
$EG_{PJ,y}$ is The 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).
$EF_{grid,CM,y}$ is 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).

Calculation of $EG_{PJ,y}$

As the proposed project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, the following applies:

$EG_{PJ,y} = EG_{facility,y}$

Where:

$EG_{PJ,y}$ is the 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).
$EG_{facility,y}$ is the quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/yr).

Baseline emission factor

The baseline emission factor (EF_y) is calculated as a combined margin ($EF_{grid,CM,y}$), consisting of the combination of operating margin ($EF_{grid,OM,y}$) and build margin ($EF_{grid,BMy,}$) factors according to the following seven steps defined in the "Tool to calculate the emission factor for an electricity system". Data for the calculations are based on official national statistics books: *China Energy Statistical Yearbook* and *China Electric Power Yearbook*, and are presented in Annex 3 of the PDD and the EF calculation spreadsheet.

Step 1. Identify the relevant electricity systems

The power generated from the proposed project activity will be supplied to the grid. As the DNA has published a delineation of the project electricity system and connected electricity systems, these delineations are used.

Following the DNA delineation, the project electricity system is the Northeast Power Grid (NEPG), consisting of three provincial grids: Jilin, Liaoning and Heilongjiang.

The connected electricity system is the North China Power Grid (NCPG), consisting of six provincial grids: Beijing, Tianjin, Hebei, Shanxi, Inner Mongolia and Shandong. However, as power is exported to the connected electricity system, NCPG is not included in the project boundary: electricity exports are not subtracted from electricity generation data used for calculating and monitoring the baseline emission rate.

For the purpose of determining the operating margin emission factor, use one of the following options to determine the CO_2 emission factor(s) for net electricity imports from a connected electricity system:

(a) 0 tCO_2/MWh, or
(b) The weighted average operating margin (OM) emission rate of the exporting grid, determined as described in Step 4 (d) below; or
(c) The simple operating margin emission rate of the exporting grid, determined as described in Step 4 (a), if the conditions for this method, as described in Step 3 below, apply to the exporting grid; or
(d) The simple adjusted operating margin emission rate of the exporting grid, determined as described in Step 4 (b) below.

For imports from connected electricity systems located in Annex-I country(ies), the emission factor is 0 tonnes CO_2 per MWh. However, there are no electricity imports from Annex I country(ies).

Electricity exports should not be subtracted from electricity generation data used for calculating and monitoring the electricity emission factors.

Following the calculations of the DNA, the weighted average operating margin (option (c)) is used to calculate the CO_2 emission factors for net electricity imports ($EF_{grid,import,y}$).

Step 2. 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 build margin emission factor:

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

Following the calculations of the DNA, and the statistical data available, Option I is chosen.

Step 3. Select a method to determine the operating margin (OM)

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

a) Simple OM;
b) Simple Adjusted OM;
c) Dispatch data analysis OM;
d) Average OM

According to the tool, the Simple OM method (a) is applicable to the project if the low-cost 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

Since generation from all sources (including hydro power) other than thermal plants were from 6% to 8% of total generation in the Northeast Power Grid in 2004-2008[39] and this percentage has not changed significantly in recent years, the Simple OM method is applicable to the proposed project.

The Simple OM emissions factor can be calculated using either ex-ante or ex-post data vintages. The project proponents have chosen to use the ex-ante option, and $EF_{grid,OM,y}$ is fixed for the duration of the first crediting period.

- 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. The three most recent years for which data is available are 2006-2008.

Step 4. Calculate the operating margin emission factor according to the selected method

(a) Simple OM

[39] see Annex 3.

The Simple Operating Margin emission factor $EF_{grid,OM,y}$ is defined as the generation-weighted average emissions per unit net electricity generation (tCO_2/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants. Two options can be selected to calculate the simple OM:

Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit; 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).

The criteria for Option B are met, as (a) the necessary data for Option A is not available as indicated in the calculations of the DNA, (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) Option I is chosen in Step 2.

Option B – Calculation based on total fuel consumption and electricity generation of the system

According to the Tool, where Option B is used, 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 total fuel consumption of the project electricity system, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{co_2,i,y}}{EG_y} \qquad (2)$$

Where
$EF_{grid,OMsimple,y}$ is the simple operating margin CO_2 emission factor in year *y* (tCO_2/MWh)
$FC_{i,y}$ 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 the net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ/mass or volume unit)
$EF_{CO2,i,y}$ is the CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/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, when using the ex-ante option, is the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation

On the basis of the data available, the three-year average operating margin emission factor is calculated by the DNA as a full-generation-weighted average of the emission factors[40]:

[40] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2552.pdf

$EF_{grid,OMsimlpe,y}$ = 1.1109 tCO_2/MWh

Step 5. Identify the group of power units to be included in the build margin

The sample group of power units *m* used to calculate the build margin consists of 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.[41] This option is chosen as it comprises larger annual generation than the five units built most recently. Following the deviation[42], the latest statistical data available (from the China Power Yearbook) is used by the DNA to determine the most recent year from which the added generation capacity is just exceeds 20% of the latest statistic year 2008. The added generation capacity is the sample group of power units *m* used to calculate the build margin.

In terms of vintage of data, project participants can choose between option 1 ex-ante, and option 2 ex-post data vintages. The project proponents have chosen to use the ex-ante option, and $EF_{grid,BM,y}$ is fixed for the duration of the first crediting period.

- *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.

Step 6. Calculate the 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:

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

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

[41] If 20% falls on part capacity of a unit, that unit is fully included in the calculation.
[42] Deviation for projects in China (DNV, 7 Oct 05), see http://cdm.unfccc.int/Projects/Deviations.

The CO_2 emission factor of each power unit *m* ($EF_{EL,m,y}$) should be determined as per the guidance in step 4 (a) for the simple OM, using options A1, A2 or A3, using for y the most recent historical year for which power generation data is available, and using for m the power units included in the build margin.

However, due to the limited availability of publicly available data, the DNA uses the accepted deviation mentioned in Step 5 to calculate $EF_{BM,y}$, as follows:

- The CO_2 emission factor used is the weighted average emission factor for thermal power plant calculated from the average net energy conversion efficiency of the best technologies commercially available in China for solid, liquid and gas fuels, using option A2, weighted on the basis of the emissions from each of these fuel types in the latest year for which data is available.
- The added generation capacity is taken instead of generation, as with the determination of the cohort of plant included in the build margin.

And the $EF_{grid,BM,y}$ of the Northeast Power Grid is 0.7086 tCO_2/MWh[43]. (See Annex 3 for more details)

Step 7. Calculation of the combined margin emission factor

The combined margin emission factor is calculated as follows:

$$EF_{grid,CM,y} = w_{OM} \bullet EF_{grid,OM,y} + w_{BM} \bullet EF_{grid,BM,y} \quad (4)$$

Where
$EF_{grid,BM,y}$ is the build margin CO_2 emission factor in year *y* (tCO_2/MWh)
$EF_{grid,OM,y}$ is the operating margin CO_2 emission factor in year *y* (tCO_2/MWh)
w_{OM} is the weighting of operating margin emissions factor (%)
w_{BM} is the weighting of build margin emissions factor (%).

The default weights are used, i.e. for the wind farm projects in the first crediting period and the subsequent crediting period, $w_{OM} = 0.75$ and $w_{BM} = 0.25$.

On the basis of these weights for the first crediting period, the combined margin emission factor is calculated (and rounded to the fourth digit), and fixed ex-ante:

$EF_{grid,CM,y} = 1.0103$ tCO_2/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 any renewal of the crediting period.

Table 10. Values obtained when calculating the baseline emission factor

Variable	Value
Operating Margin Emissions Factor ($EF_{grid,OM,y}$ in tCO_2/MWh)	1.1109
Build Margin Emissions Factor ($EF_{grid,BM,y}$ in tCO_2/MWh)	0.7086

[43] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2552.pdf

Baseline Emissions Factor ($EF_{grid,CM,y}$ in tCO_2/MWh)	1.0103

Baseline emissions (BE_y) now can be calculated as the combined margin CO_2 emission factor ($EF_{grid,CM,y}$) multiplied by the annual net generation of the proposed project ($EG_{PJ,y}$).

Leakage

According to the methodology, no leakage is considered for the proposed project.

Calculate Emission Reduction

The emission reduction ER_y by the project activity during a given year y is the difference between baseline emission (BE_y) and project emissions (PE_y), as follows:

$$ER_y = BE_y - PE_y \quad (5)$$

Where the baseline emissions (BE_y in tCO_2) are the product of the baseline emissions factor (EF_y in tCO_2/MWh) times the electricity supplied by the project activity to the grid ($EG_{PJ,y}$ in MWh). The calculation formula is as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y} = (EG_{export,,y} - EG_{import,y}) \times EF_{grid,CM,y} \quad (6)$$

With:
$EG_{export,y}$ is the quantity of annual electricity delivered to the grid by the proposed project (MWh);
$EG_{import,y}$ is the quantity of annual electricity purchased from the grid by the proposed project (MWh).

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

This section includes a compilation of information on the data and parameters that are not monitored throughout the crediting period but that are determined only once and thus remain fixed throughout the crediting period and that are available when validation is undertaken. Following EB guidance, data that is calculated with equations provided in the methodology or default values specified in the methodology are not included in the compilation.

Data / Parameter:	$FC_{i,y}$
Data unit:	Mass or volume
Description:	the amount of the fossil fuel *i* consumed in the project electricity system in year *y*
Source of data used:	China Energy Statistical Yearbook
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Based on official national statistics

Any comment:	

Data / Parameter:	$EG_{grid,y}$ and $EG_{m,y}$
Data unit:	MWh
Description:	Electricity supplied to power grid by included sources in year *y*
Source of data used:	China Electric Power Yearbook
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Based on official national statistics
Any comment:	

Data / Parameter:	NCV_i
Data unit:	GJ/mass or volume unit
Description:	Net caloric value of fossil fuel type i consumed in the project electricity system in year y
Source of data used:	China Energy Statistic Yearbook
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Based on official national statistics, accepted and used by the DNA for the official emission factor calculations
Any comment:	

Data / Parameter:	$EF_{CO2,i,y}$ and $EF_{CO2,m,y}$
Data unit:	tCO_2/GJ
Description:	CO_2 emission factor of fossil fuel type *i* in year *y*
Source of data used:	Taken from DNA of China, see http://qhs.ndrc.gov.cn/qjfzjz/t20090703_289357.htm.which uses the IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The IPCC default values at the lower level of 95% confidence interval are accepted and used by the DNA for the official emission factor calculations, and are the default value in the tool.
Any comment:	

Data / Parameter:	Efficiency of the best technology commercially
Data unit:	%
Description:	Best commercial available efficiency of coal, gas, oil fuel power plant
Source of data used:	http://qhs.ndrc.gov.cn/qjfzjz/t20090703_289357.htm.
Value applied:	Best efficiency for coal plant is 39.08%; Best efficiency for oil plant is 51.46% Best efficiency for gas plant is 51.46%
Justification of the choice of data or description of measurement methods and procedures actually applied :	Based on official national statistics, accepted and used by the DNA for the official emission factor calculations
Any comment:	

Data / Parameter:	Installed Capacity
Data unit:	MW
Description:	Installed capacity of the NEPG in year *y*
Source of data used:	China Electric Power Yearbook(2007,2008,2009,2010)
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Based on official national statistics
Any comment:	

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

>>

Based on the Feasible Study Report, the proposed project will generate 98,100 MWh electricity (net) annually and supply to the NEPG in operation period. The emission reduction ER_y by the project activity during a giving year y is calculated as follows (rounded to whole tonnes):

$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$ = 98,100 MWh × 1.0103 tCO_2/MWh = 99,110 tCO_2

$ER_y = BE_y - PE_y$ = 99,110 - 0 = 99,110 tCO_2

The ex-ante calculations are included in the ER calculation spreadsheet.

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

>>

Table 11 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)
2011	0	99,110	0	99,110
2012	0	99,110	0	99,110
2013	0	99,110	0	99,110
2014	0	99,110	0	99,110
2015	0	99,110	0	99,110
2016	0	99,110	0	99,110
2017	0	99,110	0	99,110
Total (tonnes of CO_2e)	0	693,770	0	693,770

*Note: * Using 12-monthly periods from the start of the crediting period*

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

>>

The following baseline and monitoring methodology is used:

- ACM0002 version 12.1.0 "Consolidated methodology for grid-connected electricity generation from renewable sources" (valid from 17 Sep 2010 onwards)

B.7.1 Data and parameters monitored:

All data collected as part of the monitoring are archived electronically and kept at least for 2 years after the end of the last crediting period. 100% of the data are monitored if not indicated otherwise in the tables below. All measurements are conducted with calibrated measurement equipment according to relevant industry standards.

Data / Parameter:	$EG_{facility,y}$
Data unit:	MWh
Description:	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y
Source of data to be used::	Calculated as export of electricity ($EG_{export,y}$) minus import of electricity ($EG_{import,y}$).
Value of data applied for the purpose of calculating expected emission reductions in section B.5	98,100 MWh/year once fully operational.
Description of measurement methods and procedures to be applied:	Continuous measurement and at least monthly recording

QA/QC procedures to be applied:	Cross check measurement results with records for sold electricity
Any comment:	

Data / Parameter:	***$EG_{export,y}$***
Data unit:	MWh
Description:	The quantity of annual electricity exported to the grid by the proposed project
Source of data to be used:	Electricity meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	98,100 MWh/year once fully operational.
Description of measurement methods and procedures to be applied:	Continuous measurement and at least monthly recording. Main meter and back-up meter are installed at Zhangdong substation. Any error resulting from the meter shall not exceed 0.5%. Designated person record the readings of the main meter each month. The meters are bidirectional, which can record the import and export electricity generation.
QA/QC procedures to be applied:	1. The export electricity supply to the grid is checked by measurement results with records for sold electricity. 2. When the main meter fails to work normally, the readings of the back-up meter will be adopted. 3. All data collected as part of monitoring should be archived electronically and be kept at least for 2 years after the end of the last crediting period. 4. The main meter will be calibrated once per year by a qualified calibration organization in accordance with industry standards.
Any comment:	

Data / Parameter:	***$EG_{import,y}$***
Data unit:	MWh
Description:	The quantity of annual electricity imported from the grid by the proposed project
Source of data to be used:	Electricity meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Supposed to be Zero
Description of measurement methods and procedures to be applied:	Continuous measurement and at least monthly recording. Main meter and back-up meter are installed at Zhangdong substation. Any error resulting from the meter shall not exceed 0.5%. Designated person record the readings of the main meter each month. The meters are bidirectional, which can record the import and export electricity

	generation.
QA/QC procedures to be applied:	1. The export electricity supply to the grid is checked by results with records for sold electricity. 2. When the main meter fails to work normally, the readings of the back-up meter will be adopted. 3. All data collected as part of monitoring should be archived electronically and be kept at least for 2 years after the end of the last crediting period. 4. The main meter will be calibrated once per year by a qualified calibration organization in accordance with industry standards.
Any comment:	

B.7.2. Description of the monitoring plan:

>>

Liaoning Zhangwu Pingandi Wind Farm Project adopts ACM0002 Version 12.1.0 “Consolidated methodology for grid-connected electricity generation from renewable sources” to determine the emission reductions from the net electricity generation from the wind farm. This plan describes in more detailed process.

I. Responsibility

The responsibility for monitoring lies with Fuxin Juyuan Wind Power Generation Co., Ltd., who operates the proposed project activity. The company will establish a CDM project management office and assign dedicated people responsible for the monitoring and reporting of the generation and emission reductions of the project activity.

II. Training

The project developer will train all related staff before the start of the crediting period. The training contains CDM knowledge, operational regulations, quality control (QC), data monitoring requirements and data management regulations, etc.

After training, the qualified monitoring staff will be allocated to do the monitoring work. The training plan, staff qualifications and relative training recorded will be archived by the wind farm.

III. Data and parameters to be monitored

The net electricity supplied by the proposed project activity to the grid ($EG_{facility,y}$) will be monitored through the main meter installed in the project on-site substation, recording exports to the grid ($EG_{export,y}$) and imports from the grid ($EG_{import,y}$). The net electricity supplied by the proposed project activity to the grid ($EG_{facility,,y}$) is the difference of exports to the grid and imports from the grid ($EG_{export,y}$ - $EG_{import,y}$). The electricity meters measure continuously and accumulatively. The data is recorded monthly. A back-up meter is also installed at the on-site substation. When the main meter fails to work normally, the readings of the back-up meter will be adopted.

IV. Installation of electricity meters

The net electricity supplied by the proposed project activity to the grid substation will be monitored

through the main meter installed in the project on-site substation, recording exports to the grid ($EG_{export,y}$) and imports from the grid ($EG_{import,y}$). Net electricity supplied to the grid by the project is calculated as exports minus imports ($EG_{export,y}$ - $EG_{import,y}$). The backup meters will also be installed at the project on-site substation. The metering equipments shall have sufficient accuracy so that any error resulting from such equipment shall not exceed 0.5%. The electricity meters monitor the flow continuously and are reported monthly.

The net supplied power monitored by these meters will suffice for the purpose of billing and emission reductions, as long as the error in the meters is within the agreed limits. The main meter used for billing will also be the primary meter used for emission reduction calculations.

V. Calibration

The metering equipments are calibrated and checked for accuracy in accordance with Chinese electric industry regulation DL/T 448-2000. The metering equipments shall have sufficient accuracy so that any error resulting from such equipment shall not exceed 0.5%. The net generation output registered by the meters alone will suffice for the purpose of billing and emission reduction verification as long as the error in the meters is within the agreed limits.

Both 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.

Calibration is carried out by the qualified entity, and these records will be maintained by the developer.

All the meters installed shall be tested by qualified entity after: the detection of a difference larger than the allowable error in the readings of both meters; the repair of all or part of 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 giving the other party sufficient notice to allow a representative to attend during any corrective activity.

Should any previous months reading of the main meter be inaccurate by more than the allowable error, or otherwise functioned improperly, the net generation output shall be determined by:
(a) first, by reading backup meter, unless a test by either party reveals it is inaccurate;
(b) if the backup system is not within acceptable limits of accuracy or operation is performed improperly Fuxin Juyuan Wind Power Generation Co., Ltd. and the Northeast Power Grid shall jointly prepare an reasonable and conservative estimate of the correct reading, and provide sufficient evidence that this estimation is reasonable and conservative when DOE undertakes verification; and
(c) if the Northeast Power Grid and Fuxin Juyuan Wind Power Generation Co., Ltd. fail to agree then the matter will be referred for arbitration according to agreed procedures.

VI. Quality control

Monthly net generation data will be approved and signed off by CDM manager before it is accepted and stored.

This audit will check compliance with operational procedures in this monitoring plan.

This internal audit will also identify potential improvements to procedures to improve monitoring and reporting in future years.

VII. Reporting

The Monitoring Report will describe the monitoring procedures and the approved and signed off metering data, corrected errors, and the emission reduction calculations.

With the Monitoring Report, the calibration records are presented for verification.

VIII. Data management system

Physical document such as paper-based maps, diagrams and environmental assessments will be collated in a central place, together with this monitoring plan. In order to facilitate auditors' reference of relevant literature relating to the Liaoning Zhangwu Pingandi Wind Farm Project, the project material and monitoring results will be indexed. All paper-based information will be stored by the technology department of Fuxin Juyuan Wind Power Generation Co., Ltd. and all the material will have a copy for backup.

And all data including calibration records is kept at least until 2 years after the end of the total crediting period of the CDM project.

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

>>

Date of completion of the baseline study and monitoring methodology: 18/07/2011.

Contact information of the entity and persons responsible:

- Carbon Resource Management S.A. prepared the PDD. CRM is one of the project participants.
- The persons preparing the documentation were:
  - Ms. Li Xia, Mr. Shi Xiangfeng, Ms. Yao Yanxia, lx@carbonresource.com, Tel: +86 10 8447 5246/8
  - Mr. Christiaan Vrolijk, cv@carbonresource.com, Tel: +44 7919 385 107.

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:

>>
18/05/2010

The starting date of a CDM project activity is the earliest of the date(s) on which the implementation or construction or real action of a project activity begins/has begun. The starting date of the proposed project activity is the date of the wind turbine and tower contract, as this is the earliest date as indicated in the timeline in Section B.5.

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

>>
20y-0m from commissioning

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

C.2.1. Renewable crediting period:

A renewable crediting period is chosen.

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

>>
15/08/2011

C.2.1.2. Length of the first crediting period:

>>
7y-0m

C.2.2. Fixed crediting period:

Not chosen

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:

>>

An Environmental Impact Assessment (EIA) for the proposed project activity has been completed by the Environmental Science Institute of Liaoning in January 2010, and was approved by the Environmental Protection Bureau of Liaoning Province in January 2010.

The main impacts identified in the EIA are summarised below.

Impacts during the construction period

- Waste water: Both domestic waste water and process waste water will be produced from the project site. The main pollutant in the process waste water is suspended solids (SS), which is not harmful to the surrounding environment; the process waste water can be used directly for site sprinkling. Domestic waste water will be treated through a septic tank and discharged into the surrounding grassland as gardening water, which will not cause negative impact to the local environment.
- Solid Wastes: The industrial wastes produced onsite are mainly waste soil and rock and construction wastes, which will be used for backfilling. Domestic solid wastes produced by onsite workers will be collected and be transferred to landfill for final treatment. Therefore, the negative impact is insignificant.
- Ecosystem: After the construction period, the Developer will re-plant the area in order to restore the ecosystem as quickly as possible. It is expected that the vegetation in the project site will have recovered in 1 to 3 years.
- Noise: The noise from construction machines has some impact on the immediately surrounding area. However, there are no residential areas within 500m to the project site. Therefore, the negative impact is insignificant.

Impacts during operational period

- Domestic waste water and solid wastes: The waste water produced will be treated through a septic tank, and discharged into the grassland surrounded. Onsite domestic garbage will be collected and transferred to a landfill for final treatment. Therefore, the negative impact is insignificant.
- Ecosystem: During normal daily operation, vehicles will be prohibited from driving on the grassland onsite. Daily maintenance and inspections in the wind farm will be carried out on foot to avoid any damage to the pasture land. The operating staff will monitor the condition of the grassland onsite and do vegetation recoveries work in time. On-site maintenance and inspection work shall be done in the daytime, and high noise levels will be avoided, so as to avoid normal activity of the animals in the area around the site. Therefore, the daily operation of the project will not make a significant impact on the living of the animals in the area.
- Noise: The wind turbines and power substation will generate noise during operation period. Sound insulation measures will be implemented to reduce the noise to an acceptable level. However, there is no residential area within 500m to the project site; therefore, the negative impact is insignificant.

Conclusion

Wind power is renewable energy and the impacts caused by wind farms on the surrounding ecosystem, water, noise, and atmosphere environment is insignificant.

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:

>>

Environmental impacts are not considered significant. The Environmental Protection Bureau of Liaoning Province has approved the EIA.

SECTION E. Stakeholders' comments

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

>>

In June 2010, staff from the Developer carried out a survey of the local villagers and residents near the area. Questionnaires were sent to 40 stakeholders and the survey had a 100% response rate. The result of the survey indicated the support to the project.

The questionnaire was designed to be understandable and easy to fill in for the local stakeholders. The questionnaire included a short summary of the proposed project activity, questions about the responding stakeholder and a number of specific questions and the opportunity for further comments.

E.2. Summary of the comments received:

>>

Stakeholders surveyed

Item	Content	Vote	Proportion
Gender	Male	29	72.5%
	Female	11	27.5%
Occupation	Farmers	26	65%
	Workers	1	2.5%
	Officers	10	25%
	Students	0	0%
	Teachers	3	7.5%
	Others	0	0%
Education	Elementary school	10	25%
	Junior high school	24	60%
	Senior high school	5	12.5%
	University or above	1	2.5%

Responses

1. Will the project affect your environment of living, studying and working?	Yes	No	Not Sure
	0	100%	0%
2. Do you think the project affect natural resources or ecosystems, such as water, habitats, etc?	Yes	No	Not Sure
	0	97.5%	2.5%
3. Do you worry about the project cause noise, vibration or release of electromagnetic radiation that could adversely affect your health?	Yes	No	Not Sure
	0	100%	0
4. Will the project help to reduce GHG emissions, comparing to conventional thermal power plant?	Yes	No	Not Sure
	100%	0	0
5. Do you think the proposed project will have a	Yes	No	Unclear

positive impact on local economic development?	97.5%	0	2.5%
6. Do you agree with the development of the Project?	Yes	No	No Concern
	100%	0	0
7. What is your suggestion about this project?	No negative feedback		

No further comments were given.

Conclusions from the survey

The survey shows that the proposed project has strong support among the local stakeholders. They all believe the proposed project will promote the local economic development and agree the project construction.

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

>>
The local stakeholders are supportive of the proposed project activity, and there have been no comments to be taken in account that could affect the project design.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding from Annex I used for the financing of the proposed project activity.

Annex 3

BASELINE INFORMATION

Step 1. Identify the relevant electric power systems

Following the DNA delineation, the project electricity system is the Northeast China Power Grid (NEPG), consisting of three provincial grids: Liaoning, Jilin and Heilongjiang.

Step 2. Choose whether to include off-grid power plants in the project electricity system (optional)

See B.6. Option I is chosen: only grid power plants are included in the calculation.

Step 3. Select an operating margin (OM) method

According to Tool to calculate the emission factor for an electricity system, the Simple OM method is applicable to the project if the low-cost resources constitute less than 50% of total grid generation on average in the five most recent years or based on long-term average hydroelectric production. The most recent year for which data is available in the yearbook is the year 2009. Table A1 presents the shares of generation from all sources including hydro power, other than thermal plants. The table shows that over the last five years average generation from these sources has been consistently 6%. The Simple OM method, therefore, is applicable to the proposed project as the share of low-cost/must-run generation is 6% in the most recent last 5 years.

Table A1 Power generation in the Northeast Power Grid from 2004 to 2008

Year	Low-cost/must-run generation 10^8kWh	Total generation 10^8kWh	Share
2004	118.23	1,830.90	6%
2005	159.72	1,929.63	8%
2006	120.24	2,112.38	6%
2007	127.40	2,313.00	6%
2008	139.60	2,404.00	6%
Total	665.19	10,589.91	6%
Average	131.40	2,046.48	6%

Source: China Power Year Book (2005/p474) (2006/p568) (2007/p638) (2008/p733)(2009/p695)

Note: Only nuclear/renewables are considered low-cost/must-run

Step 4. Calculate the operating margin emission factor according to the selected method

Option B – Calculation based on total fuel consumption and electricity generation of the system

Table A2 CO_2 emission factors of fuels

Fuel	Net Calorific Value		CO2 emission factor* (tCO2/TJ)
Solids			
Raw coal	20,908	kJ/kg	87.300
Clean coal	26,344	kJ/kg	87.300
Other washed coal	8,363	kJ/kg	87.300
Moulding coal	20,908	kJ/kg	87.300
Coke	28,435	kJ/kg	95.700
Other coking products	28,435	kJ/kg	95.700
Liquids			
Crude oil	41,816	kJ/kg	71.100
Gasoline	43,070	kJ/kg	67.500
Kerosene	43,070	kJ/kg	75.500
Diesel	42,652	kJ/kg	72.600
Fuel oil	41,816	kJ/kg	75.500
Other petroleum products	38,369	kJ/kg	75.500
Gases			
Natural gas	38,931	kJ/m3	54.300
Coke oven gas	16,726	kJ/m3	37.300
Other gas	5,227	kJ/m3	37.300
LPG	50,179	kJ/kg	61.600
Refinery gas	46,055	kJ/kg	48.200

Sources: LCV from China Energy Statistical Year Book 2008, p284; CO2 emission factor from the Chinese DNA (also 2006 IPCC Guidenlines for National Greenhouse Gas Inventories, Vol 2 (Energy), Chapter 1, Tables 1.3 and 1.4)
*Note: * Using IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories*

Fossil fuel consumption

Fuel consumption is taken from the latest China Energy Statistical Yearbook editions. The yearbooks present a range of more than 10 fuels for each province. Data is presented in Table A3 below. The share of emissions from coal consumption is also given in the table.

Table A3 Fuel use in thermal power production in NEPG in 2006-2008

Fuel	Unit	2006	2007	2008	Total
Raw coal	10^4 t	11,118.52	11,478.88	12,135.66	34,733.06
Clean coal	10^4 t	0.03	-	-	0.03
Other washed coal	10^4 t	788.57	871.18	920.51	2,580.26
Coke	10^4 t	3.32	4.99	5.77	14.08
Coke oven gas	10^8 m^3	4.28	8.86	10.72	23.86
Other gas	10^8 m^3	56.69	77.44	68.74	202.87
Crude oil	10^4 t	0.49	0.24	0.37	1.10
Gasoline	10^4 t	-	-	0.02	0.02
Diesel	10^4 t	1.44	1.82	2.28	5.54
Fuel oil	10^4 t	13.62	10.36	12.99	36.97
LPG	10^4 t	-	-	-	-
Refinery gas	10^4 t	12.82	9.32	11.31	33.45
Natural gas	10^8 m^3	2.29	2.05	2.24	6.58
Other petroleum products	10^4 t	-	0.01	-	0.01
Other coking products	10^4 t	-	0.46	-	0.46
Other E (standard coal)	10^4 tce	112.53	66.19	48.08	226.80

Sources: DNA; and China Power Year Book (2007, 2008, 2009)

Emissions from fossil fuel consumption

The emissions from this fuel use are calculated using the following formula, and are presented in Table A4:

CO_2 emissions = $\sum i\ (FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y})$

Table A4 Emissions from thermal generation in NEPG, 2006-2008

Fuel	2006	2007	2008	Total
Raw coal	202,942,832	209,520,369	221,508,367	633,971,569
Clean coal	690	-	-	690
Other washed coal	5,757,270	6,360,397	6,720,551	18,838,218
Coke	90,345	135,789	157,015	383,149
Coke oven gas	267,021	552,758	668,799	1,488,577
Other gas	1,105,268	1,509,825	1,340,204	3,955,298
Crude oil	14,568	7,135	11,001	32,704
Gasoline	-	-	581	581
Diesel	44,590	56,357	70,601	171,548
Fuel oil	429,998	327,076	410,108	1,167,183
LPG	-	-	-	-
Refinery gas	284,585	206,890	251,065	742,540
Natural gas	484,095	433,360	473,526	1,390,981
Other petroleum products	-	290	-	290
Other coking products	-	12,518	-	12,518
Other E (standard coal)	-	-	-	-
Total	211,421,263	219,122,765	231,611,818	662,155,845

Calculation of net generation from included sources

Gross generation for each province is presented in the yearbooks. The data is broken down into three categories: thermal, hydro and other sources. For the OM calculations, only thermal generation is included. In addition, the yearbooks present own consumption of plant from the three different generator categories. Gross generation and own consumption is used to calculate net generation from included sources. The calculations are presented in Table A5 below.

Table A5 Thermal generation, own consumption rate, and net supply in NEPG (2006-2008)

	2006		
Region	Gross generation (10^8 kWh)	Own use (%)	Net generation (10^8 kWh)
Liaoning	962.82	6.62	899.08
Jilin	385.76	6.78	359.61
Heilongjiang	629.64	7.85	580.21
NEPG			1,838.90
	2007		
	Gross generation (10^8 kWh)	Own use (%)	Net generation (10^8 kWh)
Liaoning	1065	7	990.45
Jilin	437	7.68	403.44
Heilongjiang	684	7.67	631.54
NEPG			2,025.43
	2008		
	Gross generation (10^8 kWh)	Own use (%)	Net generation (10^8 kWh)
Liaoning	1085	7.18	1,007.10
Jilin	464	7.76	427.99
Heilongjiang	715	7.53	661.16
NEPG			2,096.25

Source: DNA; and China Power Year Book (2007,2008,2009)

Operating Margin Emission Factor calculations

The Operating Margin Emissions Factor is now calculated from the data presented above using the formula below. The calculation is shown in Table A6.

$$EF_{grid,OMsimlpe,y} = \Sigma i\ (FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}) / EG_y$$

Table A6 Operating margin emission factor calculation

	2006	2007	2008	Total / 3-year average
CO2 emissions (tCO2)	211,421,263	219,122,765	231,611,818	662,155,845
Net generation (MWh)	183,890,005	202,542,560	209,625,110	596,057,675
EF_OM	1.1497	1.0819	1.1049	1.1109

Based on above data, the simple OM emission factor of NEPG is calculated ex-ante using a 3-year generation-weighed average is 1.1109 tCO_2e/MWh.

Step 5. Identify the group of power units to be included in the build margin

The sample group of power units *m* used to calculate the build margin consists of 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.[44] This option is chosen as it comprises larger annual generation than the five units built most recently. Following the deviation, the latest statistical data available (from the China Power Yearbook 2009) is used by the DNA to determine the most recent year from which the

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

added generation capacity is just exceeds 20% of the latest statistic year 2008. The added generation capacity is the sample group of power units *m* used to calculate the build margin.

Table A7 Identify the year from which the added generation capacity is equal to or just exceeds 20% of the latest statistic year 2008

Plant type	Added 2007-2008	Added 2006-2008	Share of additions
Thermal	4,126	14,292	88.7%
Hydro	90	138	0.9%
Nuclear	-	-	0.0%
Other	1,127	1,678	10.4%
Total	5,343	16,108	100%
Added by 2007	10.0%	30.2%	
Selected	No	Yes	

Source: China Power Year Book (2007, 2008, 2009).

Step 6. Calculate the build margin emission factor

Because of the limited availability of publicly available data, this proposed project uses a substitute method accepted by EB to calculate $EF_{BM,y}$

First, the CO_2 emission factor used is the weighted average emission factor for thermal power plant calculated from the average net energy conversion efficiency of the best technologies commercially available in China for solid, liquid and gas fuels, weighted on the basis of the emissions from each of these fuel types in the latest year for which data is available.

Table A8 CO_2 emissions of each main fuel in NEPG in Year 2008

Fuel type	Emissions (tCO2e)	Share λ
Solid	228,385,933	98.61%
Liquid	492,291	0.21%
Gas	2,733,594	1.18%
Total	231,611,818	100%

The fuel emission shares in the latest year are calculated from the emissions presented in Table A4 above.

Based the emission percentage (λ_i) of different kind fossil fuels and the corresponding emission factor (EF_i) according to the best technology commercially available in the China, the weighted emission factor of thermal power ($EF_{thermal}$) is calculated.

TableA9 Emission factor of the best technology commercially available in China, by fuel type

Plant type	Best efficiency η	CO2 emission factor* (tCO2/TJ)	EFi,Adv (tCO2e/MWh)
Coal/solid	39.08%	87.3	0.8042
Oil/liquid	51.46%	75.5	0.5282
Gas	51.46%	54.3	0.3799

Source: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2552.pdf
Note: * IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories

So, emission factor of thermal plant is calculated as the weighted average of these technologies:

Table A10 Weighted average emission factor of the best commercially available thermal power plant in NEPG

Plant type	EFi,Adv (tCO2e/MWh)	Share λ	EFthermal (tCO2e/MWh)
Coal/solid	0.8042	98.61%	0.7930
Oil/liquid	0.5282	0.21%	0.0011
Gas	0.3799	1.18%	0.0045
Thermal			0.7986

Secondly, using the emission factor for thermal plant (Table A10), and the shares of thermal plant in capacity additions (Table A7), the build margin emission factor is determined.

Table A11 Build margin emission factor, NEPG

Plant type	Added capacity (%)	EFi (tCO2e/MWh)	EFBM (tCO2e/MWh)
Thermal	88.73%	0.7986	0.7086
Hydro	0.86%	-	-
Nuclear	0.00%	-	-
Other	10.42%	-	-
Total	100.00%		0.7086

Step 7. Calculation of the combined margin emission factor

The combined margin emission factor is calculated using the weights as specified. The emission factor used is rounded to the fourth digit.

$$EF_{grid,CM,y} = w_{OM} \times EF_{grid,OM,y} + w_{BM} \times EF_{grid,BM,y} = 0.75\times 1.1109 + 0.25\times 0.7086 = 1.0103\ tCO_2/MWh$$

The baseline emissions factor ($EF_{grid,\ CM,y}$) is calculated as the weighted average of the operating margin emission factor and build margin emission factors. The default weights for this project type are w_{OM} = 0.75, w_{BM} = 0.25.

Table A12 Combined margin baseline emission factor calculation

	EF (tCO_2/MWh)	weight

OM	1.1109	75%
BM	0.7086	25%
Combined margin	1.0103	

Annex 4

MONITORING INFORMATION

No further information.

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