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:

Project Title: Huadian Inner Mongolia Tongliao Kailu Jieji Wind Farm Project
Version No: 02
Completion Date: 23/11/2011

A.2. Description of the project activity:

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The Huadian Inner Mongolia Tongliao Kailu Jieji Wind Farm Project (hereafter refers to the Project) is located in the Northeast of Yihe Tala Township of Xiao Jieji Town, Kailu County, Tongliao City, Inner Mongolia Autonomous Region, and invested and operated by Inner Mongolia Huadian Jieji Wind Power Generation Co., Ltd (hereafter refers to the Project Owner). It involves the installation of 33 turbines, each of which has a rated output of 1500kW, providing a total capacity of 49.5MW. The Project will supply 106,032 MWh electricity annually with the PLF of 24.45% to be connected into Northeast China Power Grid (NECPG).

The purpose of the Project is to supply clean energy by using renewable wind resources. It will help reduce GHG emissions generated from the high-growth and coal-dominated power generation from NECPG which is dominant of fossil fuel fired power plants. According to the Tool for the demonstration and assessment of additionality, the baseline scenario is identified to be the equivalent annual electricity supplied by the NECPG, which is the same as the situation prior to the implementation of the Project activity. The Project is estimated to deliver 107,124 tCO_2e emission reduction annually in the first crediting period, which will contribute to the alleviation of climate change.

Being as an environmentally sound energy supply technology, wind power is a priority development project in China. The contributions of the Project to sustainable development goal are summarized as follows:

- Supply electricity as a supplement to Inner Mongolia Autonomous Region, help to satisfy increasing demand for energy in local area;
- Help to diversify and improve power mix of NECPG;
- Contribute to promote local economic development;
- As being located in a power grid dominated by thermal power plants, development of the Project will not only reduce GHG emissions, mitigate local environmental pollution caused by air emissions from thermal power plants, but also reduce the dependence on exhaustible fossil fuels for power generation;
- Help to promote the development of wind power industry in Inner Mongolia Autonomous Region; and
- Create employment positions for local people during the construction and operation period.

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
P.R.China (host)	Inner Mongolia Huadian Jieji Wind Power Generation Co., Ltd	No
Sweden	Carbon Asset Management Sweden Pte Ltd	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

People's Republic of China

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

Inner Mongolia Autonomous Region

A.4.1.3. City/Town/Community etc:

Yihe Tala Township of Xiao Jieji Town, Kailu County, Tongliao City

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

The project site is located in Yihe Tala Township of Xiao Jieji Town, Kailu County, Tongliao City, Inner Mongolia Autonomous Region. The geographical coordinates of project is 121°23′37.86″～121°27′21.78″E and 43°54′23.58″～43°58′28.98″N. Figure 1~2 shows the location of the proposed project.

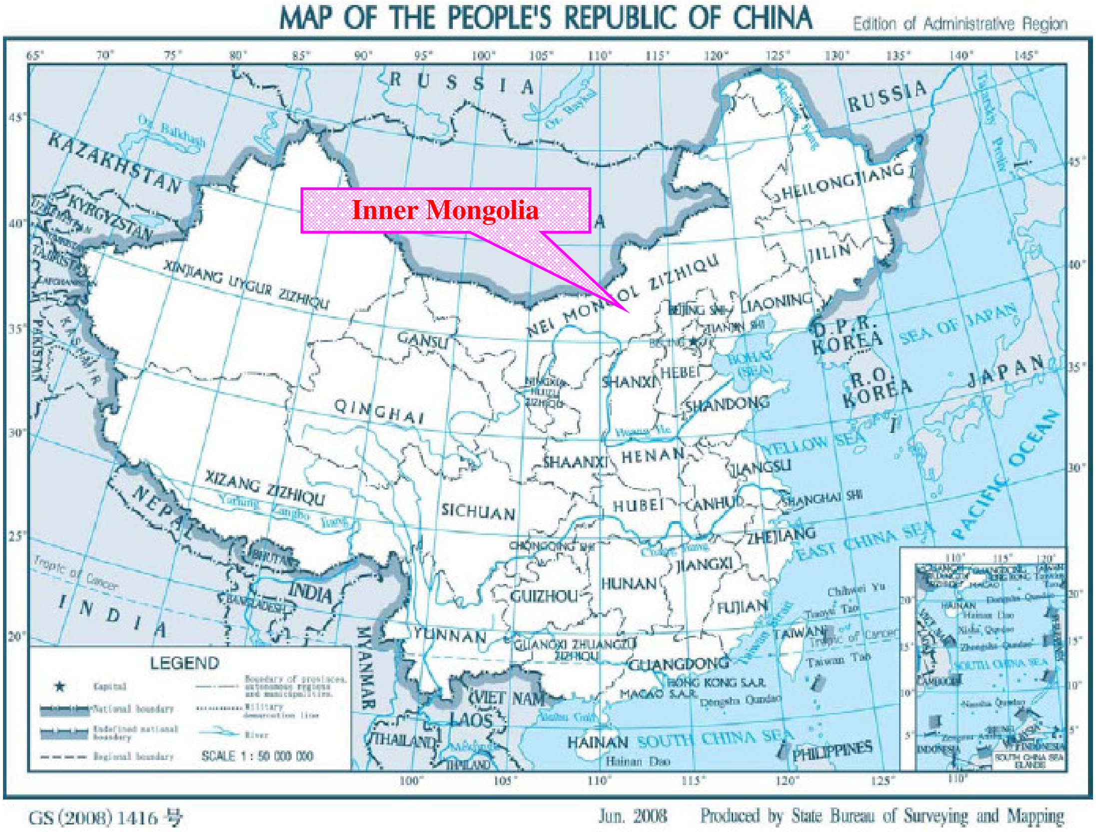

Figure 1 Map of location of Inner Mongolia Autonomous Region in China

Figure 2: Location of the Project site

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

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Category: Renewable electricity in grid connected applications
Sectoral Scope: 1 Energy industries

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

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The Project activity aims at generating clean electricity through renewable wind resources in Yihe Tala Township of Xiao Jieji Town, Kailu County, Tongliao City, Inner Mongolia Autonomous Region, P.R.China. Prior to the start of the implementation of the project activity, the equivalent annual electricity was supplied by the NECPG dominated by thermal power, which is the same as the baseline scenario identified in the Section B.

The Project activity involves installation of 33 wind turbines with each capacity of 1,500 kW and type of SL1500/82, totals up an installation capacity of 49.5 MW. The lifetime of wind turbines is 20 years[1]. The Project adopts a unit connection mode of one-turbine-one-transformer. Each turbine is equipped with a 35kV transformer. The PLF of the Project is 24.45%, and the annul electricity supply is 106,032MWh. Main technical parameters of the turbines are listed as Table 1 below.

Table 1. Main parameters of wind turbine employed by the Project[1]

No	Item	Unit	Value
	Turbine		
1	Rated capacity	kW	1,500
2	Number of blades		3
3	Rotor Diameter	m	82.9
4	Cut in speed	m/s	3
5	Nominal wind speed	m/s	10.5
6	Cut out speed	m/s	20
	Generator		
7	**Rated** capacity	kW	1,520
8	Rated voltage of generator	v	690

The electricity will be finally upgraded to 220kV by substation, then connected to NECPG. Electricity delivered to NECPG by the Project will be monitored by electricity meter(s) installed at the project activity site. The Project is to use the domestic equipment, and therefore won't involve in technology transfer.

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

A crediting period of 7 (seven) years (renewable twice) is selected for the project activity. The total emission reductions during the first crediting period are 107,124 tCO_2e during the first crediting period of the proposed project (from 01/01/2012 to 31/12/2018). The estimated amount of emission reductions over the chosen crediting period is summarized as follows:

Years	Annual estimation of emission reductions in tonnes of CO_2e
2012	107,124

[1] Approved FSR, and Contract of Turbine and Generator singed on 05/01/2010, which have been provided during onsite audit.

2013	107,124
2014	107,124
2015	107,124
2016	107,124
2017	107,124
2018	107,124
Total estimated reductions (tonnes of CO_2e)	749,868
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	107,124

A.4.5. Public funding of the project activity:

There is no public funding from Annex I parties for the proposed 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:

The following approved baseline and monitoring methodology is applied to the proposed project:

The approved consolidated baseline and monitoring methodology ACM0002 “Consolidated baseline methodology for grid-connected electricity generation from renewable sources” （Version 12.1.0, EB58）
Tool for the demonstration and assessment of additionality (Version 05.2, EB39)
Guidelines on the assessment of investment analysis （Version 03.1, EB51）
Tool to calculate the emission factor for an electricity system (Version 02.2.0)

For more information on these methodologies, please refer to:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved

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

The methodology ACM0002 (Version 12.1.0) is applicable to the Project since the Project is a grid-connected renewable power generation project activities that 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).

As the Project activity is to install a new wind power plant, it meets the condition under which the methodology ACM0002 (Version 12.1.0) is applicable:

Condition under which the methodology is applicable	Judgment
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.	Yes, the Project activity meets the condition since the Project activity is to install a new wind power plant.

Also, the Project is not in the condition under which the the methodology ACM0002 (Version 12.1.0) is not applicable:

Condition under which the methodology is not applicable	Judgment
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	No, the Project activity does not involve switching from fossil fuels to renewable energy at the site of the project activity.
Biomass fired power plants	N/A, the Project is a newly-built wind power project.
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	

Therefore approved consolidated baseline and monitoring methodology ACM0002 (Version 12.1.0) is applicable to the proposed project.

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

As per ACM0002 (version 12.1.0), 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. The electricity generated by the project will be delivered to NECPG, therefore, the spatial extent of the project boundary of the project covers the project site and all power plants connected to the NECPG. According to the guidance of China DNA[2] which provides the delineation of grid boundaries, NECPG is the grid boundary of the project. The greenhouse gases and emission sources included in or excluded from the project boundary are shown in Table 2 below.

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

Table2. Sources and gases in the project boundary

	Source	Gas	Included?	Justification / Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel power plants that are displaced due to the project activity.	CO_2	Yes	Main emission source.
		CH_4	No	Minor emission source. Excluded for conservative purpose.
		N_2O	No	Minor emission source. Excluded for conservative purpose.
Project Activity	For geothermal power plants, fugitive emissions of CH_4 and CO_2 from non-condensable gases contained in geothermal steam.	CO_2	No	Not applicable
		CH_4	No	Not applicable
		N_2O	No	Not applicable
	CO_2 emissions from combustion of fossil fuel for electricity generation in solar thermal power plants and geothermal power plants	CO_2	No	Not applicable
		CH_4	No	Not applicable
		N_2O	No	Not applicable
	For hydro power plants, emissions of CH_4 from the reservoir	CO_2	No	Not applicable
		CH_4	No	Not applicable
		N_2O	No	Not applicable

A flow diagram of the project boundary is shown as in **Figure 3** below:

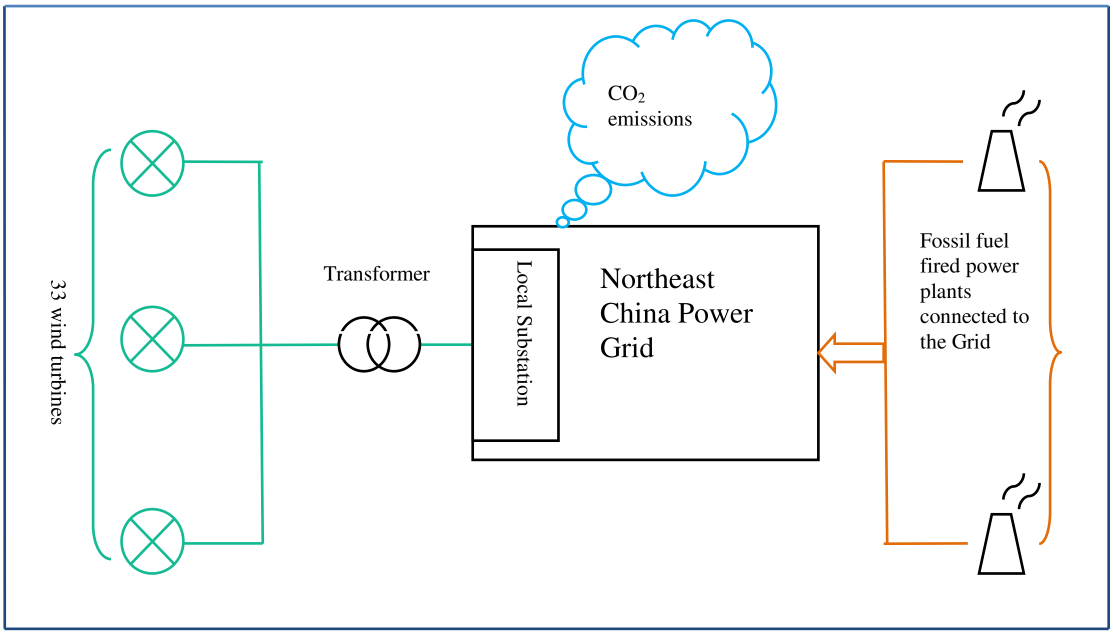

Figure 3 diagram of the Project Boundary

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

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As the project activity is the installation of a new grid-connected renewable power plant, and the electricity generated by the project will be connected to the NECPG. According to ACM0002 (version 12.1.0), the baseline scenario of the Project is identified as 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 in the Northeast China Power Grid, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system" (Version 02.2.0).

The basic parameters used for calculating baseline emissions of the project are provided in following:

Parameter	Unit	Value
EF_{OM}	tCO_2e/MWh	1.1109
EF_{BM}	tCO_2e/MWh	0.7086
EF_y	tCO_2e/MWh	1.0103

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

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

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Prior consideration of CDM and timeline

The project owner seriously considered CDM in the decision to proceed with the investment in the Project prior to the start of the Project activity. The benefits of the CDM were a decisive factor in the decision to proceed with the project activity. According to the Feasibility Study Report (FSR), the project IRR is lower than the benchmark of 8% (after tax), indicating that the project is financially unattractive. Being aware of the project is applicable to CDM, and the potential CDM revenue can overcome the financial barrier. Therefore, the project owner decided to implement the project in parallel with the CDM application. An overview of key events is given in Table 2.

Table 2 CDM relevant milestones of the project

Date	Key Events	Comment
05/2009	Feasibility Study Report (FSR) was completed	As indicated in the FSR, the project is financial unattractiveness, and CDM is considered as a main factor to make it financial feasible.
12/06/2009	The FSR was passed the evaluation of sectoral experts .	The Official Assessment Report given by the sectoral experts confirms that the project IRR of the project is below the benchmark 8% (after tax), thus less financially attractive, and suggests the project to apply CDM to make the project financial feasible.
09/07/2009	Approval of EIA	

15/07/2009	Board decision to develop the Project as a CDM project	Based on the FSR and Official Assessment Report by sectoral experts, the board finally decided to develop the project as CDM project.
29/12/2009	Approval of FSR	
05/01/2010	Board decision to start and speed up the CDM development after receiving the FSR approval	
05/01/2010	Contract of Turbine and Generator signed (the first contract related to the implementation or construction or real action of the Project activity begins)	The starting date of the Project activity
11/01/2010	Contract of Installation of Turbine and Generator signed	
12/01/2010	Contract of Construction signed	
14/01/2010	Construction Order	
21/01/2010	**Notification regarding to prior consideration of the CDM submitted to China's DNA**	The Notification was confirmed by China's DNA on 25/01/2010
22/01/2010	**Notification regarding to prior consideration of the CDM listed in UNFCCC website**	
23/06/2010	CDM Emission Reductions Purchase Agreement signed (ERPA)	
12/2010	The Project applying for LoA of China's DNA	
14/04/2011	The project attended the No. Eighty-fourth Assessment Meeting held by China's DNA	
13/06/2011	LoA of China's DNA issued	

According to "Tool for the demonstration and assessment of additionality" (Version 5.2) and "Guidelines on the assessment of investment analysis"（Version 4.0）, the additionality of the project is demonstrated and assessed through the following steps:

Step1. Identification of alternatives to the proposed 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 proposed project activity:

In absence of the proposed project, plausible and credible alternatives available to the proposed project that provide outputs or services comparable to the proposed CDM project activity include:

Alternative 1: The Project activity not undertaken as a CDM project activity;
Alternative 2: Construction of a thermal power plant with equivalent amount of annual power supply;
Alternative 3: Construction of other renewable energy power plant with equivalent amount of annual power supply;
Alternative 4: Equivalent annual electricity supplied by NECPG.

Besides wind energy, solar PV, geothermal, tide energy, biomass and hydro are the possible grid-connected renewable energy technologies that could be applied in NECPG. Due to the technology and investment barriers, solar PV and geothermal and tide energy are far from being economically attractive[3,4,5].Biomass power generation technology is still in the demonstration phase and can bring only poor economic benefits, which can not be operated without support from the national policies[6] . Only hydropower projects have the investment return rate that can compete over that of wind power projects. However, there is no hydro power resource to develop in the region of Inner Mongolia Autonomous Region[7]. Therefore, the hydro and other kinds of renewable energy power plants are also not realistic alternative. As a result, the alternative 3 is not a plausible and credible one to the proposed project.

Sub-step 1b. Enforcement of applicable laws and regulations:

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

The Chinese government encourages and promotes wind power development through a series of laws, regulations and preferential policies. Alternative 1) is in compliance with legal and regulatory requirements.

Alternative 2: Construct a thermal power plant with equivalent amount of annual power supply

For the average annual utilization hours of the fossil fuel plants are larger than that of the Project, the installed capacity of the fossil fuel-fired plants with equivalent annual power supply as the Project will be lower than 49.5MW. However according to *Notice on Strictly Prohibiting the Installation of Fuel-fired Generation with the Capacity of 135MW or below issued by the General Office of the State Council（decree no. 2002-6,）* coal-fired plants with a capacity of 135MW or less are prohibited from development in large grid such as provincial girds[8], and the fossil fuel-fired power units with less than 100MW capacity is strictly regulated for installations according to current regulations in China[9]. Consequently, alternative 2 is not a feasible alternative scenario to the proposed project.

Alternative 3: Construct other renewable energy power plant with equivalent amount of annual power supply.

The alternative is in compliance with legal and regulatory requirements; however, it is excluded from baseline scenario in sub-step 1a with reasonable explanation.

Alternative 4: Equivalent annual electricity supplied by NECPG

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[3] http://finance.qq.com/a/20070920/002031.htm

[4] Source: Page 5 of Overview of Chinese Renewable Energy Development 2006, by Energy Bureau of NDRC, CRED(Center for Renewable Energy Development) of NDRC and CREIA(Chinese Renewable Energy Industries Association)

[5] http://www.gxoa.gov.cn/NewsView.aspx?id=889

[6] http://www.nongji.com.cn/news/viewNews.action?newsId=27133

[7] http://web.cenet.org.cn/web/econscie/index.php3?file=detail.php3&nowdir=&id=97382&detail=1

[8]http://www.zjjmw.gov.cn/zcfg/gjfg/2002/10/10/9318.shtml

[9] Interim Rules on the Installation and Management of Small-scale Fuel-fired Generators issued in August 1997, as for more detailed information please refer to http://www.sdpc.gov.cn/zcfb/zcfbqt/2007qita/t20070131_115037.htm

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

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

Step 2. Investment analysis

The purpose of this step is to determine whether the Project activity is economically or financially less attractive than other alternatives without revenue from the sale of certified emission reductions (CERs). The investment analysis was conducted in the following steps:

Sub-step 2a. Determine appropriate analysis method

The three analysis methods suggested by tools for the demonstration and assessment of additionality （Ver.05.2） are simple cost analysis (option I), investment comparison analysis (option II) and benchmark analysis (option III). Since the proposed project will earn revenues from not only the CDM but also from electricity output, the simple cost analysis method (option I) is not appropriate. The investment comparison analysis method (Option II) is also not applicable because the alternative of the Project is "Equivalent annual electricity supplied by NECPG" rather than a new investment project. The Project will use benchmark analysis method (option III) based on total investment IRR to identify whether the financial indicators of the Project is better than the benchmark value.

Sub-step 2b. Apply benchmark analysis (Option III)
With reference to *Interim Rules on Economic Assessment of Electric Engineering Retrofit Projects*[10], the benchmark project IRR (after tax) of 8% is applied in Chinese power industry, which has been used widely for Feasibility Studies of the power projects investment, including the wind power project in China.

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

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

(1) Basic parameters for calculation of financial indicators

Based on the approved Feasibility Study Report of the Project, basic parameters for calculation of financial indicators are summarized as follows:

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

Table 3. The financial indicators for the proposed project

Indicator	Unit	Value	Data Source
Installed capacity	MW	49.5	FSR
Annual Electricity Supply	MWh	106,032	FSR
Total Static Investment	Million Yuan	470.24	FSR
	Yuan/kW	9499.8	
Average Annual O&M Cost	Million Yuan	9.81	FSR
	% of the total static investment	2	
Feed-in Tariff (including VAT)	RMB/kWh	0.54	FSR
Value Added Tax Rate	%	17 [11]	FSR
Income Tax	%	25	FSR
Education Tax	%	3	FSR
City Build Tax	%	5	FSR
Project Lifetime	year	21 (including 1-year period of construction)	FSR
Expected CERs Price	EURO/ t CO_2e	10.5	Prediction

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

In accordance with the benchmark analysis (Option III), the Project will be financially unattractive if the financial indicators of the Project (i.e. project IRR) are lower than the benchmark rate.

Table 4 below shows the fluctuating situation of project IRR, with and without CDM revenues. As shown from Table 3, the IRR is 6.69% in absence of CDM revenues, which is lower than the benchmark rate of 8%. And therefore the project is unattractive to the investor, as well as not applicable commercially. However, with the CDM revenue, project IRR is significantly improved and exceeds the benchmark rate.

Table 4. Financial indicators of the Project

	IRR

[11] According to the *Notice of problem of policy on increment value duty about comprehensive utilization of resources and other product* (Document No. [2008]156) issued by the Ministry of Finance and the National Tax Bureau, the wind power project enjoys a preferential policy of 50% VAT refund, namely 8.5% VAT.

	Benchmark rate =8%
Without CDM revenue	6.69%
With CDM revenue	9.87%

Sub-step 2d. Sensitivity analysis

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

Four financial parameters are identified as the main variable factors for sensitive analysis, including :

(1) total static investment;
(2) annual O&M cost;
(3) feed-in tariff; and
(4) annual electricity supply

Assuming the fluctuation range varies from -10%~ +10%, which is consistent with the approved FSR and is a reasonable range commonly used in FSR for sensitivity analysis of construction project in China, the project IRR varies (without CERs revenue) to different extents.

Detailed results of sensitive analysis of the four indicators are shown in Table 5 below.

Table 5. Sensibility analysis of financial indicator for the Project

(IRR without the CDM revenue)

	-10%	-5%	0%	5%	10%
Total Static investment	8.16%	7.39%	6.69%	6.03%	5.41%
Annual O&M costs	6.99%	6.84%	6.69%	6.54%	6.39%
Feed tariff	5.19%	5.96%	6.69%	7.39%	8.09%
Annual electricity supply	5.19%	5.96%	6.69%	7.39%	8.09%

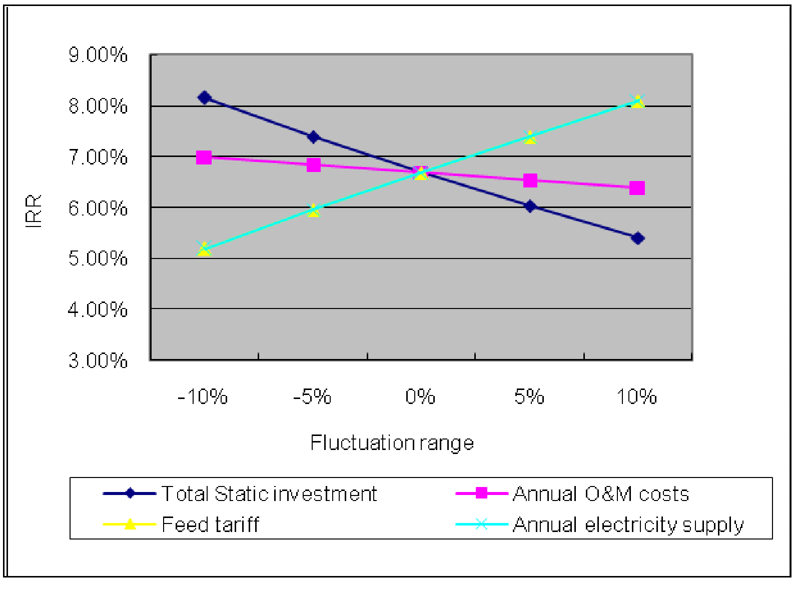

Figure 4. Sensibility analysis of financial indicator

The impact of feed-in tariff or annual electricity supply on IRR is most significant, following by total static investment. Table B6 below summarizes the variation of each financial parameter that can make the project IRR reach 8%.

Table 6 Variation of financial parameters to reach the benchmark of project IRR
(IRR without the CDM revenue)

	Variation
Total static investment	-8.99%
Annual O&M costs	-44.93%
Feed-in tariff	9.35%
Annual electricity output	9.35%

However, these variations do not reflect a realistic range of assumptions for the input parameters of the financial analysis.

1) Total static investment
The FSR was finalized by a qualified organization, then assessed by sectoral expert, and finally approved by Inner Mongolia Development and Reform Commission. Thus, the FSR provides reliable assessment on the investment of the Project. Moreover, for a wind farm project, the costs of the equipments and engineering construction comprise the majority of total static investment. As prices of turbines and other related equipments, and raw materials have been increasing in recent years[12,13], a decrease of the total static investment is unlikely occurred. As per the approved FSR, the total static investment of the project is estimated as 470.24 million RMB. Compared with that, according to contracts of equipments purchase and construction works[14], the real investment of main equipment and construction works is 474.06 million RMB, which is larger than the total static investment estimation. Therefore, the total static investment of the Project cannot decrease by 8.99%, which is unrealistic.

2) Annual O&M cost
As shown in Table 5 and Table 6 above, when the annual O&M cost varies from -10% to 10% the project IRR is still lower than the benchmark IRR, and if annual O&M cost is dropped by 44.93% the project IRR could reach benchmark. Compared with the other three parameters, the annual O&M cost has little effect on the impact of IRR, and can be regarded as an insensitive factor. In any case, it is not realistic to decrease annual O&M cost by 44.93%. Besides, considering that the costs of materials and commodities and the labour cost are keeping raising[15], therefore the annual O&M cost reduced is unlikely occurred. Thus, it is unlikely that O&M cost would decrease by as much as 44.93%.

3) Annual electricity output/PLF
The project IRR can reach the benchmark when the annual electricity output increases by 9.35%. As mentioned above, the annual electricity output of 106,032MWh, namely the PLF is 24.45%, applied in the PDD is taken from the approved FSR which was finalized in May 2009. The annual electricity

[12] 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 the price of wind turbines and equipments increasing, as demonstrated in *The Development of Wind Power*, published by People's Daily
[13] Http://www.newenergy.org.cn/html/01012/12131037681_1.html.

[14] Equipments purchase contracts and contracts on construction works have been provided to DOE during on-site audit.

[15] http://ccn.mofcom.gov.cn/swxw/show.php?eid=36260
http://www.chinanews.com/cj/2010/10-06/2569894.shtml
http://www.wefweb.com/news/20081124/1419416679_0.shtml

output/PLF was calculated based on the wind speed data of the local wind resources during the most recent 56 years from 1953~2008 provided by Kailu County meteorological station and latest wind speed data measured on site by the anemometer tower during December 2007 to December 2008, and by using professional WAsP software and WindFarmer in accordance with "Wind Resources Evaluation Method of Wind farms" (GB/T 18710-2002) which considers the turbine characteristics and turbines distribution optimization for maximizing power generation. The annual electricity output in the FSR represents a long-term average power supply throughout the lifetime of the Project estimated according to historical data, where the yearly-variations have already been taken into account. And, according to the historical data provide by local meteorological station, the annual average wind speed of the project site changed gently since 1970's and tends to be declined over the past 10 years[16]. Therefore, the electricity output of the Project would not change so much to make the project IRR reach 8%.

4) Feed-in tariff

The IRR of the Project will reach the benchmark when the expected tariff increases by 9.35%. However, as demonstrated below the feed-in tariff of the Project would not be significantly changed, i.e. increasing by 9.35%.

The tariff used in the investment analysis and PDD is taken from the FSR. The Project is located in eastern Inner Mongolia; therefore, the FSR refers to approved wind farm tariffs in eastern Inner Mongolia which were the most available and valid at the time of preparing FSR[17]. And, according to those tariff approvals, the tariff issued for wind power projects in eastern Inner Mongolia were maintained at 0.54Yuan/KWh (including VAT). On July 20, 2009, NDRC issued *Circular on the Establishment of Feed-in Tariffs for On-grid Wind Power Projects* (Document No.FGJG[2009]1906) on the national wind power tariff policy, which regulates that wind power projects will be applied the unified tariff based on wind resource area. For eastern Inner Mongolia, according to the Document, it belongs to Type II resource area and all wind power projects in this area including the Project shall apply the tariff of 0.54 RMB/kWh (including VAT). The tariff of the Project was approved at 0.54 RMB/kWh (including VAT) in accordance with the regulation of the *Document No.FGJG [2009]1906* by the government on 28/09/2010[18].

Therefore the tariff of 0.54 RMB/kWh (including VAT) applied in the FSR is consistent with the government guidance on tariff, and it is impossible to increase the tariff of the Project by 9.35%.

After above sensitive analysis, when financial indicators change within reasonable range, the proposed project is not financially feasible without CDM support. Therefore, alternative 1 is not a feasible alternative baseline scenario.

Step 3: Barrier analysis

The proposed project does not adopt barrier analysis.

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[16] the approved FSR

[17] Notification of electricity tariff for wind power projects (Fa Gai Jia Ge [2007]1260) issued by NDRC on 09 June 2007

Notification of electricity tariff for wind power projects, issued by NDRC, [2007] No.:3303, dated 3 December 2007

Notification of electricity tariff for wind power projects (Fa Gai Jia Ge [2008]1876) issued by NDRC on 23 June 2008

[18] Tariff approval for wind power projects in Tongliao City (Nei Fa Gai Jia Zi [2010]2173) issued by DRC of Inner Mongolia on 28/09/2010.

Step 4: Common practice analysis

Sub-step 4a: Analyse other activities similar to the proposed project activity
The Project is a newly built 49.5MW wind power project located in Inner Mongolia Autonomous Region. The geographical scope to select the similar project in the common practice analysis is limited to Inner Mongolia since the investment circumstance, regulations related and natural sources of each province in China are different. China is a big country, the policies and regulations in Chinese provinces are different. Common practice analysis is limited to the provincial level due to different investment environment for each province differs. For example, the electricity tariff for different area is much different under the control of National Development and Reform Commission and price index of industrial products is very different[19]. Also the difference of wind resources in different area is relatively large[20]; hence the selected geographical area for the project is Inner Mongolia.

In 2002, a reform on the electric power sector was approved by the State Council[21]. After 2002 the electricity generation and power grid operation are separated into two sectors, and private capital providers were allowed to invest in power plants. The investment climate was quite different compared to the situation before the reform. So wind power projects commissioned after 2002 are chosen to do common practice analysis.

Besides, the projects with installed capacity between 50% ~150% of the Project, namely 25~75MW are selected as similar projects.

Therefore, the wind power projects with installed capacity between 25~75MW and commissioned after 2002 in Inner Mongolia are selected to do common practice analysis, the registered CDM projects and projects under validation are not included according to EB's guidance. According to the public available information [22], following projects shown in Table 6 are identified as similar wind farm projects in Inner Mongolia which are commissioned after 2002, with capacity between 25~75MW, and neither registered as CDM projects nor under validation.

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[19] Data is from *National Bureau of Statistics of China*.

[20] http://www.showchina.org/zgdl/sylm/200701/t104908.htm

[21] http://www.chinapower.com.cn/article/1000/art1000014.asp

[22] Date source:

- *Static of Installed Capacity of Wind Farms in China 2007*, and *Static of Installed Capacity of Wind Farms in China 2009* by Mr. Shi Pengfei, Vice Chairman of Chinese Wind Association.

  http://www.cwea.org.cn/upload/20080324.pdf http://www.windpower-china.cn/node/1446

- UNFCCC: http://cdm.unfccc.int/Projects/projsearch.html
- NDRC China: http://cdm.ccchina.gov.cn/web/index.asp

Table 6 Similar scale wind farms located in Inner Mongolia

No.	Project Name	Type	Installed Capacity (MW)	Commissioning	Remark
1	Hexigten Qi Dali Wind Power Project (Phase III)	Goldwind	10.2	Mar. 2004	Demonstration Project Supported by national debt fund
		NEG Micon	21.0		
2	Honiton Energy Bailingmiao Phase One Wind Farm Project	Suzlon	50	Jan. 2008	Owned by a 100% foreign-owned company, and is a VER project under Gold Standard program with ID No.: GS449
3	Honiton Energy Bailingmiao Phase Two Wind farm Project	Suzlon	50	Nov. 2009	Owned by a 100% foreign-owned company, and is a VER project under Gold Standard program with ID No.: GS505
4	Honiton Energy Xiwu Phase One Wind Farm Project	Suzlon	50	Dec. 2009	Owned by a 100% foreign-owned company, and is a VER project under Gold Standard program with ID No.: GS620

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

Wind power projects constructed in Inner Mongolia Autonomous Region with a starting date of operation later than January 1, 2002 which were not developed as CDM projects with capacity between 25~75MW are analyzed as follows:

Hexigten Qi Dali Wind Farm Project (Phase III) is a demonstration project supported by Special Fund for Treasury Bond and received preferential national loan approved by the State Council [23]. But the Project did not get the financial support, thus Dali project with Special Fund for Treasury Bond and preferential national loan, it is more financially superior compared to the Project.

For Honiton Energy Bailingmiao Phase One Wind Farm Project, Honiton Energy Bailingmiao Phase Two Wind farm Project, and Honiton Energy Xiwu Phase One Wind Farm Project, they are all developed by Honiton Energy Limited which is a 100% foreign-owned company[24], thus cannot apply the CDM. However, due to facing the similar financial barriers, the three projects applied for the Gold Standard VER in order to obtain the additional revenues from selling GS VERs to solve the financial barriers. All the three projects meet the same additionality criteria for CDM projects, and have been registered as GS VER projects[25]. Compared with that, the Project has no such addition revenues from selling VERs, and facing financial unattractive problem.

Based on the above, there is distinct difference between the Project and similar projects as discussed above. Therefore, the project is not a common practice.

23 Http://www.chifeng.gov.cn/html/2008-11/3130.shtml
http://www.gd.xinhuanet.com/newscenter/ztbd/2007-10/18/content_11435955.htm

24 http://cn.reuters.com/article/CNEnvNews/idCNCHINA-1229520091201?sp=true

25 All the three projects with GS project ID as: 449, 505 and 602, please check following website:
https://gs1.apx.com/mymodule/ProjectDoc/EditProjectDoc.asp?id1=449
https://gs1.apx.com/mymodule/ProjectDoc/EditProjectDoc.asp?id1=505
https://gs1.apx.com/mymodule/ProjectDoc/EditProjectDoc.asp?id1=620

Moreover, other wind power projects in Inner Mongolia with compared capacity to Project and commissioned after 2002, due to face same financial barriers as the Project, apply for CDM, some have been registered as CDM , and others are under CDM development to seek additional revenues from CERs.

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

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

I. Project emissions (PE_y)

For most renewable power generation project activities, $PE = 0$. However, some project activities may involve project emissions that can be significant. These emissions shall be accounted for as project emissions by using the following equation:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y} \quad (1)$$

Where:

PE_y = Project emissions in year y (tCO_2e/yr).

$PE_{FF,y}$ = Project emissions from fossil fuel consumption in year y (tCO_2e/yr). The project does not involve fossil fuel consumption, so $PE_{FF,y} = 0$.

$PE_{GP,y}$ = Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year y (tCO_2e/yr). The project isn't a geothermal plant, so $PE_{GP,y} = 0$.

$PE_{HP,y}$ = Project emissions from water reservoirs of hydro power plants in year y (tCO_2e/yr). The project isn't a hydro power plants, so $PE_{HP,y} = 0$.

II. Baseline emissions

According to baseline methodology ACM0002 (Version 12.1.0), the baseline emissions are the CO_2 emissions from the equivalent electricity supply in NECPG that are displaced by the Project activity. So the baseline emissions by the Project activity during a given year *y* is obtained from the formula below. According to ACM0002, the baseline emission should be calculated as:

$$BE_y = EG_{PJ,y} \times EF_{grid.CM.y} \quad (2)$$

Where,

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

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

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system (Version 02.2.0)" (tCO_2/MWh)

Calculation of $EG_{PJ,y}$

As the Project 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, then, according to ACM0002 (Version 12.1.0), the $EG_{PJ,y}$ is calculated as:

$$EG_{PJ,y} = EG_{facility,y} \tag{3}$$

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

According to *Tool to calculate the emission factor for an electricity system.(Version 02.2.0)*, the baseline emission factor(EF_y)is calculated as a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) factors according to the following six steps. OM and BM are calculated by the method of ex-ante, which will be fixed during the first crediting period. Data for calculation are based on official national statistics books: China Energy Statistical Yearbook and China Electric Power Yearbook.

Step 1. Identify the relevant electricity system

In China, the delineation of the project electricity system and connected electricity system has been published by the Chinese DNA, which is clear defined. So the project electricity system and the connected electricity system delineated by Chinese DNA will be used. The electricity generated by the project is connected to the NECPG. Therefore, the relevant electric power system is the NECPG which consists of Liaoning, Jilin and Heilongjiang grids. And according to the guidance of China DNA, there is no electricity import from other electricity system involved in NECPG.

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.

The **Option Ⅰ** is selected to calculate the emission factor since all the power plants in the Northeast China Power Grid are gird- connected.

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

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

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

The simple OM method can only be used if low-cost/must-run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production. From 2004 to 2008, the ratio of low-cost/must-run resources in the total generation of the NECPG are 6.45%, 7.98%, 5.69%, 5.53% and 4.34% respectively, less than 50%. Therefore, the simple OM can be used for the project.

For simple OM, the emission factor can be calculated using either of the two following data vintages:

- *Ex ante* option: If the *ex ante* option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation. For off-grid power plants, use a single calendar year within the 5 most recent calendar years prior to the time of submission of the CDM-PDD for validation.
- *Ex post* option: If the *ex post* option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emission factor to be updated annually during monitoring. If the data required to calculate the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year (y-1) may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year (y-2) may be used. The same data vintage (y, y-1, y-2) should be used throughout all crediting periods.

The "ex-ante" will be employed for OM calculation of the project, without requirement to monitor and recalculate the emissions factor during the crediting period.

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

The method (a) simple OM is selected. The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost/must-run power/units. The simple OM may be calculated:

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

In China, the data of each power unit is not available. Therefore, option A cannot be used. And 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. Therefore, operation B will be used.

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

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_y} \qquad (3)$$

Where

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

$FC_{i,y}$ =Amount of fossil fuel type *i* consumed in the project electricity system in year y (mass or volume unit)

$NCV_{i,y}$ =Net calorific value (energy content) of fossil fuel type *i* in year y (GJ/mass or volume unit)

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

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

i =All fossil fuel types combusted in power sources in the project electricity system in year y

y =The relevant year as per the data vintage chosen in Step 3.

Electricity imports should be treated as one power plant *m*. There are no net electricity imports from a connected electricity system within the same host country,

According to "China's Regional Grid Baseline Emission Factors 2010" published by Chinese DNA, the operating margin emission factor ($EF_{grid,OM,y}$) of the NECPG is 1.1109tCO_2e/MWh. See details in Annex 3.

Step 5. Calculate the build margin emission factor

The Build Margin emission factor $EF_{BM,y}$ is calculated ex-ante based on the most recent information available on plants already built for sample group *m* at the time of PDD submission.

The sample group of power units m used to calculate the build margin should be determined as per the following procedure, consistent with the data vintage selected above:

(a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-units}}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-units}}$, in MWh);
(b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\%}$) and determine their annual electricity generation ($AEG_{SET\text{-}\geq 20\%}$, in MWh);
(c) From $SET_{5\text{-units}}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample});

It is very difficult to obtain the data of the five power units started to supply electricity to the grid most recently because these data are considered as confidential business matter in China. So, $SET_{\geq 20\%}$ is selected as SET_{sample}. Based on relevant data released by Chinese DNA, none of the power units in the selected SET_{sample} started to supply electricity to the grid more than 10 years ago. Hence the selected SET_{sample} is used to calculate the build margin.

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:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (4)$$

Where

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

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

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

m =Power units included in the build margin

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

In China, EB accepts the following deviation in methodology application:

1) The group of power plants to be considered for the determination the BM emission factor can't be selected as no plant specific generation data are available. Instead, the capacity addition from one year to another is used as basis for determining the build margin, i.e. the capacity addition over 1 - 3 years, whichever results in a capacity addition that is closest to 20% of total installed capacity.
2) Use proportional weights that correlate to the distribution of installed capacity in place during the selected period above, using plant efficiencies and emission factors of commercially available best practice technology in terms of efficiency. It is suggested to use the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy.

Since there is no way to separate the different generation technology capacities as coal, oil or gas etc from thermal power based on the present statistical data, the following calculating measures will be taken:

- First, according to the energy statistical data of most recent one year, determine the ratio of CO_2 emissions produced by solid, liquid, and gas fuels consumption for power generation;
- Second, multiply this ratio by the respective emission factors based on commercially available best practice technology in terms of efficiency;
- Finally, this emission factor for thermal power is multiplied with the ratio of thermal power identified within the approximation for the latest 20% installed capacity addition to the grid. The result is the BM emission factor of the grid.

Sub-step 1: Calculate the proportion of CO_2 emissions related to consumption of coal, oil and gas fuel used for power generation as compared to total CO_2 emissions from the total fossil fuelled electricity generation (sum of CO_2 emissions from coal, oil and gas).

$$\lambda_{Coal,y} = \frac{\sum_{i \in COAL, j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (5)$$

$$\lambda_{Oil,y} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (6)$$

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

Where,

$FC_{i,j,y}$ = Amount of fuel type *i* consumed by province *j* in year *y*.

$NCV_{i,y}$ = Net calorific value (energy content) of fuel type *i* in year *y* (GJ/mass or volume unit).

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

Coal, Oil and *Gas* is solid, liquid and gas fuels respectively.

Sub-step 2: Calculate the operating margin emission factor of fossil fuel-fired generation:

$$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y} \qquad (8)$$

Where,

$EF_{Coal,Adv,y}, EF_{Oil,Adv,y}, EF_{Gas,Adv,y}$ are the emission factors for coal-fired, oil-fired and gas-fired generation technology according to commercially available best practice technology in terms of efficiency.

A coal-fired power plant with a total installed capacity of 600MW is assumed to be the commercially available best practice technology in terms of efficiency, the estimated coal consumption of such a National Sub-critical Power Station with a capacity of 600MW is 314.35gce/kWh, which corresponds to an efficiency of 39.08% for electricity generation.

For gas and oil power plants a 200 MW combined cycle power plant with a specific fuel consumption of 238.74gce/kWh, which corresponds to an efficiency of 51.46% for electricity generation, is selected as commercially available best practice technology in terms of efficiency[26].

Sub-step 3: Calculate the Building Margin emission factor

$$EF_{grid,BM,y} = \frac{CAP_{Thermal,y}}{CAP_{Total,y}} \times EF_{Thermal} \qquad (9)$$

Where,

$CAP_{Total,y}$ is the total capacity addition and $CAP_{Thermal,y}$ is the total thermal (coal, oil and gas) power capacity addition.

According to "China's Regional Grid Baseline Emission Factors 2010" published by Chinese DNA, the build margin emission factor ($EF_{grid,BM,y}$) of the NECPG is 0.7086tCO_2e/MWh. See details in Annex 3.

When calculating OM and BM, the installed capacity, power generation and the rate of internal electricity consumption of thermal power plants are sourced from *China Electric Power Yearbo*ok

[26]China's Regional Grid Baseline Emission Factors 2010 published by the Chinese DNA, 20/12/2010

2007-2009. The fuel consumption and the net caloric value of thermal power plants are sourced from *China Energy Statistical Yearbook 2007-2009.* The carbon emission factors of each fuel are sourced from *2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energ,.*

Step 6. Calculate the combined margin emission factor

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

(a) Weighted average CM; or
(b) Simplified CM.

The weighted average CM method (option A) should be used as the preferred option.

Using weighted average CM, the combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = w_{OM} \times EF_{grid,OM,y} + w_{BM} \times EF_{grid,BM,y} \tag{10}$$

Where:

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

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

w_{OM} =Weighting of operating margin emissions factor (%)

w_{BM} =Weighting of build margin emissions factor (%)

According to the "China's Regional Grid Baseline Emission Factors 2009" *published* by Chinese DNA, the Operating Margin Emission Factor ($EF_{grid,OM,y}$) of the Northeast China Power Grid is 1.1109tCO_2e/MWh and the Build Margin Emission Factor ($EF_{grid,BM,y}$) is 0.7086tCO_2e/MWh. The defaults weights value for wind power projects are used as specified in the "Tool to calculate the emission factor for an electricity system" (Version 02.2.0) ($w_{OM} = 0.75$; $w_{BM} = 0.25$). Therefore, the Combined Baseline Emission Factor of the NECPG corresponds to 1.0103tCO_2e/MWh.

III. Project leakage (LE_y)

According to ACM0002 (Version 12.1.0), no leakage emissions are considered, i.e. LE_y =0 tCO_2e.

IV. Emission reductions (ER_y)

The project activity will generate GHG emission reductions by avoiding CO_2 emissions from electricity generation by fossil fuel power plants of NECPG. The emission reduction (ER_y) is calculated as follows:

$$ER_y = BE_y - PE_y \tag{11}$$

Where:

ER_y = Emission reductions in year *y* (tCO_2e/yr)

PE_y =Project emissions in year *y* (tCO_2e/yr). For the project, $PE_y = 0$.

BE_y =Baseline emissions in year *y* (tCO_2e/yr), calculated as:

$$BE_y = EG_{facility,y} \times EF_{grid,CM,y} \quad (12)$$

Where:

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

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

Therefore, the emission reductions of this project can be calculated as:

$$ER_y = BE_y = EG_{facility,y} \times EF_{grid,CM.y} \quad (13)$$

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

Data / Parameter:	NCV_i
Data unit:	TJ per mass or volume unit of fuel i
Description:	The net calorific value (energy content) per mass or volume unit of a fuel i
Source of data used:	China Energy Statistical Yearbook 2009
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official data
Any comment:	

Data / Parameter:	$FC_{i,y}$
Data unit:	t or m^3
Description:	Amount of fossil fuel type i consumed in the project electricity system (NECPG) in year y
Source of data used:	China Energy Statistical Yearbook 2007-2009
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official data
Any comment:	--

Data / Parameter:	$EF_{CO_2,i,y}$
Data unit:	$t CO_2/GJ$
Description:	CO_2 emission factor of fossil fuel i in year y
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	See Annex 3 for details.
Justification of the	IPCC world-wide default values are adopted.

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

Data / Parameter:	Electricity Generation
Data unit:	MWh/year
Description:	The total power generation and power generated by low-cost/must run power plants within NECPG in year 2007~2009
Source of data used:	China Electric Power Yearbook,2006-2008
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official data
Any comment:	--

Data / Parameter:	Electricity self-consumption ratio
Data unit:	%
Description:	The auxiliary electricity consumption rate of the power plants in NECPG
Source of data used:	China Electric Power Yearbook,2007-2009
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official data
Any comment:	--

Data / Parameter:	$\eta_{best,i}$
Data unit:	%
Description:	The efficiency of best technology commercially available for coal-, gas- and oil-fired power in China.
Source of data used:	The bulletin of China Regional Grid Emission Factor 2010 issued by China DNA on 20/12/2010.
Value applied:	The efficiency of best technology commercially available for coal is 39.08%, for gas is 51.69%; and for oil is 51.46%.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official data

Data / Parameter:	Installed capacity

Data unit:	MW
Description:	Installed capacity of power plant category i in NECPG from 2005 to 2007
Source of data used:	China Electricity Yearbook 2007~2009
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official data

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

I. Estimated project emissions

The proposed project is a wind power plant that the project emissions should not be taken into account according to ACM0002 (Version 12.1.0), i.e. PE_y =0 tCO_2e

II. Estimated baseline emissions

According to the Feasibility Study Report (FSR), the annual electricity supply is estimated to be 106,032 MWh. The baseline emission factor is 1.0103 tCO_2e/ MWh and the annual baseline emission of the project is 107,124 tCO_2e as calculated below.

$$BE_y = EG_y \times EF_y = 106{,}032 \times 1.0103 = 107{,}124 \ tCO_{2e}/yr$$

III. Calculate the project leakag

According to ACM0002 (Version12.1.0), the Project needn't consider leakages, i.e. L_y =0 tCO_2e.

IV. Calculate the emission reductions

The project activity will generate GHG emission reductions by avoiding CO_2 emissions from electricity generation by fossil fuel power plants. The emission reduction (ER_y) is calculated as follows:

$$ER_y = BE_y - PE_y - LE_y = 107{,}124 - 0 - 0 = 107{,}124 \ tCO_2e$$

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

Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
2012	0	107,124	0	107,124
2013	0	107,124	0	107,124
2014	0	107,124	0	107,124
2015	0	107,124	0	107,124
2016	0	107,124	0	107,124
2017	0	107,124	0	107,124

2018	0	107,124	0	107,124
Total (tonnes of CO_2e)	0	749,868	0	749,868

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

B.7.1. Data and parameters monitored:

Data / Parameter:	$EG_{out,\ y}$
Data unit:	MWh
Description:	Electricity supplied to NECPG by the Project in year y.
Source of data to be used:	Project activity site
Value of data applied for the purpose of calculating expected emission reductions in section B.5	106,032
Description of measurement methods and procedures to be applied:	The data will be continuously measured by bidirectional electricity meter(s) and recorded monthly. The data will be kept during the crediting period and two years after.
QA/QC procedures to be applied:	The accuracy of the electricity meter is 0.5s or above. Sales receipts will be used for double check to ensure the consistency. The meter will be calibrated according to the industry standard by a qualified organization to ensure accuracy.
Any comment:	

Data / Parameter:	$EG_{im,\ y}$
Data unit:	MWh
Description:	Electricity imports from NECPG by the Project for operation in year y.
Source of data to be used:	Project activity site
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	The data will be continuously measured by electricity meter(s) and recorded monthly. The data will be kept during the crediting period and two years after.
QA/QC procedures to be applied:	The accuracy of the electricity meter is 0.5s or above. Sales receipts will be used for double check to ensure the consistency. The meter will be calibrated according to the industry standard by a qualified organization to ensure accuracy.
Any comment:	

Data / Parameter:	$EG_{facility,y}$
Data unit:	MWh
Description:	Net electricity supplied to the NECPG by the Project in year *y*.
Source of data to be used:	Project activity site , the data will be calculated based on the data of $EG_{out,y}$ and $EG_{im,y}$
Value of data applied for the purpose of	106,032

calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	$EG_{facility,y}=EG_{out,y}-EG_{im,y}$ The data ($EG_{out,y}$ and $EG_{im,y}$) will be continuously measured and monthly recorded. The data will be archived and kept at least for two years after the end of the last crediting period.
QA/QC procedures to be applied:	$EG_{facility,y}$ is calculated based on $EG_{out,y}$ and $EG_{im,y}$, the calculation result will be checked through internal audit. $EG_{out,y}$ and $EG_{im,y}$ will be double checked by Sales receipts.
Any comment:	

B.7.2. Description of the monitoring plan:

The project owner is the user of this monitoring plan and will be responsible for it. For the purpose of the integrated, continuous, transparent and accurate monitoring of the Project and the precise calculation of emission reductions during the crediting period, based on the monitoring methodology and the actual conditions of the Project, the monitoring plan is designed as follow:

1. Data to be monitored

As emission factor of the Project is determined ex-ante, the main data to be monitored includes electricity supplied to NECPG by the Project ($EG_{out,\ y}$) and the electricity imports from NECPG by the Project ($EG_{im,\ y}$). The net electricity supply of the Project is calculated as the difference between $EG_{out,\ y}$ and $EG_{im,\ y}$, namely, $EG_{facility,y} = EG_{out,\ y} - EG_{im,\ y}$, which will be used in the emission reduction calculation.

2. Operational and management structure for monitoring

The monitoring of the emission reductions will be carried out according to Figure 4 below.

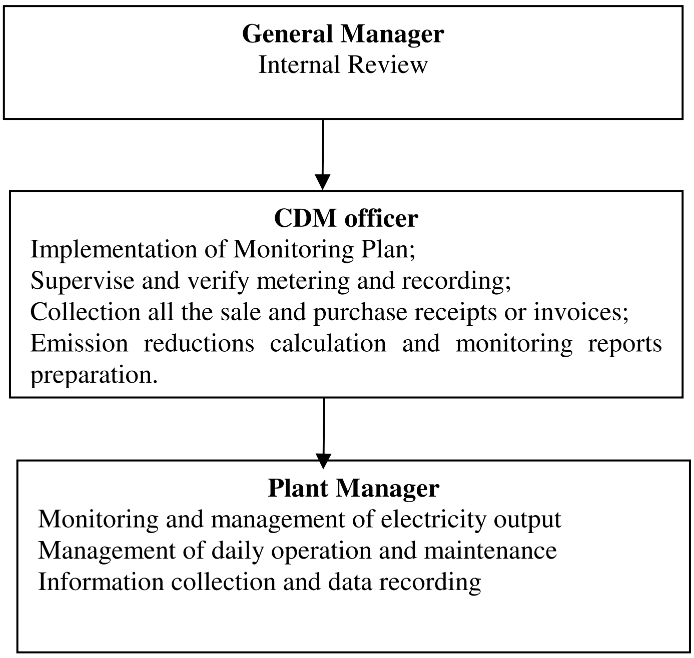

Figure 4. The personnel structure of the project monitoring

Plant manager of wind farm is responsible to record and collect the information and data required by the Monitoring Plan. The required information and data will be documented and sent to the CDM officer monthly. The CDM officer works out the monitoring plan, charges of its implementation and reports to the General Manager of the company. The General Manager of the company will make the confirmations on monitoring calculation data and reports.

The project owner will entrust the professional engineers and experts to train all the relative staffs before operation of generators. The training contains CDM knowledge, operational regulations, quality control (QC) standard flow, data monitoring requirements and data management regulations etc.

3. Monitoring apparatus and installation:

The electricity exports ($EG_{out,\,y}$) to and imports ($EG_{im,\,y}$) from the grid by the Project will be continuously monitored through electricity meter(s) installed at the project activity site. The electricity meter(s) has bidirectional function that can continuously measured the electricity exports ($EG_{out,\,y}$) to and imports ($EG_{im,\,y}$) from the grid, and precision of 0.5s or above. The electricity meter(s) will be installed in accordance with Technology & Management Regulations for Power Metering Devices, the accuracy of the electricity meter must meet the national standard. Electricity data can be cross-checked against relevant electricity sale receipts and/or records from the grid.

In case other wind farms will share the same meter(s) with the Project in the future, an agreement with the Grid Company, the project owner of the Project and project owner of other wind farms shall be signed. Calculation/monitoring method of electricity amount accounting shall be clearly identified in this agreement.

4. Data monitoring

The monitoring steps are as follows:

(1) Each month, the project owner will read and record the electricity data measured by the electricity meter and report o the Grid Company.

(2) The Grid Company provides the project owner with the monthly electricity supply data and electricity import record;

(3) The project owner provides the Grid Company with sales receipts according to the data provided by the Grid Company and preserves the copies of the sales receipts.

(4) The project owner provides DOE with readings record of meters and copies of sales receipts.

The principle of the processes is to guarantee that the DOE obtains the actual and precise data of net generated electricity.

5. Quality Assurance and Quality Control

The calibration of meter conducted by qualified organization must comply with national standard and sectoral regulations to ensure the accuracy. The calibration records must be archived together with other monitoring records.

If any previous months reading of the electricity meter are inaccurate by more than the allowable error, or otherwise functioned improperly, the net energy output shall be determined by:

(a) the Project Owner and the Grid Company shall jointly prepare an estimate of the correct reading;
(b) if the Grid Company and the Project Owner fail to agree then the matter will be referred for arbitration according to agreed procedures.

If any emergency occurred, after handling of the emergency the project owner must prepare a report regarding the emergency to explain to DOE that the handling method is reasonable.

6. Data Management System
All monitoring data and records will be archived in electronic document and paper document. The project owners will also keep copies of sales receipts and prepare a monitoring report at the time of verification, which includes the net electricity generation, the calibration records, the emission reductions calculation and meters' corrective action records.

All the electronic and paper documents will be archived during the crediting period and two years after.

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

The completion of the baseline methodology is 23/11/2011
The entity completing the application of the baseline and monitoring methodology is:

Carbon Asset Management Sweden Pte Ltd
Email: sunny.lin@tricorona.se
Tel: +86-10-65305930

Carbon Asset Management Sweden Pte Ltd is the project participant.

SECTION C. Duration of the project activity / Crediting period

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

05/01/2010

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

20 years.

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

C.2.1. Renewable crediting period

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

01/01/2012

C.2.1.2. Length of the first crediting period:

7 years 0 months

C.2.2. Fixed crediting period:

n/a

C.2.2.1. Starting date:

n/a

C.2.2.2. Length:

n/a

SECTION D. Environmental impacts

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

According to China Environmental Protection Law, the Environmental Impact Assessment (EIA) must be completed before the development and construction of the proposed project. Thus, the project owner authorized a third party to carry out the EIA report. The EIA report was approved by the Environmental Protection Bureau of Inner Mongolia Autonomous Region on 09/07/2009, indicating that the project meets all the national environmental protection regulations. The analysis and measures to be taken to mitigate the impacts are demonstrated in the following:

Dust and Air Quality
The air impact during the construction period mainly comes from flying dust produced by excavating land and transportation vehicles, and some exhaust discharge from using and moving construction machinery. The project owner will take the effective prevention measures, such as timely sprinkler suppression dust, stamping sacking on the construction site, and other construction work surfaces. All these measures can be effective in reducing the impact on the environment. The construction of projects is small-scale, relatively simple and has a short construction period, the excavation, transport dust will also spend a shorter time, the short-term construction period, and a temporary, partial impact on the region's air quality does not have a greater influence.

Waste water and sewage
The waste water and sewage from daily office work of employees is negligible, all the wastewater and sewage will be firstly processed by using sedimentation pond and septic tank, then applied to the farmland. No waste water or sewage will be discarded.

Noise
The noise pollution mainly comes from transportation and the construction equipment during construction period and aerodynamic interaction between the wind and turbine blades during operation period. Since the Project site is far away from residential area, the noise control can meet the national standard. Thus impacts on surrounding environment are not significant.

Solid Waste
The amount of soil backfilled is equal to the soil excavated, thus soil erosion will not occur. Therefore, during construction period, solid waste is mainly from the life sludge of workers in construction. Garbage will be transported to the nearby garbage dump properly. The solid waste of wind farm operation period is mainly the living garbage of operation and maintenance personnel and management staff. The waste will be transported to the garbage dump for treatment after being collected.

Radiation of electromagnetism
Impact of radiation of electromagnetism arising from substation equipment can meet the limitation of the national standard, and is considered insignificant. Also, it is unlikely bring negative impacts on residents’ health because of the distant between wind farm and residential area.

Conclusion
Wind Farm building can alleviate the pollution of the surrounding environment from the construction of coal-fired power plant, have the role of use of renewable energy, conservation of

fossil energy, reducing pollution, protecting the ecological environment. Therefore, from the view of environmental protection, the project is practicable.

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

According to the results of EIA and the approval issued by the Environmental Protection Bureau of Inner Mongolia Autonomous Region, the impacts on the environment are not significant.

SECTION E. Stakeholders' comments

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

To invite the comments of local stakeholders on the project activity, a survey was conducted in February, 2011 by the project owner. The surveyed stakeholders are from local villages around the Project site, with different age, gender, education level and occupation (see Table 6 below). 40 questionnaires were distributed, and all of them were recovered with 100% recovery rate.

The main questions contained in the questionnaire include:
- Background information of the interviewee.
- Do you satisfy your current living situation and environment?
- Do you know wind farm?
- Do you think whether the project is important?
- Do you support the construction of the project?
- Do you think whether project site selection is reasonable?
- What do you think the major impacts on environment caused by the project activity?
- How do you think the impacts on ecological environment caused by the project construction?
- Do you think which positive impacts the project will bring to your daily life? Air pollution reduction, revenue increasing, employment position increasing, improving standard of living, and etc.
- Do you think the project will bring negative impacts on your daily life?
- What the impacts on local economic development from the project activity?
- What are your other comments and suggestions?

Table 6 Statistic information of the stakeholders participating in the survey

Item	Sub-item	Number	Percentage
Gender	Male	39	97.5%
	Female	1	2.5%
Age	18~35	8	20.0%
	36~55	29	72.5%
	> 55	3	7.5%
Education level	Elementary school	5	12.5%
	Junior high school	22	55.0%
	Senior high school	8	20.0%
	University or above	5	12.5%
Occupation	Farmers	34	85.0%
	Officials	5	12.5%
	Worker	1	2.5%

E.2. Summary of the comments received:

The results of the survey are summarized as follows.

Do you satisfy your current living situation and environment?	Yes	No	
	40	-	
	100%	0%	
Do you know wind farm?	Yes, very much	Yes	No

	39	1	-		
	97.5%	2.5%	0%		
Do you think whether the project is important?	Very important	Important	Don't know	Not important	
	-	38	2	-	
	0%	95%	5%	0%	
Do you support the construction of the project?	Support	Oppose	Don't care		
	40	-	-		
	100%	0%	0%		
Do you think whether project site selection is reasonable?	Reasonable	Don't care	Unreasonable		
	40	-	-		
	100%	0%	0%		
What do you think the major impacts on environment caused by the project activity?	Air pollution	Water pollution	Noise	No significant impact	
	-	-	-	40	
	0%	0%	0%	100%	
How do you think the impacts on ecological environment caused by the project construction?	Improvement	No impact	Destroy		
	37	3	-		
	92.5%	7.5%	0%		
Do you think which positive impacts the project will bring to your daily life? Air pollution reduction, revenue increasing, employment position increasing, improving standard of living, and etc.	Reduce air pollution	Increase income	Increase job opportunity	Improve standard of living	Others
	1	38	33	33	-
	2.5%	95%	82.5%	82.5%	0%
Do you think the project will bring negative impacts on your daily life?	Yes	No negative impact	Don't know		
	-	40	-		
	0%	100%	0%		
What the impacts on local economic development from the project activity?	Stimulate local economic development	No significant impact	Don't care		
	40	-	-		
	100%	0%	0%		
What are your other comments and suggestions?	None				

Conclusion

The survey shows that the Project receives strong support from local people. The consensus is that the Project can bring many positive impacts to the local economy and livelihoods of local people with increased job opportunities, increased income and stimulated economy. No other comments and suggestions were received.

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

Both the local resident and government gave strong support to the construction of the Project. According to comments from the stakeholders, it is not necessary to adjust the design, construction or operation of the proposed project.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Represented by:	
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Salutation:	Mr.
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Represented by:	/
Title:	Managing Director
Salutation:	Mr.
Last Name:	Oo
Middle Name:	/
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding from Annex I parties for the proposed project.

Annex 3

BASELINE INFORMATION

Table 1 Fuel consumption and emission of the Northeast China Power Grid in 2006

Fuel type	Unit	Liaoning	Jilin	Heilongjiang	Subtotal	Emission factor	Average low caloric value	CO_2 emission（tCO_2e）
						($kgCO_2/TJ$)	（MJ/t,km3）	I=D×G×H/100000（quality）
		A	B	C	D=A+B+C	G	H	I=D×G×H/10000 (volume)
Raw coal	10^4 t	4681.99	2738.24	3698.29	**11118.52**	87,300	20,908	202,942,832
Clean coal	10^4 t	0.03			**0.03**	87,300	26,344	690
Other washed coal	10^4 t	674.74	17.83	96	**788.57**	87,300	8,363	5,757,270
Moulded coal	10^4 t				**0**	87,300	20,908	0
Coke	10^4 t	3.32			**3.32**	95,700	28,435	90,345
Coke gas	10^8 m^3	2.68	0.16	1.44	**4.28**	37,300	16,726	267,021
Other coal gas	10^8 m^3	55.26	1.43		**56.69**	37,300	5,227	1,105,268
Crude oil	10^4 t	0.49			**0.49**	71,100	41,816	14,568
Gasoline	10^4 t				**0**	67,500	43,070	0
Diesel oil	10^4 t	0.75	0.39	0.3	**1.44**	72,600	42,652	44,590
Fuel oil	10^4 t	11.73	0.45	1.44	**13.62**	75,500	41,816	429,998
LPG	10^4 t				**0**	61,600	50,179	0
Refinery gas	10^4 t	8.55		4.27	**12.82**	48,200	46,055	284,585
Natural gas	10^8 m^3		0.19	2.1	**2.29**	54,300	38,931	484,095
Other petroleum product	10^4 t				**0**	72,200	41,816	0
Other coke product	10^4 t				**0**	95,700	28,435	0
Other energy	10^4 tce	12.16	17.6	82.77	**112.53**	0	0	0
							Total	211,421,263

Data sources: China Energy Statistic Yearbook 2007

Table 2 Fuel consumption and emission of Northeast China Power Grid in 2007

Fuel type	Unit	Liaoning	Jilin	Heilongjiang	Subtotal	Emission factor	Average low caloric value	CO_2 emission（tCO_2e）
						($kgCO_2$/TJ)	（MJ/t,km3）	I=D×G×H/100000（quality）
		A	B	C	D=A+B+C	G	H	I=D×G×H/10000 (volume)
Raw coal	10^4 t	4869.32	2873.45	3736.11	**11478.88**	87,300	20,908	209,520,369
Clean coal	10^4 t				**0**	87,300	26,344	0
Other washed coal	10^4 t	747.85	16.52	106.81	**871.18**	87,300	8,363	6,360,397
Moulded coal	10^4 t				**0**	87,300	20,908	0
Coke	10^4 t	4.99			**4.99**	95,700	28,435	135,789
Coke gas	10^8 m^3	5.53	1.44	1.89	**8.86**	37,300	16,726	552,758
Other coal gas	10^8 m^3	68.38	9.06		**77.44**	37,300	5,227	1,509,825
Crude oil	10^4 t	0.24			**0.24**	71,100	41,816	7,135
Gasoline	10^4 t				**0**	67,500	43,070	0
Diesel oil	10^4 t	0.96	0.39	0.47	**1.82**	72,600	42,652	56,357
Fuel oil	10^4 t	8.43	0.45	1.48	**10.36**	75,500	41,816	327,076
LPG	10^4 t				**0**	61,600	50,179	0
Refinery gas	10^4 t	7.33		1.99	**9.32**	48,200	46,055	206,890
Natural gas	10^8 m^3		0.02	2.03	**2.05**	54,300	38,931	433,360
Other petroleum product	10^4 t	0.01			**0.01**	72,200	41,816	302
Other coke product	10^4 t	0.46			**0.46**	95,700	28,435	12,518
Other energy	10^4 tce	12.41	2.43	51.35	**66.19**	0	0	0
							Total	219,122,778

Data sources: China Energy Statistics Yearbook 2008

Table 3 Fuel consumption and emission of Northeast China Power Grid in 2008

Fuel type	Unit	Liaoning	Jilin	Heilongjiang	Subtotal	Emission factor	Average low caloric value	CO_2 emission（tCO_2e）
						($kgCO_2$/TJ)	（MJ/t,km3）	I=D×G×H/100000（quality）
		A	B	C	D=A+B+C	G	H	I=D×G×H/10000 (volume)
Raw coal	10^4 t	4973.05	3289.16	3873.45	**12135.66**	87,300	20,908	221,508,367
Clean coal	10^4 t				**0**	87,300	26,344	0
Other washed coal	10^4 t	791.96	15.58	112.97	**920.51**	87,300	8,363	6,720,551
Moulded coal	10^4 t				**0**	87,300	20,908	0
Coke	10^4 t	5.77			**5.77**	95,700	28,435	157,015
Coke gas	10^8 m^3	4.12	1.06	5.54	**10.72**	37,300	16,726	668,799
Other coal gas	10^8 m^3	61.11	7.63		**68.74**	37,300	5,227	1,340,204
Crude oil	10^4 t	0.37			**0.37**	71,100	41,816	11,001
Gasoline	10^4 t	0.02			**0.02**	67,500	43,070	581
Diesel oil	10^4 t	0.84	1.07	0.37	**2.28**	72,600	42,652	70,601
Fuel oil	10^4 t	10.64	1.06	1.29	**12.99**	75,500	41,816	410,108
LPG	10^4 t				**0**	61,600	50,179	0
Refinery gas	10^4 t	7.54		3.77	**11.31**	48,200	46,055	251,065
Natural gas	10^8 m^3		0.39	1.85	**2.24**	54,300	38,931	473,526
Other petroleum product	10^4 t				**0**	72,200	41,816	0
Other coke product	10^4 t				**0**	95,700	28,435	0
Other energy	10^4 tce	16.9	3.04	68.19	**88.13**	0	0	0
							Total	231,611,818

Data sources: China Energy Statistics Yearbook 2009

Table 4 The fossil fuel-fired electricity generation of Northeast China Power Grid in 2006

Province	Electricity generation （10^8kWh）	Electricity generation(MWh)	Auxiliary Power Ratio (%)	Electricity supply(MWh)
Liaoning	962.82	96,282,000	6.62	89,908,132
Jilin	385.76	38,576,000	6.78	35,960,547
Heilongjiang	629.64	62,964,000	7.85	58,021,326
Total				183,890,005

Data sources: China Electric Power Yearbook 2007

Table 5The fossil fuel-fired electricity generation of Northeast China Power Grid in 2007

Province	Electricity generation （10^8kWh）	Electricity generation(MWh)	Auxiliary Power Ratio (%)	Electricity supply(MWh)
Liaoning	1065	106,500,000	7	99,045,000
Jilin	437	43,700,000	7.68	40,343,840
Heilongjiang	684	68,400,000	7.67	63,153,720
Total				202,542,560

Data sources: China Electric Power Yearbook 2008

Table 6 The fossil fuel-fired electricity generation of Northeast China Power Grid in 2008

Province	Electricity generation （10^8kWh）	Electricity generation(MWh)	Auxiliary Power Ratio (%)	Electricity supply(MWh)
Liaoning	1085	108,500,000	7.18	100,709,700
Jilin	464	46,400,000	7.76	42,799,360
Heilongjiang	715	71,500,000	7.53	66,116,050
Total				209,625,110

Data sources: China Electric Power Yearbook 2008

Table 7 The Simple OM calculation

Year	2006	2007	2008
CO_2 emission (tCO_2e)	211,421,263	219,122,778	231,611,818
Electricity supply（MWh）	183,890,005	202,542,560	209,625,110
OM	(211,421,263+219,122,778+231,611,818) / (183,890,005+202,542,560+209,625,110) =1.1109 tCO_2e/MWh		

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

Fuel type	Unit	Liaoning A	Jilin B	Heilongjiang C	Subtotal D=A+B+C	Average low caloric value（MJ/t,km3） G	Emission factor ($kgCO_2/TJ$) H	CO_2emission（tCO_2e） I=D×G×H/100000（quality） I=D×G×H/10000 (volume)	percentage λ
Raw coal	10^4 t	4,973.05	3,289.16	3,873.45	12,135.66	20,908	87,300	221,508,367	
Clean coal	10^4 t	0	0	0	0.00	26,344	87,300	0	
Other washed coal	10^4 t	791.96	15.58	112.97	920.51	8,363	87,300	6,720,551	
Briquette	10^4 t				0.00	20,908	87,300	0	
Coke	10^4 t	5.77	0	0	5.77	28,435	95,700	157,015	
Other coke product	10^4 t	0			0.00	28,435	95,700	0	
Subtotal								**228,385,933**	**98.61%**
Crude oil	10^4 t	0.37	0	0	0.37	41,816	71,100	11,001	
Petroleum	10^4 t	0.02	0	0	0.02	43,070	67,500	581	
Diesel oil	10^4 t	0.84	1.07	0.37	2.28	42,652	72,600	70,601	
Fuel oil	10^4 t	10.64	1.06	1.29	12.99	41,816	75,500	410,108	
Other petrol product	10^4 t	0	0	0	0	41,816	72,200	0	
Subtotal								**492,291**	**0.21%**
Natural gas	10^8 m^3	0	3.9	18.5	22.4	38,931	54,300	473,526	
Coke oven gas	10^8 m^3	41.2	10.6	55.4	107.2	16,726	37,300	668,799	
Other gas	10^8 m^3	611.1	76.3	0	687.4	5,227	37,300	1,340,204	
LPG	10^4 t	0	0	0	0	50,179	61,600	0	
Refinery gas	10^4 t	7.54	0	3.77	11.31	46,055	48,200	251,065	
Subtotal								**2,733,594**	**1.18%**
Total								**231,611,818**	**100%**

Data sources: China Energy Statistics Yearbook 2009

Table 9 Emission factor of most advanced commercial power technologies

	variable	Power generation efficiency (%) A	Emission factor ($kgCO_2$/TJ) B	Oxidation C	Emission factor (tCO_2/MWh) D=3.6/A/1,000,000×B×C
Coal-fired power plant	$EF_{Coal,Adv,y}$	39.08	87,300	1	0.8042
Oil-fired power plant	$EF_{Oil,Adv,y}$	51.46	75,500	1	0.5282
Gas-fired power plant	$EF_{Gas,Adv,y}$	51.46	54,300	1	0.3799

Table 10 Installed capacity of Northeast China Power Gird in 2008

Capacity	Unit	Liaoning	Jilin	Heilongjiang	Total
Thermal power	MW	19,900	8,350	16,570	44,820
Hydro power	MW	1,430	3,890	940	6,260
Nuclear power	MW	0	0	0	0
Wind power and others	MW	860	760	620	2,230
Total	MW	22,190	13,000	18,130	53,320

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Table 11Installed capacity of Northeast China Power Gird in 2007

Capacity	Unit	Liaoning	Jilin	Heilongjiang	Total
Thermal power	MW	19,720	7,580	14,080	41,380
Hydro power	MW	1,410	3,890	870	6,170
Nuclear power	MW	0	0	0	0
Wind power and others	MW	359	514	230	1,103
Total	MW	21,489	11,984	15,180	48,653

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Table 12 Installed capacity of Northeast China Power Gird in 2006

Capacity	Unit	Liaoning	Jilin	Heilongjiang	Total
Thermal power	MW	16,721	7,039	12,456	36,216
Hydro power	MW	1,401	3,872	853	6,126
Nuclear power	MW	0	0	0	0
Wind power and others	MW	216	221	115	552
Total	MW	18,338	11,132	13,424	42,894

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Table 13 Calculation of BM emission factor of Northeast China Power Grid

	2006	**2007**	**2008**	**2006-2008 Capacity additions**	**2007-2008 Capacity additions**	**Share in total capacity additions**
	A	B	C	D=C-A	E=B-A	
Thermal power	36,216	41,380	44,820	14,292	4,126	88.73%
Hydro power	6,126	6,170	6,260	138	90	0.86%
Nuclear power	0	0	0	0	0	0.00%
Wind power and others	552	1,103	2,230	1,678	1,127	10.42%
Total	**42,894**	**48,653**	**53,320**	**16,108**	**5,343**	100.00%
Share in the total capacity of 2008				30.21%	10.02%	

$EF_{BM,y}$=0.7986×88.73%=0.7086 tCO2/MWh

According to the calculation, the Operating Margin Emission Factor ($EF_{grid,OM,y}$) of the NECPG is 1.1109tCO_2e/MWh and the Build Margin Emission Factor ($EF_{grid,BM,y}$) is 0.7086tCO_2e/MWh. The defaults weights value for wind power projects are used as specified in the "Tool to calculate the emission factor for an electricity system" (Version 02.2.0) ($w_{OM} = 0.75$; $w_{BM} = 0.25$). Therefore, the Combined Baseline Emission Factor of the Northeast China Power Grid corresponds to 1.0103tCO_2e/MWh.

Annex 4

Monitoring Information

No further information on the monitoring information.