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

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A.1. Title of the project activity:

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Guohua Rongcheng Phase III Wind Farm Project
PDD Version: 02.1
Date: 08/03/2012

Version history of the PDD

Version number	Date	Nature of revision(s)
01	29/08/2011	Completed version of the PDD, prepared for GSP process.
02	10/02/2012	Revised according to the validation.
02.1	08/03/2012	Updated with the selected methodology, ACM0002 version 12.3.0, dated 02/03/2012

A.2. Description of the project activity:

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Guohua Rongcheng Phase III Wind Farm Project (hereinafter referred to as the proposed project) is located in Chengshan Town, Rongcheng City, Shangdong Province, the People's Republic of China. The project owner is Guohua Resourceful (Rongcheng) Wind Power Generation Co., Ltd.

The proposed project has a total installed capacity of 49.5 MW, consisting of 33 wind turbines with unit capacity of 1500kW. The expected annual power delivered to the grid is 100,263MWh. The power output will be delivered to the North China Power Grid (NCPG) via Shandong Power Grid.

The scenario existing prior to the start of the implementation of the proposed project is the same as the baseline scenario as identified in section B.4, i.e. electricity would have otherwise been generated by the operation of existing power plants connected to NCPG and by the addition of new generation sources of NCPG. After the proposed project is put into operation, the power generated will substitute a part of power supply in NCPG which is dominated by fuel-fired power plants and thus reduce greenhouse gas (GHG) emission through avoiding CO_2 emissions produced by NCPG. The estimated annual average emission reduction is 89,823 tCO_2e.

The proposed project will generate power with wind energy and contribute to sustainable development mainly by:

- Reducing the emission of CO_2 and other pollutants compared with fuel-fired power plant;
- Creating local employment opportunities during the construction and operation of the proposed project and improving the living standard of local people;
- Implementation of the proposed project will also contribute to the promotion of renewable energy development.

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)	Kindly indicate if the party involved wishes to be considered as project participant (Yes/No)
China (host)	Guohua Resourceful (Rongcheng) Wind Power Generation Co., Ltd.	No
UK	Noble Carbon Credits Limited	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

Further contact information of project participants is provided in Annex 1.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

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The People's Republic of China

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

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Shandong Province

A.4.1.3. City/Town/Community etc:

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Chengshan Town, Rongcheng City

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

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The proposed project is located in Chengshan Town, Rongcheng City, Shandong Province, the People's Republic of China. The coordinates of the proposed project location area are 121º11′-122º42′ east longitude and 36º41′-37º35′ north latitude[1]. Figure A4-1 and A4-2 are the location of the proposed project.

[1] The project coordinates in decimal format are 121.18º-122.7º east longitude and 36.68º-37.58º north latitude.

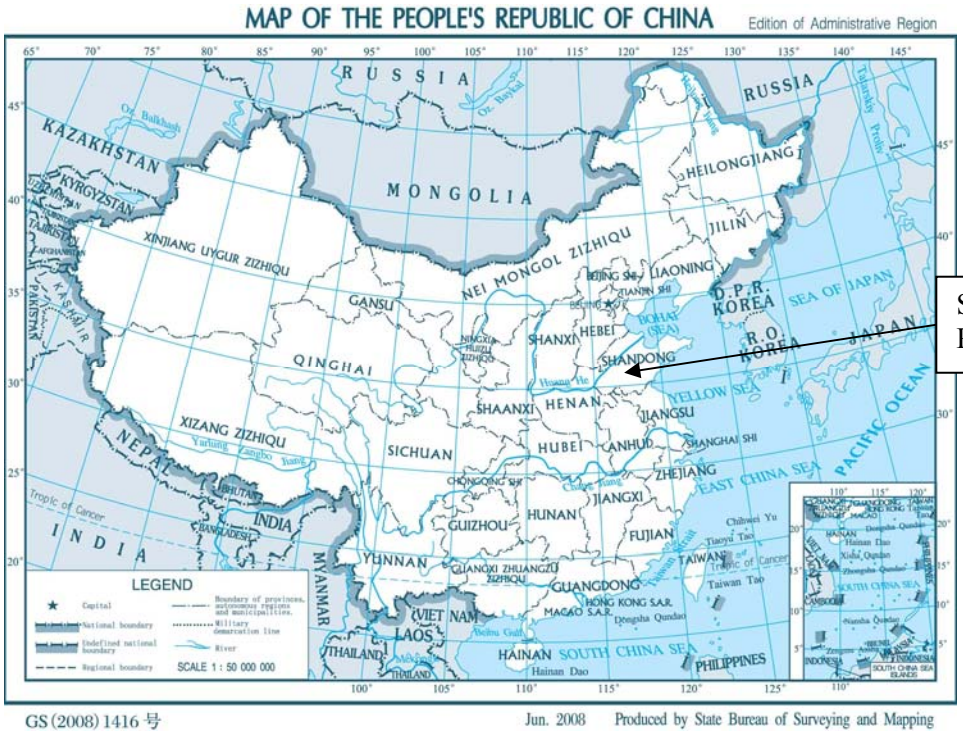

Figure A4-1 Geographic Location of Shandong Province

Figure A4-2 Geographic Location of the Proposed Project

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

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

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

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The purpose of the proposed project is to generate zero-emission wind power and deliver it to North China Power Grid. Hence there are no CO_2, CH_4, and N_2O emissions. For the proposed project,

(a) The scenario existing prior to the start of the implementation of the project activity is NCPG providing the same electricity service as the proposed project, i.e. electricity would have otherwise been generated by the operation of power plants connected to the NCPG.. After the proposed project is put into operation, the power generated will substitute a part of power supply of NCPG which is dominated by fossil fuel fired power plants and thus reduce greenhouse gas (GHG) emission through avoiding CO_2 emissions produced by power plants connected to the NCPG.

(b) The project scenario is the implementation of the proposed project which will have a total installed capacity of 49.5MW, consisting of 33 domestic wind turbines with a unit capacity of 1,500kW. The power output will supply an average annual generation of 100,263MWh to NCPG and replace the same amount of electricity generated by fossil fuel fired power plants connected to NCPG. The plant load factor of the proposed project is 0.231[2], which was determined by a third party (FSR designer) based on analysis of local wind resource and technical status of generating equipments. This is consistent with the *Guidelines for the Reporting and Validation of Plant Load Factors* (Version 01) issued by EB**.** The key technical parameters of the wind turbines are as follows:

Table A4-1 Key technical parameters of the wind turbines [3]

Parameter	Value
Model of wind turbine	GW82/1500
Manufacture	Xinjiang Goldwind Science & Technology Co., Ltd.
Rotor Diameter	82m
Amount of vane	3
Height of hub	70m
Cut-in wind speed	3m/s
Cut-out wind speed	22 m/s
PLF	0.231
Life time	20years

The proposed project generates electricity by utilizing the renewable wind resources, a kind of clean and zero-emission energy, so there will be no GHG emission involved in the project activity. The electricity generated by the wind turbines firstly will be boosted up to 35KV before connected to the 110KV transformer at the project site, and then delivered to the NCPG via Shandong Power Grid.

A gateway meter will be installed on the project site for monitoring the electricity delivered to the grid and the electricity consumed by project through the main line. Meanwhile, for the safe operation of the

[2] PLF=Operation hour/8760h*100%=2026h/8760h*100%=23.1%. According to Annex 11 of EB 48 Report, Guideline for the reporting and validation of plant load factors (version 01), the plant load factor shall be defined ex-ante in the CDM-PDD according to one of the following three options: (a) The plant load factor provided to banks and/or equity financiers while applying the project activity for project financing, or to the government while applying the project activity for implementation approval; (b) The plant load factor determined by a third party contracted by the project participants (e.g. an engineering company). The plant load factor of the proposed project is 23.1% according to the FSR, accomplished by the accredited third party, i.e. Beijing Jipeng Investment Information & Consultant Ltd., and it was also provided to the government while applying the project activity for implementation approval.

[3] The Technical Documentation of the Equipment

project, a backup line will be connected for the emergency. A backup-line meter will be installed to measure the electricity imported through the backup line.

As the project utilize clean energy to generate electricity there will be no GHG emission in the project scenario;

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

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

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Renewable crediting period is adopted. The estimated annually average emission reduction in the first crediting period is 89,823 tCO_2e.

Table A4-2 The estimation of the emission reductions in the first crediting period

Year	The estimation of emission reductions (tCO_2e)
01/08/2012-31/07/2013	89,823
01/08/2013-31/07/2014	89,823
01/08/2014-31/07/2015	89,823
01/08/2015-31/07/2016	89,823
01/08/2016-31/07/2017	89,823
01/08/2017-31/07/2018	89,823
01/08/2018-31/07/2019	89,823
The estimation of total emission reductions in the first crediting period	628,761
Total number of crediting years	*7*3*
The estimation of annual average emission reductions in the first crediting period	89,823

A.4.5. Public funding of the project activity:

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No public funding from the Annex 1 countries is provided to the proposed project.

SECTION B. Application of a baseline and monitoring methodology:

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

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The methodologies used by the proposed project are as follows:

- Approved consolidated baseline and monitoring methodology ACM0002 **"**Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (Version 12.3.0).
- "Tool for the demonstration and assessment of additionality" (Version 05.2.1).
- "Tool to calculate the emission factor for an electricity system" (Version 02.2.1)

More information on the methodology and tools listed above is available on the following website: http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

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

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The proposed project meets all the applicability criteria stated in the methodology ACM0002 (Version 12.3.0):

• The proposed project is a new grid-connected renewable power plant, i.e. wind power project, and it does not involve capacity addition, retrofit or replacement of an existing power plant/unit, and it does not involve biomass fired power plants;
• The proposed project is not related to capacity addition, retrofit or replacement of a power plant/unit;
• The proposed project does not involve switching from fossil fuels to renewable energy sources at the site of the project activity;
• The Project isn't a biomass fired power plant; The Project isn't a hydro power plant.

Therefore, the proposed project activity is in accordance with the applicability of ACM0002 (Version 12.3.0).

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

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The power generated by the proposed project will be connected to NCPG via Shandong Power Grid. According to the rules on project boundary of ACM0002 (Version 12.3.0), the spatial extent of the project boundary includes the project site and all power plants connected physically to the NCPG. According to the *China's Regional Grid Baseline Emission Factors 2011* issued by the DNA of China[4], the areas covered by NCPG include Beijing, Tianjin, Shandong, Shanxi, Hebei and Inner Mongolia. The sources and types of GHG included in the project boundary are listed in Table B3-1.

Table B3-1 the sources and gases 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	Project activity emission	CO_2	No	According to ACM0002, the proposed project generates electricity by renewable energy, thus No GHG emissions emitted.
		CH_4	No	
		N_2O	No	

[4] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2708.pdf

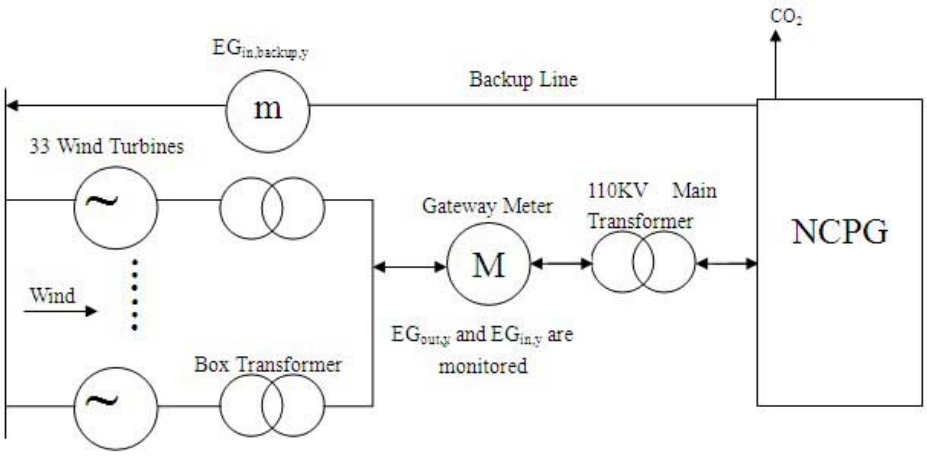

Figure B 3-1 Flow Diagram of the Project Boundary

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

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

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

According to the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1), if the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, the delineation should be used. Electricity generated by the proposed project will be delivered to North China Power Grid (NCPG). Therefore, in accordance with the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1) and the delineation given by Chinese DNA, NCPG is defined as the project electricity system as well as the project boundary of the proposed project.

The proposed project is the installation of a new grid-connected renewable power plant, thus the baseline scenario, in accordance with ACM0002 (Version 12.3.0), of the proposed project is as follow:

Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of power plants connected to NCPG and by the addition of new generation sources of NCPG to which the proposed project is connected.

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

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The timeline of events and actions which have been taken to consider seriously during development of the proposed project as a CDM one is demonstrated as following:

Table B5-1 Timeline of the proposed project activity

Time	CDM Development Event	Project Implementation Event
06/2008		Environment Impact Assessment (EIA) report was finished by Ministry of Environmental Protection of the People's Republic of China
10/2008	In the FSR, CDM was considered.	Feasibility Study Report (FSR) was finished by Shanghai Electric Power Design Institute Co., Ltd.
28/11/2008		EIA was approved by the Environmental Protection Bureau of Shandong Province.
19/12/2008		FSR was approved by Shandong Development and Reform Commission.
20/12/2008	Board decision of the proposed project with the CDM development was made by the project owner.	
10/01/2009		The loan contract was signed between Guohua Energy Investment Co., Ltd. and the project owner.
16/02/2009	The Notification of CDM development of the project was sent to NDRC.	
20/02/2009	The Notification of CDM development of the project was approved by NDRC.	
20/07/2009	The CDM Consultant Agreement was signed between Beijing Keji Consulting Ltd. and the project owner.	
25/11/2009	The Notification of the project developed as a CDM project was sent to EB and got confirmed in the same day[5].	
01/12/2009	Starting date of the project.	The Wind Turbine Purchase Contract was signed
30/01/2010	The LOA of the project from Host Country was issued by NDRC.	
04/02/2010	ERPA was signed between Noble Carbon Credits Limited and the project owner.	
26/04/2010		The order to commence was signed.
30/12/2011	MoC of the project was signed.	

The above events show that CDM was seriously considered by the project owner and was a key factor for the investment decision on the project, continuous and real actions were taken to secure CDM status for the project in parallel with its implementation.

According to the ACM0002 (Version 12.3.0), the following steps are used to demonstrate the additionality of the proposed project in accordance with the "Tool for the demonstration and assessment of additionality (Version 05.2.1)" agreed by the Executive Board.

[5] http://cdm.unfccc.int/Projects/PriorCDM/notifications/index_html

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

Define realistic and credible alternatives to the project activity(s) that can be (part of) the baseline scenario through the following sub-steps:

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

The project activity is the installation of a new grid-connected renewable power plant/unit, according to ACM0002 (Version 12.3.0), the baseline scenario is the following:

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

According to Para 105 of VVM 01.2, alternatives to the proposed project is not needed to be identified as the baseline scenario has been prescribed in the ACM0002 (Version 12.3.0) applied.

Also, as per Clause (4) quoted from "Tool for the demonstration and assessment of additionality" (Version 05.2.1), *Project activities that apply this tool in context of approved consolidated baseline methodology ACM0002, only need to identify that there is at least one credible and feasible alternative that would be more attractive than the proposed project activity*; the alternatives as follows should be included:

Alternative 1: The proposed project undertaken without being registered as a CDM project;
Alternative 2: NCPG as the provider for the same electricity output as the proposed project.

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

Alternative 1: The proposed project undertaken without being registered as a CDM project
Chinese Government encourages and promotes wind power development through China Renewable Energy Law, regulations and preferential policies. Alternative 1 is in compliance with legal and regulatory requirements.

Alternative 2: NCPG provides equivalent electricity with that delivered to the grid by the proposed CDM project.
Alternative 2 is in compliance with legal and regulatory requirements.

Step 2. Investment Analysis

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)

The investment analysis was conducted in the following steps:

Sub-step 2a. Determine appropriate analysis method

"Tools for the demonstration and assessment of additionality (Version 05.2.1)" suggests three analysis methods for this step. They are simple cost analysis (option I), investment comparison analysis (option II) and benchmark analysis (option III).

Since the proposed project will earn the revenues from not only the CDM but also electricity sales, the simple cost analysis method (option I) is not appropriate.

Investment comparison analysis method (option II) is applicable to projects whose alternatives are also investment projects. Only on such basis, comparison analysis can be conducted. The baseline scenario of the proposed project is to supply equivalent annual power output from the NCPG rather than investment projects. Therefore option II is not an appropriate method.

The proposed project will use benchmark analysis method (option III) based on the consideration that total investment benchmark *IRR* of the power sector is available.

Sub-step 2b. Benchmark Analysis Method (Option III)

According to "*Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects*"[6], the benchmark is based on *The Methodology and Parameters for Financial Evaluation of Construction projects*[7] which is the national criteria in evaluating new construction projects including fossil-fuel-fired plants. In line with the above documents, the financial benchmark rate of return of Chinese power industry is 8% of the total investment, which has been widely used for Feasibility Studies of power project investments in China and also been accepted as the benchmark for registered CDM projects in power sector. Hence, project IRR as the indicator to do the benchmark analysis which is 8% (post tax) was adopted in the proposed project.

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

(1) Basic parameters for calculation of financial indicators

The basic financial parameters of the proposed project are shown in the following Table:

Table B5-2: Basic financial parameters of the proposed project

No.	Name of the item	Indicators parameters	Date source
1	Installed capacity	49.5MW	FSR Page 4
2	Estimated annual power delivered to the grid	100,263MWh	FSR Page 6
3	PLF	0.231	FSR Page 6
4	Tariff (including VAT)	0.61RMB/kWh	FSR Page 13
5	Project operation period	20 years	FSR Page146
6	Static total investment	519.511Million	FSR Page150
7	Tax		

[6] *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects,* issued by the State Power Corporation of China, the former state authority to manage relevant power issues including new constructions of power plants.

[7] *The Methodology and Parameters for Financial Evaluation of Construction projects,* Chapter 1 General, Section 1.1

7.1	Value-add tax rate	8.5%	FSR Page147
7.2	Income tax		
	Operation year 1-3	0%	FSR Page147
	Operation year 4-6	12.5%	FSR Page147
	Operation year 7-20	25%	FSR Page147
7.3	City maintenance & Construction tax	5%	FSR Page147
7.4	Education addition tax	3%	FSR Page147
8	Annual O&M cost		
8.1	Operation year 1-2	4.88 Million	
8.2	Operation year 3-20	8.61 Million	
8.3	Maintenance rate(operation year 1-2)	0.5%	FSR Page146
8.4	Maintenance fee (operation year 3-20)	1.2%	FSR Page146
8.5	Material fee	3 RMB/kW	FSR Page146
8.6	Other fee	5 RMB/kW	FSR Page146
8.7	Insurance rate	0.15%	FSR Page146
8.8	No. of employee	15 Persons	FSR Page146
8.9	Average personal pay	0.048 Million	FSR Page146
8.10	Welfare fee rate	43%	FSR Page146
9	Depreciation rate	6.33%	FSR Page146
10	Residual rate	5%	FSR Page146
11	Long-term loan interest	7.47%	FSR Page146
12	Crediting period	7*3 yrs (Renewable)	/

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

In accordance with benchmark analysis (Option III), if the financial indicators (Project IRR) of the proposed project are lower than the benchmark, the proposed project is not considered as financially attractive.

Table B5-3: Financial indicators of the proposed project

	Project IRR (total investment)
Without CDM	6.34%
With CDM	8.65%

It is clearly shown in Table B5-3 that without CDM revenue, the project IRR is lower than the benchmark 8%, which means the proposed project is not attractive. While with the help of CDM revenue, the project IRR surpasses the benchmark and then the proposed project is financially attractive.

Sub-step 2d. Sensitivity analysis

The purpose of the sensitivity analysis is to examine whether the conclusion regarding the financial viability of the proposed project is sound and tenable with those reasonable variations in the assumptions. The investment analysis provides a valid argument in favour of additionality only if it

consistently supports (for a realistic range of assumptions) the conclusion that the project activity is unlikely to be the most financially attractive or is unlikely to be financially attractive.

According to "Guidelines on the assessment of investment analysis" (version 05), only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation, and a general point of departure variations in the sensitivity analysis should at least cover a range of +10% and -10%.

Therefore, static total investment is chosen for sensitivity analysis. Annual power delivered to the grid and tariff are both key parameters to total project revenues. Annual O&M cost is another important parameter to total project costs. Considering installed capacity times annual operating hour equals to annual power output, both parameters are not selected. The tax rates are deemed relatively stable throughout the project lifetime. So they are not included in analysis. Therefore, the parameters (Static total investment, Annual O&M cost, Annual power delivered to the grid and Tariff) used in sensitivity analysis constitute more than 20% of either total project costs or total project revenues, and there are no other parameters having significant impact on the sensitivity analysis that are not included in the sensitivity analysis.

The critical factors that influence the Project IRR are mainly as follows:

- Static total investment
- Annual power delivered to the grid
- Tariff
- Annual O&M cost

When the above parameters fluctuate within the range of –10% to +10%, the impacts on the *IRR* of total investment of the proposed project (not considering *CERs* income) are show as Table B5-4 and Figure B5.1:

Table B5-4 Sensitivity analysis of the Project *IRR*

Fluctuation range of indicator	-10%	-5%	0	5%	10%
Static total investment	7.75%	7.01%	6.34%	5.72%	5.14%
Annual power delivered to the grid	4.96%	5.65%	6.34%	6.90%	7.48%
Tariff	4.96%	5.65%	6.34%	6.90%	7.48%
Annual O&M cost	6.56%	6.45%	6.34%	6.23%	6.12%

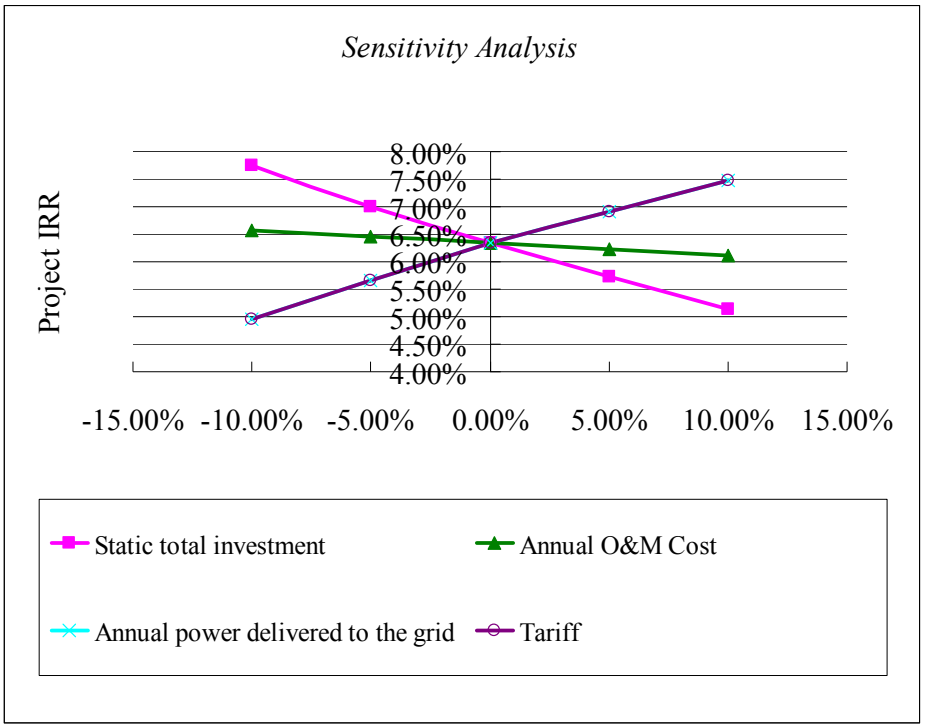

Figure B5-1 The impacts to Project *IRR* by the fluctuation of uncertain factors (not considering *CERs* income)

As shown in Table B5-4 and Figure B5-1, when above four financial parameters fluctuate within the reasonable range of -10% to +10%, the Project IRR of the proposed project is always below the benchmark 8%.

However, when the above four financial parameters fluctuate more than ±10%, project IRR will reach benchmark, see Table B5-5.

Table B5-5: The threshold of four financial parameters when the project IRR reaches benchmark.

Parameters	Fluctuation
Static total investment	-11.6%
Annual power delivered to the grid	14.5%
Tariff	14.5%
Annual O&M cost	-77.5%

1. The static total investment

As shown in Table B5-5 and Figure B5-1, in the case that the static total investment decreases by 11.6%, the Project IRR of the proposed project will reach the benchmark. The static total investment used in the investment analysis of the PDD is taken from the FSR, which was developed by an experienced and top class design institute in the power industry. Furthermore, the total value of the main contracts has reached 502.4245 Million RMB, which is 96.7% of the static total investment. Therefore, the value of static investment of the project is impossible to decrease by 11.6%.

2. Annual power delivered to the grid

As to annual power delivered to the grid, project IRR will reach the benchmark if the annual power delivered to the NCPG increases more than 14.5%. According to the FSR, the generated power adopted is calculated out based on the wind measurement data at the project site of the representative year and statistic of the average wind speed of local meteorological station of the past 33 years. Besides,

professional wind resource evaluation software was used based on wind turbines technical parameters. Therefore, it is extremely unlikely for the annual delivered power has an increase by 14.5%.

3. Tariff
When on-grid tariff increases by 14.5%, the project IRR can reach 8%. However, according to the document No.1906 issued by NDRC in 2009[8], the tariff for wind farm projects implemented since 1st August 2009 in Shandong province has been approved as 0.61 RMB/kWh (inc. VAT), which is the same as the tariff used in PDD. Furthermore, according to "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 recently released by EB[9], the highest applicable wind tariff in Shandong province is 0.61 RMB/kWh, which is the same with the project tariff. Therefore, the on-grid tariff of the proposed project is impossible to increase beyond 14.5%.

4. Annual O&M cost
If the annual O&M cost decreases by 77.5%, the project IRR can reach 8%. The annual O&M cost mainly contains employee salary and welfare, maintenance fees, material expense and insurance fees, which are essential to maintain the normal operation of the proposed project. Since the price of raw materials and products, labour cost in China has been continued rising over the years[10], annual O&M cost thus would only increase rather than decrease. Furthermore, annual O&M cost/statistic total investment of registered CDM projects in Shandong varies from 0.75% to 4.81%. As for the proposed project, annual O&M cost/statistic total investment is 1.59%, which falls in this range. Therefore, the annual O&M cost is deemed to be appropriate and it is impossible to decrease even beyond 77.5%.

Based on the above analysis, it can be concluded that without the support of CDM revenue, the proposed project is lack of financial attractiveness. However, if the proposed project can be implemented as a CDM project, the additional income from sales of CERs could improve the financial condition of the proposed project, thus ensuring the implementation of the proposed project smoothly.

As analysed above, it can be concluded that in the absence of CDM income, the proposed project is not financially attractive.

Step 3. Barrier Analysis

Not applied

Step 4. Common practice analysis

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

In line with the EB guidance on the applied additionality tool, the common practice analysis is carried out on similar projects in the same region and taking place in a comparable environment with regards to regulatory framework, investment climate, access to technology, and access to financing, etc.

The choice of the common practice analysis region

[8] http://www.ndrc.gov.cn/zcfb/zcfbtz/2009tz/t20090727_292827.htm

[9] http://cdm.unfccc.int/Reference/Notes/reg_note07.pdf

[10] http://www.stats.gov.cn/tjsj/ndsj/2010/indexce.htm

In China, the general environment of projects of wind power projects such as the wind resources, tariff, and investment climate are only similar and comparable in the same province. Therefore, the common practice region and comparable framework is set as Shandong Province in which the proposed project located.

The choice of the installed capacity of the wind farms for common practice analysis

Besides, wind farms within 15 MW is defined as small scale CDM project in CDM guidance, which means wind farm projects with installed capacity of 15MW or smaller is not considered as similar projects . Hence, this common practice analysis compares projects larger than 15 MW.

Choose the similar starting date range

Subject to documentation Guofa [2002] No.5, the Electric Power System Reform Scheme, promulgated by the State Council, the state electric power company had been split into two power grid companies, five power generation groups and four supplementary industry companies in 2002, which achieved the plant-grid separation and introduced the competition mechanism. This is a significant reform of Chinese electric power industry. Many aspects such as rules and regulation, investment environment and capital acquisition of Chinese electric power industry has experienced important transformation at that time. Therefore, only projects put into operation or power price approved after 2002 is taken into account.

Therefore, 'Similar projects' to the project activity are identified by the criteria of: (1) wind power projects with capacity more than 15MW; (2) construction year from 2002 onwards; and (3) located at Shandong Province.

According to *China Wind Farm Installation Capacity Statistic of 2007-2010*[11], *China Electric Power Yearbook 2010* and UNFCCC website, projects which were put into operation after 2002 with an installed capacity larger than 15MW in Shandong province are summarized as follows[12]:

Table B5-6 Similar Wind Farm Projects Located in Shandong Province

Project Title	Total Installed Capacity (MW)	CDM status	Reference
Laizhou Diaolongzui Wind Farm	48.75	Registered as CDM project, reference No.1010	
Qixia Tangshanpeng Windfarm Project	21.75	Registered as CDM project, reference No.1019	
Shandong Changdao 27.2 MW Wind Power Project	27.2	Registered as CDM project, reference No.1090	
Shandong Weihai 69 MW Wind Power Project	69	Registered as CDM project, reference No.1128	
Roncheng Wind Power Project,	48.75	Registered as CDM project,	

[11] 2007: http://www.cwea.org.cn/upload/20080324.pdf
2008: http://www.cwea.org.cn/upload/20090305.pdf
2009: http://www.cwea.org.cn/upload/201006102.pdf
2010: http://www.cwea.org.cn/circular/display_info.asp?cid=163

[12] The registered CDM projects and projects under GSP are not included as per "Tool for the Demonstration and Assessment of Additionality (version 05.2.1)".

48.75MW		reference No.1755	
Shandong Luneng Dongying 48MW Wind Power Project	48	Registered as CDM project, reference No.2019	
The 48MW wind power project in Lubei, Shandong Province	48	Registered as CDM project, reference No.2094	
Shandong Penglai Pingdingshan Wind Farm Project	48	Registered as CDM project, reference No.2397	
Guohua Dongying Hekou 49.5 MW Wind Farm Project (Phase 1)	49.5	Registered as CDM project, reference No.2436	
Guohua Binzhou Zhanhua 49.5MW Wind Farm Project (Phase 1)	49.5	Registered as CDM project, reference No.2438	
Guohua Dongying Lijin 49.5 MW Wind Farm Project (Phase 1)	49.5	Registered as CDM project, reference No.2442	
Shandong Laizhou phase I Wind Power Project	49.5	Registered as CDM project, reference No.2530	
Shandong Dongying 1st phase Wind Power Project	49.5	Registered as CDM project, reference No.2584	
Shandong Laizhou phase II Wind Power Project	49.5	Registered as CDM project, reference No.2730	
Yantai Dongyuan Laizhou 48.5 MW Wind Farm Project Phase I	48.5	Registered as CDM project, reference No.2764	
Shandong Rushan Luneng Wind Farm	42	Registered as CDM project, reference No.2814	
Huadian Laizhou Wind Farm Project	40.5	Registered as CDM project, reference No.2831	
Huaneng Changyi Phase I Wind Farm Project	49.5	Registered as CDM project, reference No.3353	
Shandong Huaneng Shouguang 49.5MW Wind Farm Project	49.5	Registered as CDM project, reference No.3391	
Yantai Dongyuan 25.5 MW Wind Farm Project Phase I	25.5	Registered as CDM project, reference No.3616	
Shandong Huaneng Hekou Phase I Wind Farm Project	49.5	Registered as CDM project, reference No.3718	
Shandong Penglai Wind Farm Phase II Project	48	Registered as CDM project, reference No.4402	
Penglai Daliuhang Wind Farm Project Phase I	49.8	Registered as CDM project, reference No.4587	
Weihai Jingqu 49.8 MW Wind Farm Project Phase I	49.8	Registered as CDM project, reference No.4612	
Huaneng Laizhou Phase II Wind Farm Project	49.5	Registered as CDM project, reference No.4614	
Huaneng Shandong Rongcheng Chudao Wind Power Project	49.5	Registered as CDM project, reference No.4699	
Huaneng Shandong Hekou Phase III Wind Farm Project	49.5	Registered as CDM project, reference No.4830	
Huaneng Shandong Hekou	49.5	Registered as CDM project,	

Phase IV Wind Farm Project		reference No.4871	
Guohua Rongcheng Phase II Wind Farm Project	49.5	Registered as CDM project, reference No.4882	
Shandong Binzhou Zhanhua Tao'erhe Wind Power Project	49.5	Registered as CDM project, reference No.4923	
Shandong Liuwangzhuang Wind Farm Project	38.25	Registered as CDM project, reference No.5006	
Shandong Changdao Wind Farm Project	17.55		Applied for VCS
Shandong Jimo Qingdao Huawei Wind Farm	16.35		Obtained favorable loan and foreign support as demonstration project.

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

As per *"Tool for the Demonstration and Assessment of Additionality"* (version 05.2.1), other CDM project 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. So there are 2 similar projects in Shandong province which need to be discussed: Shandong Changdao Wind Farm Project and Shandong Jimo Qingdao Huawei Wind Farm.

Shandong Changdao Wind Farm Project (project ID: 517)[13] applied for Voluntary Emission Reduction under Verified Carbon Standard (VCS) to obtain the support from VCS VER funding to solve the financial barriers. Shandong Jimo Qingdao Huawei Wind Farm Obtained favorable loan and received foreign support from a German company as demonstration project. So there are essential distinctions between the proposed project and the two similar projects.

All the other wind farms in Shandong province have already successfully been registered or are applying as CDM projects in EB. CDM-related income is an effective measure for the project developers to overcome the barriers they encounter during project development. Hence, the development of this type of project activity in Shandong Province is hard to be brought forth without CDM support.

In conclusion, the proposed project without CDM income is additional and not the common practice in Shandong Province. Without CDM support, the proposed project would unlikely occur. The project has strong additionality and can reduce the greenhouse gas emissions.

B.6. Emission reductions:

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B.6.1. Explanation of methodological choices:

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According to ACM0002 (Version 12.3.0), "Tool to calculate the emission factor for an electricity system" is adopted to calculate the baseline emission factor of the proposed project, applying the following steps:

[13] Source: https://vcsprojectdatabase1.apx.com/mymodule/ProjectDoc/EditProjectDoc.asp?id1=517

1. Calculation of emission factor

STEP 1. Identify the relevant electric system.
STEP 2. Choose whether to include off-grid power plants in the project electricity system (optional)
STEP 3. Select a method to determine the operating margin (OM).
STEP 4. Calculate the operating margin emission factor according to the selected method.
STEP 5. Calculate the build margin (BM) emission factor.
STEP 6. Calculate the combined margin (CM) emissions factor.

The detailed calculated processes are as follows:

STEP 1. Identify the relevant electric system

For determining the electricity emission factors, a project electricity system is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity (e.g. the renewable power plant location or the consumers where electricity is being saved) and that can be dispatched without significant transmission constraints.

Similarly, a connected electricity system, e.g. national or international, 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.

If the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used.

The DNA of China has published a delineation of the project electricity system and connected electricity systems, this delineation is used. Following the DNA delineation, the project electricity system is the North China Power Grid (NCPG), which consists of Beijing, Tianjin, Hebei, Shanxi, Shandong and Inner Mongolia Power Grids. The proposed project is located in Shandong Province and covered by the NCPG. Base on the Grid Interconnection Approval issued by State Grid-Shandong Electric Power Corporation to the proposed project, all the electricity generated will supply to NCPG. Therefore, NCPG is chosen as the relevant electric power system.

The connected electricity system is Northeast China Power Grid which consists of Liaoning, Jilin and Heilongjiang Power Grids, and Central China Power Grid which consists of Henan, Hubei, Hunan, Jiangxi, Sichuan and Chongqing Power Grids.

Electricity transfers form connected electricity systems to the project electricity system are defined as electricity imports and electricity transfers to connected electricity systems are defined as electricity exports.

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

Project participant 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.

Option I is chosen by the proposed project.

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

Based on one of the four following methods:
(a) Simple *OM*, or
(b) Simple adjusted *OM*, or
(c) Dispatch data analysis *OM*, or
(d) Average *OM*.

Among methods above, Method (a) can only be used where low-cost/must run resources[14] constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term normals for hydroelectricity production.

During 2005-2009, the low-cost/must run resources constitute less than 50% of total amount grid generating output in NCPG where the proposed project is connected, which is in compliance with the applicability of Method (a). The detailed information could be seen in Table B6-1.

Table B6-1 Electricity Generation Proportion of Wind farm etc. of NCPG 2005-2009

No.	Year	Electricity generation （10^8kWh）			Proportion of wind farm etc.
		Total generation	Fuel-fired power	Wind farm etc.	
1	2005[15]	6077.82	6032.31	45.51	0.749%
2	2006[16]	7250	7189	61.4	0.847%
3	2007[17]	8457.00	8380.7	76.30	0.902%
4	2008[18]	8785.00	8679.00	104.40	1.188%
5	2009[19]	9418.00	9230.00	188.8	2.005%

So, method (a) is selected for the calculation of OM emission factor ($EF_{grid, OM, y}$).

The Simple OM emission factor is calculated ex-ante, and it uses the available data in NCPG for the most recent 3 years (2007-2009).

STEP 4. Calculate the operating margin emission factor ($EF_{grid, OM, y}$) according to the selected method.

The Simple *OM* emission factor is calculated as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, excluding those low-operating cost and must-run power plants. It may be calculated:

- Based on data on net electricity generation and a CO_2 emission factor of each power unit, the average efficiency of each power unit and the fuel type(s) used in each power unit (Option A), or

[14] The low-cost/must run resources include hydro power, geothermal sources, wind power, solar sources etc.
[15] China Electric Power Yearbook 2006 P568
[16] China Electric Power Yearbook 2007 P709
[17] China Electric Power Yearbook 2008 P733
[18] China Electric Power Yearbook 2009 P695
[19] China Electric Power Yearbook 2010, P705

- 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).

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 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 data of each power plant /unit in the NCPG where the proposed project connected is not available publicly, thus Option A is not applicable. The low-cost/must run power resources in NCPG include only renewable power generation, and the quantity of electricity supplied to the grid by these sources is known. Besides, off grid power plants are not included in the calculation (i.e. if Option I has been chosen in Step 2).

Therefore, Option B is selected for calculating the Simple *OM* emission factor based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost/must run power plants/units, and based on the fuel type(s) and total fuel consumption of the project electricity system.

The calculation is as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i \left(FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}\right)}{EG_y} \quad (B.1)$$

Where:

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

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

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

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

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

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

y =The three most recent years which data is available

According to the baseline emission factor calculation published by Chinese DNA [20] (the details could be seen in Annex 3), the weighted average *OM* emission factor of NCPG from year 2007 to 2009 is: $EF_{grid,OM,y} = 0.9803 tCO_2/MWh$.

STEP 5. Calculate the build margin (BM) emission factor ($EF_{grid, BM, y}$)

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:

[20] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2708.pdf

(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 Emission Factor ($\boldsymbol{EF_{grid,\,BM,\,y}}$) is calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_{m} EG_{m,y} \times EF_{EL,m,y}}{\sum_{m} EG_{m,y}} \qquad \text{(B.2)}$$

Where:
$EF_{grid,BM,y}$ =Build margin CO_2 emission factor in year y (tCO2/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 (tCO2/MWh)
m =Power units included in the build margin
y =Most recent historical year for which power generation data is available

Due to the data's unavailability, the BM calculation in this PDD follows the guidance provided by the EB in the deviation. Calculate first the newly installed capacity and its power generation technology mix, then the weights of different power technologies in the newly installed capacity, and finally the BM emission factor based on the emissions factors of different types of most advanced commercial generation technologies[21].

Because the capacity of the coal-fired, oil-fired and gas fired power plants can not be separated in the publicly available statistical data, the BM calculation in this PDD adopts the following method. First, use the available data in the energy balance sheets of the most recent year to calculate the proportions of the CO_2 emission from solid, liquid and gaseous fuels in the total CO_2 emissions related to power generation. Second, calculate the emissions factor of the fossil fuel-fired power generation in North China Power Grid using the above proportions as the weights and the emission factors of the most advanced commercial generation technologies as the reference. Finally, the BM emission factor is the product of this emission factor of fossil fuel-fired power generation and the proportion of fossil fuel-fired power plants in the newly installed 20% capacity.The detailed steps and the related formulas are as

[21] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2708.pdf

follows:

Sub-step 5a. **Calculating the share of CO_2 emissions of different fuel-fired power plants in the total CO_2 emissions**

$$\lambda_{coal,y} = \frac{\sum_{ieCOAL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2 i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2 i,j,y}} \quad \text{(B.3)}$$

$$\lambda_{oil,y} = \frac{\sum_{ieOIL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2 i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2 i,j,y}} \quad \text{(B.4)}$$

$$\lambda_{Gas,y} = \frac{\sum_{ieGAS,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2 i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2 i,j,y}} \quad \text{(B.5)}$$

Where:

$F_{i,j,y}$ is the amount of fuel i consumed (in a mass or volume unit) by relevant provincial sub-grids j in year y;

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

$EF_{CO_2,i,j,y}$ is the CO_2 emission coefficient of fuel i (tCO_2/mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant provincial sub-grids j and the percent oxidation of fuel in year y;

COAL, OIL, and *GAS* refers to all forms of coal, oil and gas.

Sub-step 5b. **Calculating the Emission Factor of fuel-fired power technology**

$$EF_{Fuel-fired} = \lambda_{Coal} * EF_{Coal,Adv} + \lambda_{Oil} * EF_{Oil,Adv} + \lambda_{Gas} * EF_{Gas,Adv} \quad \text{(B.6)}$$

Where:

$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ represent the related Emission Factor of the commercially available most advanced coal, oil and gas fired power technology, please refer to Annex 3 for more details.

Sub-step 5c. **Calculating the $EF_{grid,BM,y}$ of NCPG**

$$EF_{BM} = \frac{CAP_{Fuel-fired}}{CAP_{Total}} * EF_{Fuel-fired} \quad \text{(B.7)}$$

Where:

CAP_{Total} is the newly increment of total installed capacity;

$CAP_{Fuel\text{-}fired}$ is the newly increment of fuel-fired installed capacity.

According to the baseline emission factor calculation published by Chinese DNA [22] (the details could be seen in Annex 3), the calculated build margin emission factor of NCPG is:
$EF_{grid,BM,y}$ =0.6426 tCO_2/MWh.

The $EF_{grid,OM,y}$ and $EF_{grid,BM,y}$ of the first crediting period of the proposed project is calculated ex-ante and will not change during the first crediting period, but will be updated once the first crediting period is over.

STEP 6. Calculate the combined margin (CM) emissions factor ($EF_{grid,CM,y}$)

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 for the proposed project is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \quad (B.8)$$

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 "Tool to calculate the emission factor for an electricity system", the weights of *OM* and *BM* for wind-farm projects are as follows:
w_{OM} = 0.75, w_{BM} = 0.25

Thus,
$EF_{grid,CM,y}$ = 0.75* $EF_{grid,OM,y}$ +0.25* $EF_{grid,BM,y}$
= 0.75×0.9803 + 0.25×0.6426
= 0.895875 (tCO_2/MWh)

2. Calculate the Baseline Emissions (BE_y) and Emission Reductions (ER_y)

According to ACM0002(Version 12.3.0), the baseline emissions (BE_y) are calculated as:

$$BE_y = EG_{PJ,y} \cdot EF_{grid,CM,y} \quad (B.9)$$

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);

[22] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2708.pdf

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

According with ACM0002, if the 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, then: $EG_{PJ,y} = EG_{facility,y}$. The proposed project is a new grid-connected power plants utilizing renewable energy, thus:

$$EG_{PJ,y} = EG_{facility,y} \quad \text{(B.10)}$$

Where:

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

In a given year, the emission reductions produced by the project activity (ER_y) is equal to baseline GHG emissions (BE_y) minus project direct emission during the same year:

$$EG_{facility,y} = EG_{out,y} - EG_{in,y} - EG_{backup,y} \quad \text{(B.11)}$$

Where:

$EG_{out,y}$ = Electricity generation supplied to the NCPG by the proposed project in year y (MWh/yr)

$EG_{in,y}$ = Electricity consumed by the proposed project which is imported from the NCPG through the main line and is expected to be 0 for the purpose of ex-ante calculation.

$EG_{backup,y}$ =The electricity consumed by the proposed project which is imported through the backup line and is expected to be 0 for the purpose of ex-ante calculation.

Thus,

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

In a given year, the emission reductions produced by the project activity (ER_y) is equal to baseline GHG emissions (BE_y) minus project direct emissions during the same year:

$$ER_y = BE_y - PE_y \quad \text{(B.12)}$$

Where:

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

BE_y = Baseline emissions in year y (tCO_2e/yr)

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

According to ACM0002 (Version 12.3.0), the project emissions are taken as zero, and no leakage emissions are considered.

Thus:

$$ER_y = BE_y = EG_{PJ,y} \cdot EF_{grid,CM,y} = EG_{facility,y} \cdot EF_{grid,CM,y} = (EG_{out,y} - EG_{in,y} - EG_{backup,y}) \cdot EF_{grid,CM,y} \quad \text{(B.13)}$$

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

Data / Parameter:	EG_y
Data unit:	kWh
Description:	Power Generation in each province of NCPG

Source of data used:	*China Electric Power Yearbook 2008-2010*
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	*China Electric Power Yearbook* is published by the editorial board of China Electric Power Yearbook, it is authorized.
Any comment:	Uncertainty level of data is low.

Data / Parameter:	Rate of auxiliary power
Data unit:	%
Description:	Self- consumption rate of electricity in each province of NCPG
Source of data used:	*China Electric Power Yearbook 2008-2010*
Value applied:	See annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	*China Electric Power Yearbook* is published by the editorial board of China Electric Power Yearbook, it is authorized.
Any comment:	Uncertainty level of data is low.

Data / Parameter:	Installed Capacity
Data unit:	kW
Description:	Installed capacity in each province of NCPG
Source of data used:	*China Electric Power Yearbook 2008-2010*
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	*China Electric Power Yearbook* is published by the editorial board of China Electric Power Yearbook, it is authorized.
Any comment:	Uncertainty level of data is low.

Data / Parameter:	$EF_{coal, Adv,y}$
Data unit:	tCO2/MWh
Description:	The emission factor of the best thermal power technology commercially available.
Source of data used:	"2011 Baseline Emission Factors for Regional Power Grids in China" http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2708.pdf
Value applied:	0.7967
Justification of the choice of data or description of measurement methods and procedures actually applied :	Authoritative government bulletin
Any comment:	Uncertainty level of data is low.

Data / Parameter:	$EF_{Oil,Adv}$
Data unit:	tCO_2/MWh
Description:	The emission factor with the best oil fired power plant technology commercially available.
Source of data used:	"2011 Baseline Emission Factors for Regional Power Grids in China" http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2708.pdf
Value applied:	0.5250
Justification of the choice of data or description of measurement methods and procedures actually applied :	Authoritative government bulletin
Any comment:	Uncertainty level of data is low.

Data / Parameter:	$EF_{gas,Adv}$
Data unit:	tCO_2/MWh
Description:	The emission factor with the best gas fired power plant technology commercially available.
Source of data used:	"2011 Baseline Emission Factors for Regional Power Grids in China" http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2708.pdf
Value applied:	0.3776
Justification of the choice of data or description of measurement methods and procedures actually applied :	Authoritative government bulletin
Any comment:	Uncertainty level of data is low.

Data / Parameter:	$FC_{i,y}$
Data unit:	mass or volume unit
Description:	Amount of fossil fuel type *i* consumed in the project electricity system in year *y*
Source of data used:	*China Energy Statistics Yearbook 2008-2010*
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	*China Energy Statistics Yearbook* is published by China Statistics Press, it is authorized.
Any comment:	Uncertainty level of data is low.

Data / Parameter:	$NCV_{i,y}$
Data unit:	GJ/mass or volume unit
Description:	Net calorific value (energy content) of fossil fuel type *i* in year *y*
Source of data used:	*China Energy Statistics Yearbook 2008- 2010*
Value applied:	See Annex 3
Justification of the	*China Energy Statistics Yearbook* is published by China Statistics Press, it is

choice of data or description of measurement methods and procedures actually applied :	authorized.
Any comment:	Uncertainty level of data is low.

Data / Parameter:	$EF_{CO2,i,y}$
Data unit:	tCO_2/GJ
Description:	CO_2 Emission Factor of fossil fuel type *i* in year *y*
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories (Volume 2, Chapter 1, p1.23)
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC default values at the lower limit of the uncertainty at a 95% confidence interval.
Any comment:	Uncertainty level of data is low.

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

>>

As calculated above, the combined margin emission factor of NCPG is 0.895875tCO_2/MWh.

According to the feasibility study report of the proposed project, the amount of net electricity to be delivered to the grid is 100,263MWh annually, as per formula B.12 in B.6.1,

$BE_y = (EG_{out,y} - EG_{in,y}) * EF_{grid,CM,y}$=89,823 tCO_2.

According to formula B.13, the annual emission reductions due to the proposed project are:
$ER_y=BE_y = (EG_{out,y} - EG_{in,y} - EG_{backup,y})\times EF_{grid,CM,y}$ =100,263MWh*0.895875 tCO_2/MWh =89,823 tCO_2.

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

>>

Renewable crediting period is adopted for the project. The estimation of emission reductions for the first crediting period is calculated as follows:

Table B6-2 Estimation of emission reductions due to the proposed project activity

No.	Year	Estimation of project emission (tCO_2e)	Estimation of baseline emission (tCO_2e)	Estimation of emission reductions (tCO_2e)
1	01/08/2012-31/07/2013	0	89,823	89,823
2	01/08/2013-31/07/2014	0	89,823	89,823
3	01/08/2014-31/07/2015	0	89,823	89,823
4	01/08/2015-31/07/2016	0	89,823	89,823
5	01/08/2016-31/07/2017	0	89,823	89,823
6	01/08/2017-31/07/2018	0	89,823	89,823

7	01/08/2018-31/07/2019	0	89,823	89,823
Total		**0**	628,761	628,761

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

>>

B.7.1. Data and parameters monitored:

>>

Data / Parameter:	$EG_{facility,y}$
Data unit:	MWh/yr
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 based on the data of $EG_{out,y}$, $EG_{in,y}$ and $EG_{backup,y}$.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	100,263MWh
Description of measurement methods and procedures to be applied:	$EG_{facility,y}$ equals to electricity delivered to the NCPG by the proposed project in year y ($EG_{out,y}$) minus the electricity consumed by the proposed project which is imported from the NCPG through the main line ($EG_{in,y}$) and the electricity consumed by the proposed project which is imported from the NCPG through the backup line($EG_{backup,y}$). The data will be measured continuously, recorded monthly, and archived in electronic version for crediting period+2yrs.
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	$EG_{out,y}$
Data unit:	MWh/yr
Description:	Electricity generation supplied to the NCPG by the proposed project in year y.
Source of data to be used:	Measured by electricity meter on the project site.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	100,263MWh
Description of measurement methods and procedures to be applied:	The data will be measured continuously, recorded monthly, and archived in electronic version for crediting period+2yrs.
QA/QC procedures to be applied:	According to the national standard, the meter will be calibrated annually. Cross check measurement results with records for sold electricity
Any comment:	Uncertainty level of data is low.

Data / Parameter:	$EG_{in,y}$
Data unit:	MWh/yr
Description:	Electricity consumed by the proposed project which is imported from the NCPG through the main line in the year y.
Source of data to be used:	Measured by electricity meter on the project 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 measured continuously, recorded monthly, and archived in electronic version for crediting period+2yrs.
QA/QC procedures to be applied:	According to the national standard, the meter will be calibrated annually. Cross check measurement results with records for bought electricity
Any comment:	Uncertainty level of data is low.

Data / Parameter:	$EG_{backup,y}$
Data unit:	MWh
Description:	The electricity consumed by the proposed project which is imported from the backup line.
Source of data to be used:	Measured by electricity meter on the project 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 measured continuously, and archived in electronic version for crediting period+2yrs.
QA/QC procedures to be applied:	According to the national standard, the meter will be calibrated annually. Cross check measurement results with records for bought electricity
Any comment:	Uncertainty level of data is low

B.7.2. Description of the monitoring plan:

>>

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

1. Monitoring objects

As the baseline emission factor has been ex-ante calculated, the main monitoring objects are the electricity delivered to the grid, electricity consumed by the proposed project which is imported from the NCPG and the net electricity delivered by the proposed project to the NCPG in year y. Meanwhile,

the installation capacity, meter's calibration and QA/QC procedure would also be in the scope of the monitoring.

2. Monitoring organization

The monitoring of the emission reductions will be carried out according to Figure B7-1 below.

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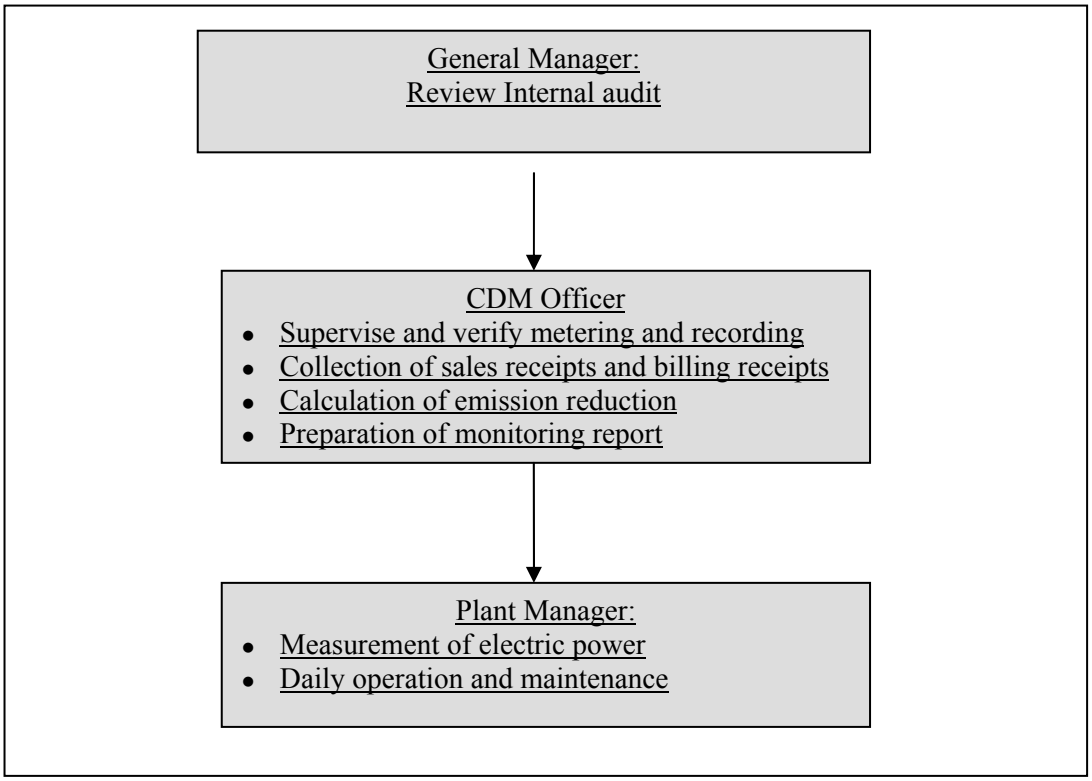
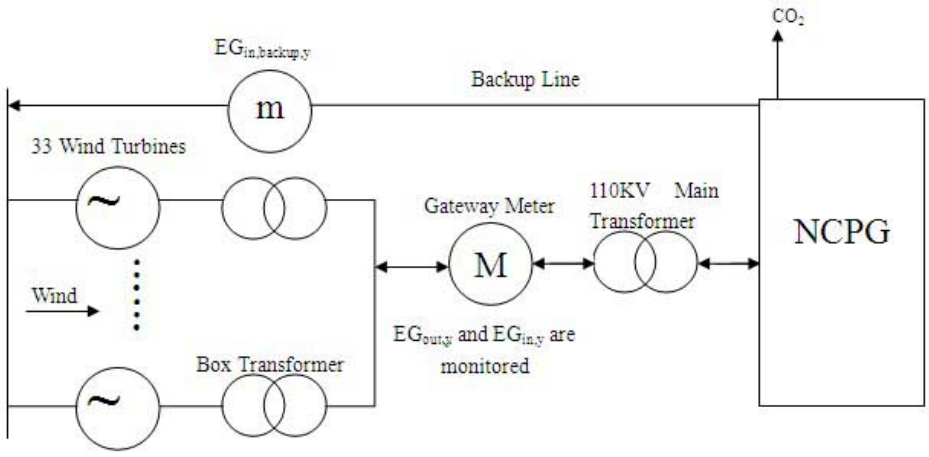


FigureB7-1: The personnel structure of the project monitoring

Plant manager of wind farm will collect the information and data required by the Monitoring Plan. The collected information will be documented and sent to the CDM officer monthly. The CDM officer will be in charge of the implementation of the Monitoring Plan and report to the General Manager of the company. The General Manager of the company will make the confirmations on monitoring calculation data and reports.

3. Monitoring equipment and installation

A bi-directional gateway meter will be installed on project site for monitoring the electricity delivered to the grid and the electricity consumed through the main line. The accuracy of the gateway meter is 0.5. Meanwhile, for the safe operation of the project, a backup line will be connected for the emergency. A backup-line meter with the accuracy of 1.0 will be installed to measure the electricity imported through the backup line. Electricity meters will be installed in accordance with *Technical Administrative Code of Electric Energy Metering* (DL/T448-2000). And annual calibration will be carried out by the qualified metrological verification organization according to the *Verification Regulation of Electrical Energy Meters with Electronics* (JJG 596-1999).



The net electricity delivered by the proposed project to the NCPG is determined as follows:
$EG_{facility,y} = EG_{out,y} - EG_{in,y} - EG_{backup,y}$

4. Calibration of Meters & Metering and the emergency procedure

In order to guarantee the precision of the meters, periodical calibration and maintenance should be performed complying with the related standards and regulations of the national power sector.

After the occurrence of the conditions below, the meters shall be tested by the designated institute commissioned by the project owner and the power grid company together:

a. the error of the meter is out of the permissible limits
b. maintenance of the meters due to the faults of the meters' components

Once the above conditions occur, the line loss and the net electricity sent to the grid will be estimated by the project owner and the power grid company; otherwise, a conservative and reasonable methods agreed by both parties will be adopted.

5 Quality Assurances and Quality Control

The quality assurance and quality control procedures for recording, maintaining and archiving data shall be improved as part of this CDM project activity. This is an on-going process which will be ensured through the CDM mechanism in terms of the need for verification of the emissions on an annual basis according to this PDD and the CDM manual.

6. Data Management System

All monitoring data and records will be archived in electronic documents as well as in paper. The project owner will also keep the copies of sale receipts. The monitored data will be kept during the whole crediting period and 2 years after.

7. Training Program

Before the operation of proposed project, the project owner has gave the staffs a training which included project monitoring, the operation rules, quality controlling and management standard, data recording and archiving, etc..

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 application of the baseline study and monitoring methodology:
08/03/2012

Name of the person and entity determining the baseline and monitoring methodology:
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Guohua Resourceful (Rongcheng) Wind Power Generation Co., Ltd. is a project participant of the proposed project, while Beijing Keji Consulting Ltd. is not.

SECTION C. Duration of the project activity / Crediting period

>>

C.1 Duration of the project activity:

>>

C.1.1. Starting date of the project activity:

>>

01/12/2009 (The date on which Wind Turbine Purchase Contract was signed)

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:

>>

01/08/2012(or the date on which a complete request for registration is submitted, whichever is earlier)

C.2.1.2. Length of the first crediting period:

>>

7years

C.2.2. Fixed crediting period:

>>
Not applicable

C.2.2.1. Starting date:

>>
Not applicable

C.2.2.2. Length:

>>
Not applicable

SECTION D. Environmental impacts

>>

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

>>
In accordance with relevant laws and regulations on environmental protection, an Environmental Impact Assessment (EIA) of the proposed project has been implemented. The results of the EIA have been approved by the Environmental Protection Bureau of Shandong Province.

The main environmental impacts of the proposed project are summarised as follows:

1. Impact of noise
The noise comes mainly from the construction of the proposed project. To solve this problem the project owner will mainly do the following work. Firstly, they will reduce the noise by choose machines with low noise. Secondly, in the areas near villages and schools, the machines with high noise will be used only during the construction phase and the operating time of those machines will be controlled. This kind of high noise machines will also be arranged far from people's living areas to reduce the noise affection

When the wind-farm is put into operation, the noise is mainly from the turbines. The noise is around 57dB in the wind turbine tower foundation, which is far lower than the standard value in specifications for the design of noise control system in industrial enterprises. Furthermore, the nearest village is 250m far away. Therefore, noise will not cause big impact to nearby residents.

2. Impact of waste residue
Waste residue during construction period is mainly the construction material. It should be removed once generated and disposed promptly to avoid the impact on the environment.
During operation period, waste residual is mainly the domestic garbage and overhaul garbage, whose impact on the environment could be reduced by dumping at designated site and disposing centrally.

3. Impact of sewage
The sewage is mainly the domestic sewage. Since the quantity is small, it could volatilize after treatment, so the impact is neglected.

4. Impact of Dust
During construction period, dust may be generated during the earth excavation and the traffic moving, which could give rise to air pollution. So, it will be strictly controlled through regular watering and other measures. And this impact could disappear once the construction is finished.

5. Main Ecological Impacts

The vegetation in the area where the proposed project located is very sparse and there is no rare endangered species, so the project construction has little impact on the diversity of local fauna and flora. There maybe some negative impact on the soil conservation. On the basis of the geomorphology, natural environment and construction method, and with the aim of reducing the negative impact, the project owner has framed a series of measures to optimize the construction and take measures to recover the vegetation.

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

>>

According to the results of EIA and the reply from the Environmental Protection Bureau of Shandong Province, the impact on the environment is not significant.

SECTION E. Stakeholders' comments

>>

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

>>

In order to invite local residents' comments, the project owner conducted a survey by ways of sending questionnaires to villagers living around the project site. 30 questionnaires were sent out and all of them were collected back, the collection rate is 100% and all of them are valid. So the valid questionnaires are 30.

An invitation notice for stakeholder comments was issued by the project developer on 13/12/2008, several representatives of local stakeholders, including governmental officials of local county and local residents, etc attended the meeting on 13/12/2008 to discuss the questionnaires collected and further introduce the project. No negative opinion on construction of the project is heard and environmental considerations expressed by stakeholders are discussed on the meeting.

E.2. Summary of the comments received:

>>

The data of the survey is showed in Table E-1

Table E-1 Summary of people's comments

NO.	Questions	Option	Ratio (%)
1	How much do you know about wind power projects and the proposed project?	A lot	33.3
		A little	66.7
		Nothing	0
2	What is the positive effect of the project construction on local economic growth?	A lot	96.7
		A little	3.3
		Nothing	0
3	What is the impact that the proposed project will have on your livelihood?	Beneficial	20
		Disadvantageous	0
		No impact	80
4	How do you think of the project site?	Resonable	90
		Unreasonable	0
		No matter	10
5	What is the effect of the project construction on local environment?	Beneficial	43.3
		Disadvantageous	0
		No impact	56.7
6	Do you support the project construction?	Yes	96.7
		No	0
		No matter	3.3

To sum up, most of the local residents knew about wind power projects and all of them held positive and supportive attitude towards the construction of the proposed project. They hope that the proposed project can be put into operation as soon as possible.

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

>>

Both local residents and government are supportive to the proposed project. According to the comments received from the stakeholders, it is not necessary now to adjust the construction and operation of the proposed project.

Annex 1

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

>>

There is no public funding from *UNFCCC* Annex 1 countries for the proposed project.

Annex 3

BASELINE INFORMATION

>>

1. Calculation of Operating Margin (*OM*) Emission Factor

Table 3-1 Calculate 2007 CO_2 emissions from fossil fired power generation of NCPG

Fuel Type	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Subtotal	Carbon Content	Combustion Emission Factor	Average Low Electricity Generation	CO_2 emissions (tCO_2e)
									(tc/TJ)	($kgCO_2/TJ$)	($MJ/t,km^3$)	L=G×J×K/100000 (mass unit)
		A	B	C	D	E	F	**G=A+B+C +D+E+F**	H	J	K	L=G×J×K/10000 (volume unit)
Raw coal	10^4t	816,17	1753.99	7716.13	7510.06	10434.25	11884.83	**40115.43**	25.8	87,300	20,908	732,214,267
Cleaned Coal	10^4t						18.43	**18.43**	25.8	87,300	26,344	423,859
Other washed coal	10^4t	5.76		156.89	478.81	48.57	756.84	**1446.87**	25.8	87,300	8,363	10,563,452
Briquette	10^4t	7.93					42.86	**50.79**	26.6	87,300	20,908	927,054
Coke	10^4t			0.02			4.09	**4.11**	29.2	95,700	28,435	111,843
Coke oven gas	10^8m^3	0.07		3.13	25.46	2.58	13.61	**45.57**	12.1	37, 300	16,726	2,843,020
Other coal gas	10^8m^3	11.8		88.38	72.8	28.17	29.64	**238.39**	12.1	37, 300	5,227	4,647,821
Crude oil	10^4t							**0**	20	71,100	41,816	0
Gasoline	10^4t			0.01				**0.01**	18.9	67,500	43,070	291
Diesel	10^4t	0.33		2.35		0.62	5.08	**8.38**	20.2	72,600	42,652	259,490
Fuel oil	10^4t	4.74		0.18			.2.35	**7.27**	21.1	75,500	41,816	229,522
LPG	10^4t							**0**	17.2	61,600	50,179	0
Refinery gas	10^4t	0.06		2.85			1.65	**4.56**	15.7	48,200	46,055	101,225
Natural gas	10^8m^3	5.03	0.73		0.54	4.22	0.01	**10.53**	15.3	54,300	38,931	2,225,993
Other oil products	10^4t	1.72						**1.72**	20	72,200	41,816	51,929
Other coal chemicals	10^4t	4.74						**4.74**	25.8	95,700	28,435	128,986
Other energy	10^4tce	11.94		77.25	360.26	30.75	163.48	**643.68**	0	0	0	0
											Subtotal	754,728,750

Data source：China Energy Statistical Yearbook of 2008

Table 3-2 2007 Electricity generation from fossil fired power generation of NCPG

Province	Electricity Generation	Self-use Electricity Rate	Electricity Supply
	（MWh）	（%）	（MWh）
Beijing	22,300,000	7.51	20,625,270
Tianjin	39,900,000	6.53	37,294,530
Hebei	163,300,000	6.67	152,407,890
Shanxi	173,400,000	7.99	159,545,340
Inner Mongolia	180,100,000	7.77	166,106,230
Shandong	259,100,000	7.23	240,367,070
Total	838,100,000		776,346,330

Data source: *China Electric Power Year Book of 2008*

Table 3-3 Operating Margin (*OM*) of NCPG in 2007

Power transferred from the Northeast China Power Grid(MWh)	1,789,750
The OM emission factor of Northeast China Power Grid (tCO_2e/MWh)	1.08186
Power transferred from the Central China Power Grid(MWh)	803,000
The OM emission factor of Central China Power Grid (tCO_2e/MWh)	1.10197
Power supplied by NCPG（MWh）	776,346,330
CO_2 emission by NCPG (tCO_2)	754,731,124
Total power supplied by NCPG（MWh）	778,939,080
Total CO_2 emission by NCPG (tCO_2)	757,549,895
SimpleOM of NCPG(tCO_2e/MWh)	0.97254

Data sources: China Electric Power Yearbook 2008 China Electric Power Yearbook 2008

Table 3-4 Calculate 2008 CO_2 emissions from fossil fired power generation of NCPG

Fuel Type	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Subtotal	Carbon Content	Combustion Emission Factor	Average Low Electricity Generation	CO_2 emissions (tCO_2e)
									(tc/TJ)	($kgCO_2/TJ$)	($MJ/t,km^3$)	L=G×J×K/100000 (mass unit)
		A	B	C	D	E	F	**G=A+B+C +D+E+F**	H	J	K	L=G×J×K/10000 (volume unit)
Raw coal	10^4t	755.75	1800.12	7353.33	7854.39	12607.82	12360.75	**42732.16**	25.8	87,300	20,908	779,976,613
Cleaned Coal	10^4t						23.88	**23.88**	25.8	87,300	26,344	549,200
Other washed coal	10^4t	5.05		134.52	582.39	66.2	691.21	**1479.37**	25.8	87,300	8,363	10,800,731
Briquette	10^4t	5.66			32.49		45.38	**83.53**	26.6	87,300	20,908	1,524,647
Coke	10^4t			0.02			6.07	**6.09**	29.2	95,700	28,435	165,723
Coke oven gas	10^8m^3	0.11	0.86	8.37	24.55	3.55	16.2	**53.64**	12.1	37,300	16,726	3,346,491
Other coal gas	10^8m^3	10.4	9.08	187.54	36	34.32	29.76	**307.1**	12.1	37,300	5,227	5,987,440
Crude oil	10^4t					0.02		**0.02**	20	71,100	41,816	595
Gasoline	10^4t							**0**	18.9	67,500	43,070	0
Diesel	10^4t	0.15		3.08		0.35		**3.58**	20.2	72,600	42,652	110,856
Fuel oil	10^4t	2.56		0.25				**2.81**	21.1	75,500	41,816	88,715
LPG	10^4t			2.93				**0**	17.2	61,600	50,179	0
Refinery gas	10^4t	0.44			0.97	2.12		**3.37**	15.7	48,200	46,055	74,809
Natural gas	10^8m^3	11.09	0.7					**14.88**	15.3	54,300	38,931	3,145,563
Other oil products	10^4t	1.45						**1.45**	20	72,200	41,816	43,777
Other coal chemicals	10^4t	7.97		7.61				**15.58**	25.8	95,700	28,435	423,968
Other energy	10^4tce	4.9	2.34	61.02	466	63.72	141.71	**739.69**	0	0	0	0
											Subtotal	806,239,126

Data source：China Energy Statistical Yearbook of 2009

Table 3-5 2008 Electricity generation from fossil fired power generation of NCPG

Province	Electricity Generation	Self-use Electricity Rate	Electricity Supply
	（MWh）	（%）	（MWh）
Beijing	24,300,000	7.14	22,564,980
Tianjin	39,700,000	7.05	36,901,150
Hebei	158,000,000	6.9	147,098,000
Shanxi	176,200,000	8.22	161,716,360
Inner Mongolia	200,800,000	7.96	184,816,320
Shandong	268,900,000	7.14	249,700,540
Total	867,900,000		802,797,350

Data source: *China Electric Power Year Book of 2009*

Table 3-6 Operating Margin (*OM*) of NCPG in 2008

Power transferred from the Northeast China Power Grid(MWh)	5,286,140
The OM emission factor of Northeast China Power Grid (tCO_2e/MWh)	1.10489
Power supplied by NCPG（MWh）	802,797,350
CO_2 emission by NCPG (tCO_2)	806,239,126
Total power supplied by NCPG（MWh）	808,083,490
Total CO_2 emission by NCPG (tCO_2)	812,079,707
SimpleOM of NCPG(tCO_2e/MWh)	1.00495

Data sources: China Electric Power Yearbook 2009 China Electric Power Yearbook 2009

Table 3-7 CO_2 Emissions from Fuel-fired Power Plants of NCPG in 2009

Fuel types	Unit	Beijing	Tianjing	Hebei	Shanxi	Inner Mongolia	Shandong	Subtotal	Emission factor	Oxidation factor	Fuel emission factor	NCV	CO_2 emission (tCO_2e)
									（tc/TJ）	（%）	($kgCO_2/TJ$)	（$MJ/t,km^3$）	L=G×J×K/100000 (Mass unit)
		A	B	C	D	E	F	G=A+B+C+D+E	H	I	J	K	L=G×J×K/10000 (Volume unit)
Raw coal	10^4t	665.16	1870.36	7623.94	8024.02	12538.57	12654.05	**43376.1**	25.8	100	87,300	20,908	791,730,246
Cleaned coal	10^4t						11.7	**11.7**	25.8	100	87,300	26,344	269,080
Other washed coal	10^4t	6.15		247.51	586.04	104.69	862.02	**1806.41**	25.8	100	87,300	8,363	13,188,417
Briquettes	10^4t	3.73					31.83	**35.56**	26.6	100	87,300	20,908	649,065
Coke	10^4t						10.43	**10.43**	29.2	100	95,700	28,435	283,824
Coke oven gas	$108m^3$	0.13	1.27	8.72	19.48	3.35	11.69	**44.64**	12.1	100	37,300	16,726	2,784,999
Other coal gas	10^8m^3	10.23	13.43	228.32	35.89	48.35	37.21	**373.43**	12.1	100	37,300	5,227	7,280,656
Crude oil	10^4t					0.13		**0.13**	20	100	71,100	41,816	3,865
Gasoline	10^4t						0.01	**0.01**	18.9	100	67,500	43,070	291
Diesel	10^4t	0.1		2.38		2.64	3.07	**8.19**	20.2	100	72,600	42,652	253,606
Fuel oil	10^4t	0.82		0.19		0.02	2.63	**3.66**	21.1	100	75,500	41,816	115,550
LPG	10^4t							**0**	17.2	100	61,600	50,179	0
Refinery gas	10^4t	0.83		3.95			3.44	**8.22**	15.7	100	48,200	46,055	182,472
Natural gas	10^8m^3	13.55	0.63		4.39	2.03	0.03	**20.63**	15.3	100	54,300	38,931	4,361,086
Other oil products	10^4t	1.52					23.18	**24.7**	20	100	72,200	41,816	745,721
Other coal chemicals	10^4t	6.62		7.79			5.52	**19.93**	25.8	100	95,700	28,435	542,341
Other energy	10^4tce		2.11	62.14	570.3	90.63	137.68	**862.86**	0	0	0	0	0
												Subtotal	822,391,221

Data sources: *China Energy Statistical Yearbook 2010*

Table 3-8 Fuel-fired Power Generation of NCPG 2009

Name of the province	Generation	Rate of electricity used by factory	Power Supply
	MWh	%	MWh
Beijing	24,100,000	6.55	22,521,450
Tianjing	41,300,000	6.8	38,491,600
Hebei	173,300,000	6.92	161,307,640
Shanxi	185,000,000	8.1	170,015,000
Inner Mongolia	213,500,000	7.82	196,804,300
Shandong	285,800,000	7.43	264,565,060
Total	923,000,000		853,705,050

Data sources: *China Electric Power Yearbook 2010*

Table 3-9 Calculation on Simple OM Emission Factor of NCPG in 2009

Electricity imported from NEPG to NCPG	6,982,610 MWh
Simple OM of NEPG	1.06915
Total emission amount in NCPG	829,856,644
Total power supply in NCPG	860,687,660 MWh
Emission factor in NCPG	0.96418 tCO_2/MWh

Data sources: *China Electric Power Yearbook 2010*，*China Energy Statistical Yearbook 2010*

Weighted Average Emission Factor of 3 years: 0.9803tCO_2/MWh

2. Information of Build Margin

Table3-10 Calculate the proportions of CO_2 emissions of power generation used solid, liquid and gaseous fuels in the total emissions

Fuel types	Unit	Beijing	Tianjing	Hebei	Shanxi	Inner Mongolia	Shandong	Subtotal	NCV	Emission factor ($kgCO_2/TJ$)	Oxidation factor	CO_2 emission (tCO_2e)
		A	B	C	D	E	F	G=A+…+F	H	I	J	K=G×H×I×J/100,000
Raw coal	10^4t	665.16	1,870.36	7,623.94	8,024.02	12,654.05	12,538.57	43,376.10	20,908	87,300	1	791,730,246
Cleaned coal	10^4t	0	0	0	0	11.7	0	11.70	26,344	87,300	1	269,080
Other washed coal	10^4t	6.15	0	247.51	586.04	862.02	104.69	1,806.41	8,363	87,300	1	13,188,417
Briquette	10^4t	3.73	0	0	0	31.83	0	35.56	20,908	87,300	1	649,065
Coke	10^4t	0	0	0	0	10.43	0	10.43	28,435	95,700	1	283,824
Other Coking Products	10^4t	6.62	0	7.79	0	5.52	0	19.93	28,435	95,700	1	542,341
Total								0.00				806,662,974
Crude oil	10^4t	0	0	0	0	0	0.13	0.13	41,816	71,100	1	3,865
Gasoline	10^4t	0	0	0	0	0.01	0	0.01	43,070	67,500	1	291
Diesel	10^4t	0.1	0	2.38	0	3.07	2.64	8.19	42,652	72,600	1	253,606
Fuel oil	10^4t	0.82	0	0.19	0	2.63	0.02	3.66	41,816	75,500	1	115,550
Other oil products	10^4t	1.52	0	0	0	23.18	0	24.7	41,816	72,200	1	745,721
Total								0				1,119,034
Natural gas	10^7m^3	135.5	6.3	0	43.9	0.3	20.3	206.3	38,931	54,300	1	4,361,086
Coke oven gas	10^7m^3	1.3	12.7	87.2	194.8	116.9	33.5	446.4	16,726	37,300	1	2,784,999
Other coal gas	10^7m^3	102.3	134.3	2283.2	358.9	372.1	483.5	3734.3	5,227	37,300	1	7,280,656
LPG	10^4t	0	0	0	0	0	0	0	50,179	61,600	1	0
Refinery gas	10^4t	0.83	0	3.95	0	3.44	0	8.22	46,055	48,200	1	182,472
Total	*10^4t*											14,609,213
Total												822,391,221

Data source：China Energy Statistical Yearbook of 2010

According to the above calculation，$\lambda_{Coal,y}$ =98.08%，$\lambda_{Oil,y}$ =0.14%，$\lambda_{Gas,y}$ =1.78%

Table 3-11 Commercialized optimal efficency and emission factors of coal, oil and gas fired powern generation

	Power supply efficiency	$COEF_{Fuel}$ ($kgCO_2/TJ$)	OXID	Emission factor (tCO_2/MWh)
	A	B	C	D=3.6/A/1,000,000×B×C
Coal-fired power technology	39.45%	87,300	1	0.7967
Oil-fired power technology	51.77%	75,500	1	0.5250
Gas-fired technology	51.77%	54,300	1	0.3776

$$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y}$$
$$= 0.7889 \text{ tCO}_2/\text{MWh}$$

Table 3-12 Installed Capacity of the NCPG 2009

Installed capacity	Unit	Beijing	Tianjing	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Fire power	MW	5,120	10,030	35,140	39,150	48,300	58,860	196,600
Hydro power	MW	1,050	10	1,790	1,610	830	1,060	6,350
Nuclear power	MW	0	0	0	0	0	0	0
Wind power and other	MW	50	0	1,360	120	6,420	860	8,810
Total	MW	6,220	10,040	38,290	40,880	55,550	60,780	211,760

Data sources: *China Electric Power Yearbook 2010*

Table 3-13 2008 installed capacity of NCPG

Installed capacity	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Fossil-fired power	MW	4,760	7,490	29,870	35,250	45,740	55,930	179,040
Hydropower	MW	1,050	0	1,540	790	830	1,050	5,260
Nuclear power	MW	0	0	0	0	0	0	0
Wind power and etc.	MW	0	0	700	0	2,300	370	3,370
Total	MW	5,810	7,490	32,110	36,040	48,860	57,350	187,660

Data source: *China Electric Power Year Book of 2009*

Table 3-14 2007 installed capacity of NCPG

Installed capacity	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Fossil-fired power	MW	3,900	6,920	29,020	30,950	39,870	54,140	164,800
Hydropower	MW	1,050	10	780	790	830	1,050	4,510
Nuclear power	MW	0	0	0	0	0	0	0
Wind power and etc.	MW	2.7	0	410	0	1,096.5	210	1,719.2
Total	MW	4,952.7	6,930	30,210	31,740	41,796.5	55,400	171,029.2

Data source: *China Electric Power Year Book of 2008*

Table 3-15 BM Calculation of the NCPG

	Installed capacity 2007	Installed capacity 2008	Installed capacity 2009	New added installed capacity 2007-2009[1]	New added installed capacity 2008-2009[2]	The fraction of newly added installed capacity
	A	B	C	D	E	F
Fire power	164,800	179,040	196,600	39,270	21,422	81.46%
Hydro power	4,510	5,260	6,350	1,849	1,090	3.84%
Nuclear power	0	0	0	0	0	0.00%
Wind power	1,719.2	3,370	8,810	7,091	5,440	14.71%
Total	171,029.2	187,660	211,760	48,210	27,952	100.00%
The fraction of installed capacity 2009				22.77%	13.20%	

Note 1 and Note 2: The new added installed capacity is calculated after considering the installed capacity, the capacity of shut down units and the installed capacity of pumped storage units.

$EF_{BM,y}$=0.7889×81.46%=0.6426 tCO_2/MWh

Annex 4

MONITORING INFORMATION

>>
There is no more information.