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

CONTENTS

Annexes

SECTION A. General description of project activity

A.1. Title of the project activity:

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Shandong Wendeng Zhangjiachan Wind Farm Project
Version number of the document: 2
Date: 02/12/2011

Version history of the PDD

Version number	Date	Nature of revision(s)
1	02/04/2011	Completed version of the PDD, prepared for GSP process.
2	02/12/2011	Revised according to the validation by DOE.

A.2. Description of the project activity:

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Shandong Wendeng Zhangjiachan Wind Farm Project (hereinafter referred to as the proposed project) is to utilize wind resources for electricity generation through the construction of a wind farm with a total capacity of 49.3MW in Wendeng City, Shandong Province, P. R. China. The electricity generated from the project will be sold to North China Power Grid (NCPG). The proposed project will achieve obvious greenhouse gas (GHG) emission reductions through the displacement of electricity delivered by NCPG which is a fossil-fuel dominated grid.

The purpose of the proposed project is to generate wind power and deliver it to NCPG. For the proposed project,

(a) Prior to the start of implementation of the project activity, there is no power generation unit at the site of the proposed project, and the electricity is supplied by the NCPG which is dominated by fossil fuel-fired power plants.
(b) The project scenario is the implementation of the proposed project, the installation and operation of 58 sets of wind turbines with a total capacity of 49.3MW which will supply an average annual amount of 90,997MWh to NCPG and replace the same amount of electricity generated by fossil fuel-fired power plants connected to NCPG. According to ACM0002 applied, the proposed project is an electricity generating activity.
(c) The baseline scenario of the proposed project is the electricity supply of equal amount as the proposed project from the NCPG. The baseline scenario of the proposed project is the same as the scenario prior to the start of the implementation of the project activity.

The proposed project is located in Wendeng City, Shandong Province, P. R. China. The proposed project involves the installation of 58 wind turbines with capacity of 850 kW each, which amount to a total installed capacity of 49.3MW. The proposed project is constructed and operated by Wendeng Zhangjiachan Wind Power Co., Ltd.. The estimated annual net electricity generation and average annual emission reductions of the proposed project are 90,997MWh and 84,709 tCO_2e, respectively.

The proposed project makes contribution to the local sustainable development as follows:

1. GHG emission reduction
The proposed project activity will achieve obvious GHG emission reductions by avoiding CO_2 emissions, as grid-connected fossil fuel-fired power dominates in the NCPG.

2. Pollutants emission reduction through replacing fossil fuel combustion
The proposed project is to replace grid-connected fossil fuel-fired power plants in the NCPG, and thus reduce fossil fuel consumption and avoid pollutants emission, such as sulfur dioxide and dust, brought by fossil fuel combustion. Therefore, the proposed project has obvious environmental benefits.

3. Employment opportunities
The implementation of the proposed project will offer job opportunities for local people during both the construction and operational period.

4. Economic development
The region can achieve economic growth and booming of local tourism through the construction and operation of the project. Furthermore, the project will contribute to local government with more tax revenues

A.3. Project participants:

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Please list project participants and Party(ies) involved and provide contact information in Annex 1. Information shall be in indicated using the following tabular format.

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)
People's Republic of China (host)	Wendeng Zhangjiachan Wind Power Co., Ltd.	No
France[1]	EDF Trading Ltd	No

(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party (ies) involved is required.

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:

[1] EDF Trading Ltd was registered in United Kingdom, but applied for the French Letter of Approval for the proposed project.

A.4.1.1. Host Party(ies):

>>
People's Republic of China

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

>>
Shandong Province

A.4.1.3. City/Town/Community etc:

>>
Wendeng 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 at Wendeng City, Shandong Province, P. R. China. The geographical coordinates of the proposed project is from 122.051944 E to 122.155278 E, and from 37.093611 N to 37.181667 N. The central geographical coordinate of the proposed project is 122.103611 E, 37.137639 N. Figures A1 and A2 show the geographical location of the proposed project.

Figure A1. The proposed project on the map of P. R. China

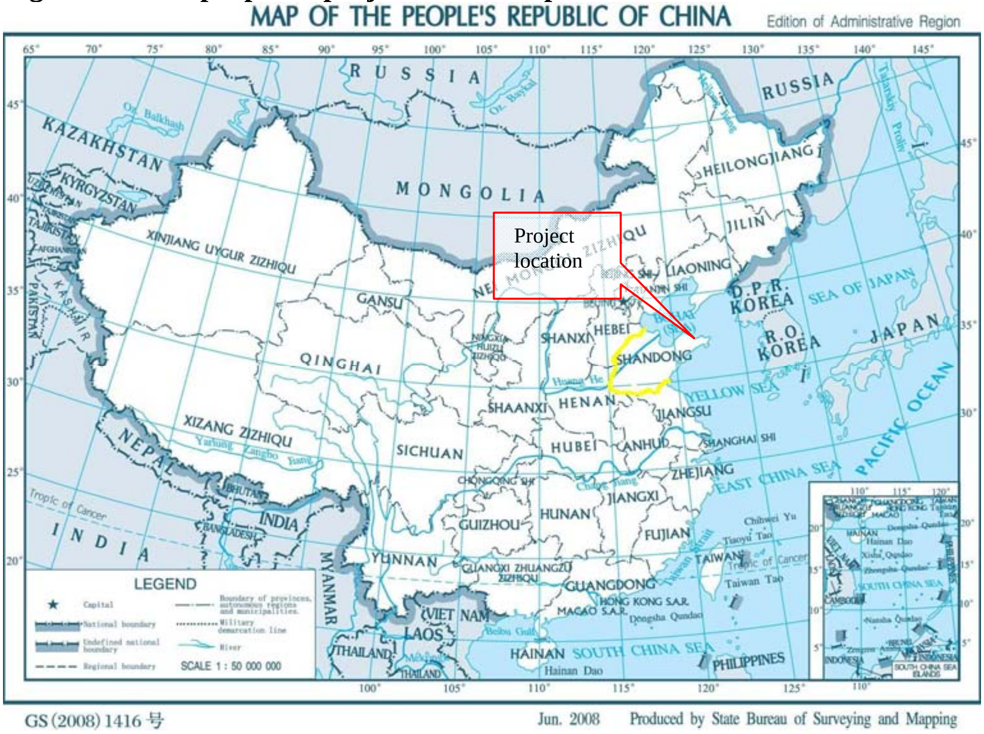

Figure A2. The proposed project on the map of Shandong Province and Wendeng City

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 proposed project is to utilize wind resources for electricity generation in Wendeng City, Shandong Province, P. R. China. The proposed project is a grid-connected renewable energy project.

Prior to the start of implementation of the project activity, there is no power generation unit at the site of the proposed project, and the electricity was supplied by the NCPG. The baseline scenario of the proposed project is providing the same electricity service as the proposed project by NCPG which is dominated by the fossil-fuel fired power plants.

The proposed project involves the installation of 58 wind turbines with capacities of 850kW each, which amount to a total installed capacity of 49.3MW. The estimated power output is 90,997MWh and the plant load factor (PLF) is 21%[2]. The annual operation hour is 1,846h.

The main technical specifications of the wind turbine are provided in the following table[3].

Item	Unit	Index
Rated capacity	kW	850
Number of blades		3
Rotor diameter	m	58
Start up speed	m/s	3
Rated wind speed	m/s	16[4]
Shutoff speed	m/s	23
Height of hub	m	65
Rated voltage of generator	kV	0.69

[2] 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 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 21% according to the Feasibility Study Report (FSR), which is determined by the accredited designing institute i.e. Shandong Industrial Design Institute Co., Ltd. which is the third party contracted by the project participant. In FSR, the plant load factor 21% is calculated with annual operational hours (1,846 hours) divided by the whole hours in a year (8,760 hours). The annual operational hours is calculated with annual power supplied to the grid (90,997MWh) divided by the installed capacity (49.3MW).

[3] The main technical specifications are sourced from Technology Agreement provided by Gamesa Wind (Tianjin) Co., Ltd..

[4] The values of rated wind speed and rated voltage of generator are sourced from Page 61 of Feasibility Study Report.

The 110kV substation on the project site will be utilized, which connects the proposed project to the Xijiao 110kV Substation. Then the power produced in the wind farm can be transmitted to the Shandong Power Grid which is part of NCPG. Grid-connected electricity generated by the proposed project will be monitored through metering equipment (meter monitoring both electricity input and electricity output) at the Xijiao 110kV Substation which belongs to the Grid Company.

The proposed project will use foreign wind turbines. Hence, it involves technology transferred to the host party

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

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A crediting period of 7 years (01/03/2012-28/02/2019, renewable twice) is selected for the project activity. An estimation of emissions reductions expected over the crediting period is provided in the table below.

Years	**Annual estimation of emission reductions in tonnes of CO_2e**
01/03/2012-28/02/2013	84,709
01/03/2013-28/02/2014	84,709
01/03/2014-28/02/2015	84,709
01/03/2015-29/02/2016	84,709
01/03/2016-28/02/2017	84,709
01/03/2017-28/02/2018	84,709
01/03/2018-28/02/2019	84,709
Total estimated reductions (tonnes of CO_2e)	592,963
Total number of the first crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	84,709

A.4.5. Public funding of the project activity:

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There is no public funding for this project.

SECTION B. Application of a baseline and monitoring methodology

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

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The approved methodology applied in the proposed project activity is ACM0002 (version 12.2.0) – "Consolidated baseline methodology for grid-connected electricity generation from renewable sources".

Reference:

http://cdm.unfccc.int/methodologies/DB/C505BVV9P8VSNNV3LTK1BP3OR24Y5L

"Tool for the Demonstration and Assessment of Additionality (version 05.2.1)"

Reference:

http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.1.pdf

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

Reference:

http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf

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 installs a new power plant at a site where no renewable power was operated prior to the implementation of the project activity. It meets all applicability conditions of methodology ACM0002 (version 12.2.0) which is listed as follows:

1) The proposed project is a new grid-connected renewable wind power project that installs a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity; and it does not involve capacity addition, retrofit or replacement;
2) The proposed project does not involve switching from fossil fuels to renewable energy at the site of the project activity.

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

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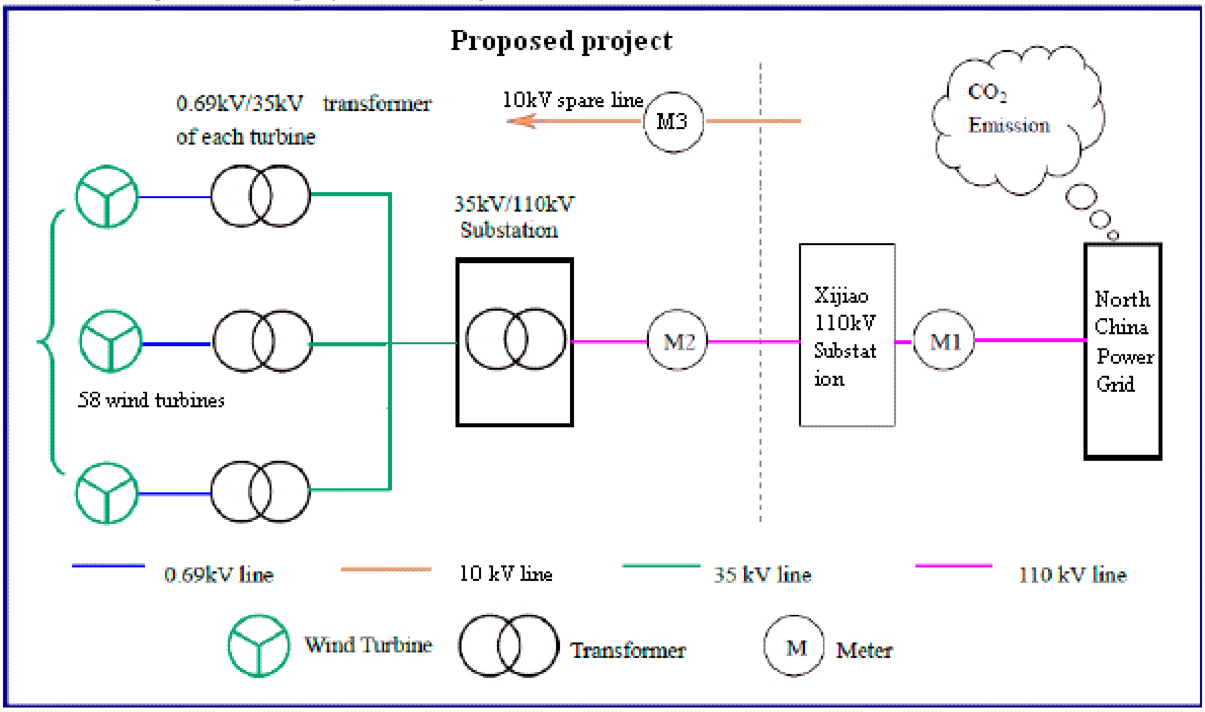
	Source	Gas	Included?	Justification / Explanation
Baseline	Fossil fuel-fired power plants in the NCPG	CO_2	Yes	Major emission sources.
		CH_4	No	Minor emission source.
		N_2O	No	Minor emission source.
Project Activity	The proposed wind power project	CO_2	No	Since the proposed project is a wind power project, it does not involve project emission according to ACM0002.
		CH_4	No	Since the proposed project is a wind power project, it does not involve project emission according to ACM0002.

		N_2O	No	Since the proposed project is a wind power project, it does not involve project emission according to ACM0002.

The spatial extent of the proposed project boundary includes the proposed project power plant and all power plants connected physically to the NCPG.

According to the "Tool to calculate the emission factor for an electricity system" (version 02.2.1), the delineation of grid boundaries as provided by the DNA[5] of China is used. North China Power Grid composed of Beijing, Tianjin, Hebei, Shanxi, Shandong and Inner Mongolia Autonomous Region Power Grids is the project electricity system.

The flow diagram of the project boundary is illustrated as follow:



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 12.2.0), if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline 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".

[5] Source: 2010 Baseline Emission Factors for Power Grids in China

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

Parameters used to determine the baseline emission are listed in the following table:

Parameter	Data	Source
$EF_{grid,OM,y}$ (tCO_2/MWh)	0.9914	Calculated in Annex 3
$EF_{grid,BM,y}$ (tCO_2/MWh)	0.7495	Calculated in Annex 3
$EF_{grid,CM,y}$ (tCO_2/MWh)	0.9309	Calculated in Annex 3

Therefore, supply of equivalent annual power output by the NCPG is the baseline scenario for the proposed project activity.

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 the CDM

The Environmental Impact Assessment (EIA) for this project was carried out by Shandong Academy of Environmental Science in April 2008 and EIA report was approved by Shandong Environmental Protection Bureau on 24/06/2008. The Feasibility Study Report (FSR) was developed by Shandong Industrial Design Institute Co., Ltd in July 2008. Based on the FSR of the proposed project, the project developer found the Project IRR is much lower than the benchmark of 8% without revenue from CERs. The proposed project is thus financially unattractive to investors. Then the project owner decided to seek additional financial support from CDM to make the proposed project financial attraction improved and made investment decision on 12/05/2009. Then, the CDM Consultancy Agreement was signed on 17/10/2009 and the Emission Reductions Purchase Agreement (ERPA) was signed with EDF Trading Ltd on 18/12/2009. The wind turbine contract was signed on 03/02/2010. The prior consideration of CDM form was accepted by EB on 04/02/2010 and accepted by the Chinese DNA on 15/03/2010. The construction work started on 26/02/2010. The Chinese Letter of Approval (LoA) was obtained on 13/06/2011 and the French LoA was obtained on 05/10/2011.

Time	Milestone
April 2008	Environment Impact Assessment (EIA) carried out by Shandong Academy of Environmental Science
24/06/2008	EIA report was approved by Shandong Environmental Protection Bureau
July 2008	Feasibility Study Report (FSR) was completed by Shandong Industrial Design Institute Co., Ltd.
09/12/2008	FSR was approved by Shandong Development and Reform Commission.
12/05/2009	Directorate decision to apply CDM support
17/10/2009	CDM Consultancy Agreement signed between the project owner and Easy Carbon Consultancy Co., Ltd.

18/12/2009	ERPA signed between the project owner and EDF Trading Ltd
03/02/2010	The wind turbine contract signed between the project owner and Gamesa Wind (Tianjin) Co., Ltd. (Project starting date)
04/02/2010	The prior consideration of the CDM form was accepted by EB.
26/02/2010	Construction started
15/03/2010	The prior consideration of the CDM form was accepted by the Chinese DNA.
13/06/2011	The Chinese LoA was obtained.
05/10/2011	The French LoA was obtained.

The additionality of the proposed project is demonstrated and assessed by the approved "Tool for the Demonstration and Assessment of Additionality" (Version 05.2.1). Following steps include:

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

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

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

Identify realistic and credible alternative(s) available to the project participants or similar project developers that provide outputs or services comparable with the proposed CDM project activity.
These alternatives are to include:

1) The proposed project activity undertaken without being registered as a CDM project activity;
2) Construction of a fossil fuel power plant with equivalent amount of annual electricity output;
3) Construction of a power plant using other source of renewable energy with equivalent amount of annual electricity output; and
4) Supply of equivalent annual power supplied to the grid by the Grid to which the proposed project is connected.

The alternative 3) is to construct renewable power plants whose annual power supply is equivalent to the projects. However, due to the undeveloped solar panels manufacturing and purification technology as well as high investment costs for power generation, solar PV[6] is far from being economically attractive. Likewise, geothermal[7] and biomass[8] of the similar installed capacity as the proposed project are alternatives far from being attractive investment in the grid in China. Only hydropower projects have the investment return rate comparable to wind power projects in China. However, the project is located in the coast with a flat topography and there is no exploitable hydropower resource[9]. Hence, Alternative 3) is not a realistic and credible alternative.

[6] Source: http://www.chinanews.com/ny/2011/06-03/3087409.shtml

[7] Source: http://www.in-en.com/newenergy/html/newenergy-1353135317230781.html

[8] Source: Biomass generation needs policy supply due to the high investment cost.
http://news.xinhuanet.com/energy/2009-07/10/content_11674750.htm

[9] http://www.nwqc.gov.cn/xwzy/xwzyshow.asp?id=1640

Sub-step 1b. Consistency with mandatory laws and regulations:
There is large difference between fossil fuel-fired power and wind farm in their annual operating hours and the stability of their operation. However, the average annual utilization hours (4,773 hours)[10] of the fossil fuel plants are larger than the average annual utilization of the project. Thus, the comparable installed capacity of the fossil fuel-fired plants with equivalent annual power supply as the project will be nearly 19 MW, while fossil fuel-fired power plants with a capacity of 135 MW or less are prohibited from development in large grid such as provincial girds[11] according to current regulations in China. Consequently, Alternative 2) is not a realistic and credible alternative.

The alternative 1) and 4) are in line with the existing Chinese laws and regulations.

Step 2. Investment analysis
The purpose of this step is to determine whether the proposed project activity is economically or financially less attractive than other alternatives without an additional funding that may be derived from the CDM project activities. 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* (version 05.2.1) 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 the electricity output, the simple cost analysis (Option I) method is not appropriate. Investment comparative analysis method is only applicable to the case that alternative baseline scenario is similar to the proposed projects, so that comparative analysis can be conducted. The baseline scenario of the proposed project is to supply equivalent annual power output from the NCPG rather than a new investment project. Therefore, the investment comparison analysis (Option II) is not an appropriate method, neither. Out of the simple cost analysis (Option I), the investment comparison analysis (Option II) and the benchmark analysis (Option III), the proposed project will use benchmark analysis method based on total investment IRR.

Sub-step 2b. Apply benchmark analysis (Option III)
With reference to *Interim Rules on Economic Assessment of Electric Engineering Retrofit Projects*[12] ,the financial benchmark return (post-tax) adopted as a guideline for investments in the electric power industry in China is 8% for the Project IRR. Thus, 8% is adopted as the benchmark of the proposed project.

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

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[10] China Electric Power Yearbook 2010, Page 731-732.

[11] 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 (Guo Ban Fa Ming Dian [2002] 6). http://www.gov.cn/gongbao/content/2002/content_61480.htm

[12] Notice on *Interim Rules on Economic Assessment of Electric Engineering Retrofit Projects* issued by state Power Corporation on 10/09/2002 (Guo Dian Fa[2002] 623).

Based on the FSR of the proposed project, basic parameters for calculation of financial indicators are as follows:

Parameter	***Data***	***Data Source***
Installed capacity	49.3 MW	FSR Page 157
Annual output	90,997 MWh	FSR Page 157
Project lifetime	21 years (1 year for construction and twenty years of operation)	FSR Page 157
Total static investment	518.04 million RMB	FSR Page 158
Annual O&M cost	11.19 million RMB (average value)[13]	IRR spreadsheet
Working capital	0.63 million RMB	FSR Page 159
Depreciation year	15 years	FSR Page 159
Depreciation rate	6.4%	FSR Page 160
Tariff	0.61 RMB/kWh (including VAT)	FSR Page 161
Residual value rate	4%	FSR Page 160
Tax rate	17% (Value added tax[14])	Cai Shui [2008]170[15]
	25% (Income tax[16])	FSR Page 161
	4% (Educational surtax[17])	FSR Page 161

[13] In the GSP PDD (version 01) dated on 02/04/2011, the annual O&M cost was 12.36million RMB, which is consistent with the FSR completed in July 2008. However, according to Cai Shui [2008]156 and the *Notice about Implementation of VAT Reform in the Whole Country* Cai Shui [2008]170, which are valid from 01/01/2009, VAT rate of 17% and Tax deduction should be put into consideration. To be conservative, the value of tax deduction has been deducted from the fixed asset investment to calculation the annual, depreciation fees, maintainence fees and insurance fees. Hence, the annual O&M cost has reduced to 11.19 million RMB and the IRR value has changed accordingly.

[14] Source: Notice about Implementation of VAT Reform in the Whole Country (Cai Shui [2008]170)

[15] The FSR was completed in July 2008, according to *Notice of Value Added Tax Policy Regarding Products Using Certain Synthesized Resources and Other Products* Cai Shui [2001]198, the VAT rate 17% should be half levied for the wind power since 2001. Hence, VAT rate of 8.5% was adopted in FSR.

However, Cai Shui [2001]198 was abolished when *Notice of Value Added Tax Policy Regarding Products Using Certain Synthesized Resources and Other Products* Cai Shui [2008]156 was issued on 09/12/2008. As per Cai Shui [2008]156 and the *Notice about Implementation of VAT Reform in the Whole Country* Cai Shui [2008]170, which are valid from 01/01/2009, VAT rate of 17% and Tax deduction should be put into consideration. Thus, VAT rate of 17% was used in the PDD.

[16] Source: The Enforcement Regulation of Business Income Tax Law of PRC, State Council Decree No.521 (http://www.gov.cn/zwgk/2007-12/11/content_830645.htm)

[17] Source: Decree No. 395 of the State Council of the People's Republic (http://www.gov.cn/zwgk/2005-09/27/content_70440.htm); Lucaizong [2005] No.15 (http://www.mlr.gov.cn/tdzt/zxgz/kyqpggs/glwj/201011/t20101123_796932.htm)

	5% (City maintenance and construction tax[18])	FSR Page 161
CER price	10.5Euro/tCO_2e	ERPA

(2) Comparison of IRR for the proposed project and the financial benchmark
In accordance with the benchmark analysis (Option III), the proposed project will not be considered as financially attractive if its financial indicators (such as Project IRR) are lower than the benchmark.

Table 1 shows the IRRs of the proposed project, without CDM-related income. Without CDM-related income, the Project IRR is lower than the benchmark and the proposed project is not financially acceptable.

Table 1. Financial indicators of the Proposed Project

	Project IRR (Total investment, benchmark=8%)
Without CDM-related income	4.40%
With CDM-related income	6.71%

Sub-step 2d. Sensitivity analysis (only applicable to options II and III):

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 financially attractive.

According to "Guidance on the assessment of investment analysis" (version 05)[19], 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, total static investment is chosen for sensitivity analysis. Annual output and tariff are both key parameters to total project revenues. Considering installed capacity times annual operating hour equals to annual power output, both installed capacity and annual operating hours are not selected. The tax rates are deemed relatively stable throughout the project lifetime. So they are not included in sensitivity analysis.

Moreover, as per *Economical Assessment Method and Parameters for Construction Project* (the 3rd edition)[20] in China, the sensitivity analysis could take the variable including the O&M cost, output price and total static investment into the consideration. Since annual O&M cost is an important parameter to total project costs, the annual O&M cost has been included in the sensitivity analysis.

Finally, the parameters (Total static investment, Annual O&M cost, Annual output and Tariff) have

[18] Source: An official document The provisional regulation of city construction tax of PRC (http://www.gxxhcpa.com/Article.asp?id=762)

[19] Source: http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf

[20] *Economical Assessment Method and Parameters for Construction Project* (the 3rd edition) issued by National Development and Reform Commission and Ministry of Construction in 2006, Page 145.

been used in sensitivity analysis, 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:

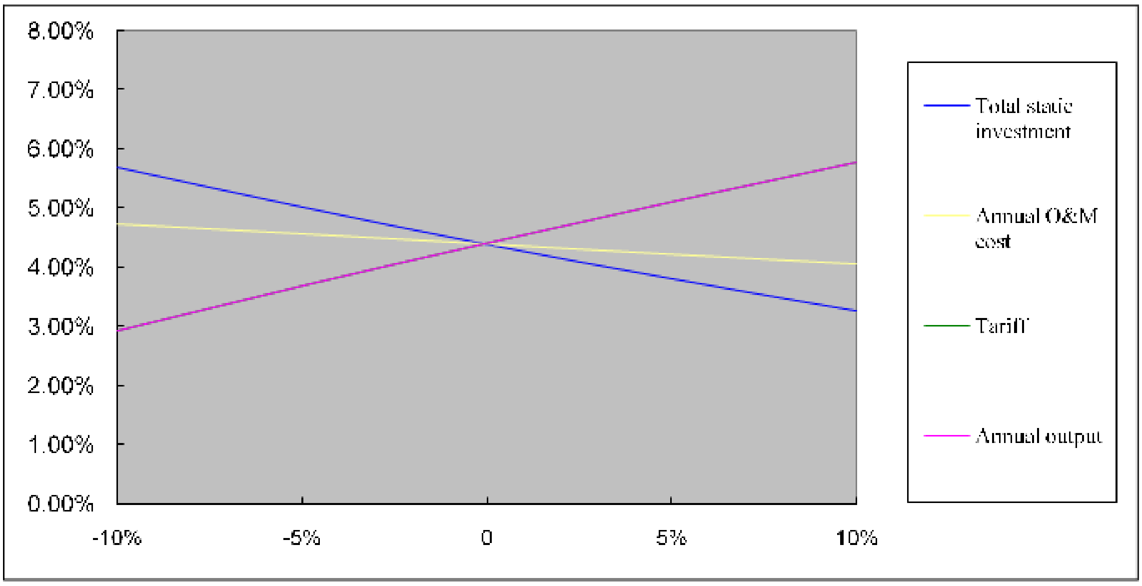
1) Total static investment;
2) Annual O&M cost;
3) Annual output;
4) Tariff

They are fluctuated within the range from -10% to +10% in the FSR and the selection is also in accordance with the Guidance from "Tool for the demonstration and assessment of additionality" (Version 05.2.1). Their impacts on Project IRR of the proposed project were presented in Table 2 and Figure 2.

Table 2. Sensitivity of total investment IRR to different financial parameters

Parameter	Variation Range				
	-10%	**-5%**	**0**	**5%**	**10%**
Total static investment	5.70%	5.03%	4.40%	3.82%	3.28%
Annual O&M cost	4.73%	4.57%	4.40%	4.23%	4.07%
Annual output	2.92%	3.68%	4.40%	5.10%	5.77%
Tariff	2.92%	3.68%	4.40%	5.10%	5.77%

Figure 2. Sensitivity of total investment IRR to different financial parameters



From Table 2 and Figure 2, as the chosen parameters vary within the reasonable range, the project IRR does not surpass the benchmark under any of the assumptions.

Table 3 the fluctuation rates of parameters when the IRR reaches to 8% (without CDM)

Total static investment	Annual O&M cost	Tariff	Annual output
-24.2%	-117.2%	27.78%	27.78%

Total static investment
With a decrease in total investment by 24.2%, the post-tax Project IRR of the project can reach benchmark of 8%. However, considering the majority part of total static investment has been spent, since the wind turbine purchase contract and the construction contracts have been signed. The current total contract amount of the proposed project is 487.189 million RMB, which have covered 94.04% of total static investment (518.04million RMB). With the considering that the proposed project is still under construction and there will cost more, therefore, the total static investment of the proposed project is impossible to be decreased by over 24.2%.

Annual O&M cost
When the annual operating cost decreases by 117.2%, the post-tax of the project IRR will reach the benchmark of 8%. O&M cost consists of five basic parameters. They are material cost, insurance, employee payroll and welfare fund, maintenance expense and miscellanea fees. Any change of the five basic parameters will result in the change of the annual O&M cost. Based on the Price Index from 2002 to 2008 listed on below table 4, it is indicated that Chinese economy is experiencing a relatively high inflation. Furthermore, the price of material is gradually increasing in China, which leads annual O&M cost gradually increasing. Besides, compared with the O&M costs of previous wind projects which have been registered as CDM project in Shandong Province, the O&M/Total static Investment of the proposed project (2.16%) falls into the range from 0.77% (Ref No. 2094) to 4.81% (Ref No.1019), which means the costs of the proposed project is reasonable.

Table 4 Price index from 2002~2008* (100 for previous years)

Item\Year	2002	2003	2004	2005	2006	2007	2008
Total Index	97.7	104.8	111.4	108.3	106.0	104.4	110.5
Fuel, power, price	100.1	107.4	109.7	115.0	111.9	104.3	120.6

* The price index of past 7 years prior to the investment decision was cited from the National Bureau of Statistic of China, [21]

Tariff
With an increase in tariff by 27.78%, the post-tax Project IRR of the project can reach the benchmark of 8%. As per the “Information note on the highest tariffs applied by the executive board in its decisions on registration of projects in the People’s Republic of China”[22] published by the EB, for the project activity category, wind power projects, the highest tariff in the Shandong Province is

[21] http://www.stats.gov.cn/tjsj/ndsj/2009/indexch.htm

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

0.61RMB/kWh (including VAT) for first 30,000 hours, and then the tariff 0.3969 RMB/kWh (including VAT)[23] for thermal plants should be applied. In line with the two-part tariff, the project IRR (post-tax) is 3.85% which can't reach the benchmark 8%.

Additionally, NDRC latest tariff policy promulgated in July 2009 regulates that the new wind power projects in Shandong Province will have to implement this fixed tariff of 0.61 RMB/kWh. Moreover, according to the approved tariff of the proposed project, which was issued by the Shandong Provincial Price Bureau (Lujiagefa[2010] No.209 on 26/10/2010), 0.61 RMB/kWh (including VAT) will be applied to the proposed project. Hence, the tariff of the proposed project has been fixed at 0.61 RMB/kWh and it is unlikely to increase by 27.78%.

Annual output

With an increase in annual net electricity supplied to grid by 27.78%, the post-tax Project IRR of the project can reach benchmark of 8%. For the proposed project, the annual operating hours was calculated by an independent accredited third party, which is Shandong Industrial Design Institute Co., Ltd, based on the on-site long-term monitoring data of local wind resources from 1971 to 2007[24] and the output characteristics of the turbines, using a scientific approach applied internationally. The volume of annual generation therefore is expected to accurately represent the long-term average power supply during the lifetime of the wind farm, taking into account yearly variations in power generation, and it is not credible to assume that generation would be significantly higher over the lifetime of the proposed project activity than that which can be expected from the long-term averages.

As per the FSR, the estimated net supplied power is calculated from the turbine availability, grid availability and the wind speed. The calculations for the proposed project are carried out using professional software designed for wind energy. The output is maximized through selection of the most suitable turbines, optimal turbine distribution in the wind farm, and considering the specific turbine characteristics, and the grid connection. The output calculations account for issues such as air density corrections, turbine efficiency, planned maintenance, contaminated rotors, and auxiliary power use, etc. The FSR has been approved by Shandong Development and Reform Commission on 09/12/2008. Therefore, it is very unlikely for the project to become commercially attractive through an adjustment of the annual net electricity supplied to grid.

In conclusion of the sensitive analysis, as the financial indicators vary within reasonable range, the proposed project remains financially unacceptable without CDM support and the proposed project is additional. Therefore, Scenario 1 is not a feasible alternative.

Step 3. Barrier analysis

The barrier analysis is not employed for the Project.

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[23] The tariff for the thermal plants in Shandong Province was 0.3724 RMB/kWh (including VAT), which was issued by National Development and Reform Commission on 29/06/2008 (Fa Gai Jia Ge [2008]1677). (source:http://www.sdpc.gov.cn/zcfb/zcfbtz/2008tongzhi/t20080702_222220.htm),

Based on the value in 2008, the tariff for the thermal plants in Shandong Province was increased by 0.0245 RMB/kWh, which was issued by National Development and Reform Commission on 27/05/2011 (Fa Gai Jia Ge [2011]1101). (Source: http://www.sdpc.gov.cn/zfdj/jggg/dian/t20110602_416532.htm). Hence, the latest tariff for the thermal plants in Shandong Province is 0.3969 RMB/kWh (including VAT).

[24] The wind resources data from 1971-2007 was provided by the local meteorological station. FSR page 22-45.

Step 4. Common practice analysis

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

In China, the general environment 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 provincial and the proposed project is compared to other projects in Shandong Province.

In April 2002, China implemented the policy "Separate power plants from network and compete in price to enter network [25] The objective of this power sector reform is to establish a more commercialized power market in China. Power project investment has to be under a more commercialized condition and considers project investment return more seriously. Since market condition for wind power project development changes much since April 2002, this common practice analysis starts from April 2002.

According to the methodology ACM0002, projects with installed capacity of or below 15 MW belong to small scale projects. Since the installed capacity of the proposed project is 49.3MW. Hence, this common practice analysis compares projects larger than 15 MW.

With reference to *Statistic of installed capacity of China's Wind Farms*[26] and the website of Verified Carbon Standard[27], there are 23 similar wind farms (capacity over 15 MW) as proposed project put into commission in Shandong Province since 2002.

Table 5 shows the similar projects commissioned (more than 15MW and within Shandong Province) since 2002.

Table 5 Similar Wind Farm Development in Shandong Province (since 2002)[28]

No.	Project Name	Installed Capacity (MW)	Construction year	Remark
1	Shandong Penglai Wind Farm Phase II Project	48	2009	Registered as CDM project, reference No.4402
2	Shandong Huaneng Hekou Phase I Wind Farm Project	49.5	2009	Registered as CDM project, reference No.3718

[25] China implemented the policy *"Separate power plants from network and compete in price to enter network"*
[26] Reference: 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
Statistic of installed capacity of China's Wind Farms is compiled by Professor Shi Pengfei.

[27] Source: http://www.vcsprojectdatabase.org/

[28] Reference: *Statistic of installed capacity of China's Wind Farms in 2007,2008 and 2009* issued by Chinese Wind Energy Association; UNFCCC web-site.

3	Shandong Rushan Luneng Wind Farm	42	2009	Registered as CDM project, reference No.2814
4	Yantai Dongyuan 25.5 MW Wind Farm Project Phase I	25.5	2008	Registered as CDM project, reference No.3616
5	Huaneng Changyi Phase I Wind Farm Project	49.5	2008	Registered as CDM project, reference No.3353
6	Shandong Dongying 1st phase Wind Power Project	49.5	2008	Registered as CDM project, reference No.2584
7	Shandong Luneng Dongying 48MW Wind Power Project	48	2008	Registered as CDM project, reference No.2019
8	Shandong Changdao 27.2 MW Wind Power Project	27.2	2007	Registered as CDM project, reference No.1090
9	Shandong Huaneng Shouguang 49.5MW Wind Farm Project	49.5	2007	Registered as CDM project, reference No.3391
10	Huadian Laizhou Wind Farm Project	40.5	2007	Registered as CDM project, reference No.2831
11	Yantai Dongyuan Laizhou 48.5 MW Wind Farm Project Phase I	48.5	2007	Registered as CDM project, reference No.2764
12	Shandong Laizhou phase I Wind Power Project	49.5	2007	Registered as CDM project, reference No.2530
13	Guohua Binzhou Zhanhua 49,5MW Wind farm Project (Phase I)	49.5	2007	Registered as CDM project, reference No.2438
14	Guohua Dongying Hekou 49.5 MW Wind Farm Project (Phase 1)	49.5	2007	Registered as CDM project, reference No.2436
15	Laizhou Diaolongzui Wind Farm	48.75	2007	Registered as CDM project, reference No.1010
16	Guohua Dongying Lijin 49.5 MW Wind Farm Project (Phase 1)	49.5	2006	Registered as CDM project, reference No.2442
17	The 48MW wind power project in Lubei, Shandong Province	48	2006	Registered as CDM project, reference No.2094
18	Roncheng Wind Power Project, 48.75MW	48.75	2006	Registered as CDM project, reference No.1755
19	Qixia Tangshanpeng Windfarm Project	21.75	2006	Registered as CDM project, reference No.1019

20	Shandong Penglai Pingdingshan Wind Farm Project	48	2005	Registered as CDM project, reference No.2397
21	Shandong Weihai 69 MW Wind Power Project	69	2005	Registered as CDM project, reference No.1128
22	Shandong Jimo Qingdao Huawei Wind Power Project	16.4	2003	Received Official Development Assistance support
23	Shandong Changdao Wind Farm Project	17.55	2004	VCS

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

As for Table 5, the Shandong Jimo Qingdao Huawei Wind Power Project commissioned in 2003 and enjoyed a higher tariff of 0.76RMB/kWh[29], which is much higher than the proposed project. The tariff of Shandong Jimo Qingdao Huawei Wind Power Project was approved in 2001. This project was an early demonstration project and received ODA support from DEG (part of KfW Bankengruppe)[30]. Considering Electric Power Industry Reform published by the State Council in February 2002, reform in China's electric power industry has been making steady progress and it has brought some fundamental changes to the industry, with vertically integrated monopolistic sector broken up and competition introduced. Therefore, the tariff of 0.76RMB/kWh in 2001 is not comparable to the later tariff of 0.61RMB/kWh in 2009, since there is significant policy environment and the No. 22 project is a demonstration project, it is not suitable for common practice. Moreover, the tariff of wind power in Shandong province was fixed to be 0.61 RMB/kWh on 20/07/2009 by NDRC[31] and could not be changed.

Shandong Changdao Wind Farm Project (project ID: 517)[32] applied for Voluntary Emission Reduction under Verified Carbon Standard (VCS) to obtain the support from VCS VER funding to solve the financial barriers.

The rest 21 wind power projects (more than 15MW) in Shandong province have been successfully registered as CDM project. 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.

As stated above, it is concluded that the proposed project is not common practice within the region. Therefore, the proposed project is additional.

[29] The tariff of Shandong Jimo Qingdao Huawei Wind Power Project is approved in 2001, which is prior to the power policy reform - "*Separate power plants from network and compete in price to enter network*". Reference: Notice of Electricity Tariff of Qingdao Huawei Wind Power Company by Shandong Provincial Price Bureau and Shandong Power Grid. Source: http://www.34law.com/lawfg/law/1797/3388/law_252417438946.shtml

[30] http://www.jimo.gov.cn/government/inc/webmenupagegongkai.asp?newsid=10233

[31] Source: http://www.ndrc.gov.cn/jggl/jggs/t20090727_292846.htm.

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

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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The key methodological steps are as follows:

1. Calculating the Baseline Emission (BE_y)
2. Calculating the Project Emission (PE_y)
3. Calculating the Leakage Emission (LE_y)
4. Calculating the Emission Reduction (ER_y)

1. Calculating the Baseline emissions

The baseline emissions (BE_y) is the product of the baseline emissions factor ($EF_{grid,CM,y}$ in tCO_2e/MWh) calculated, times the electricity supplied by the project activity to the grid ($EG_{PJ,y}$ in MWh), as follows:

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

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 proposed project 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 02.2.1). (tCO_2/MWh)

As the proposed project is the installation of a new grid-connected renewable power plant at a site where no renewable power plant was operated prior to the implementation of the project activity. Therefore,

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

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 proposed project 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)

The following steps are taken as per the *Tool to calculate the emission factor for an electricity system* (version 02.2.1).

Calculation of the baseline emissions factor

Following ACM0002, the baseline emission factor is calculated as a combined margin ($EF_{grid,CM,y}$), consisting of the combination of operating margin ($EF_{grid,OM,y}$) and build margin ($EF_{grid,BM,y}$) factors according to the following seven steps defined in the “Tool to calculate the emission factor for an electricity system” (version 02.2.1). Data for the calculations are based on official national statistics books: China Energy Statistical Yearbook and China Electric Power Yearbook.

Step 1. Identify the relevant electricity systems

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, these delineations should be used.

For the proposed project, the DNA of China has published a delineation of the project electricity system and connected electricity systems, which is used by the proposed project. According to the DNA delineation, the project electricity system is the NCPG, which consists of Beijing, Tianjin, Hebei, Shanxi, Inner Mongolia Autonomous Region, and Shandong Province Power Grids. The proposed project is located in Shandong Province and covered by the 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.

The electricity imports from Northeast China Power Grid (NECPG) and Central China Power Grid (CCPG) to NCPG have not changed significantly from 2006 to 2008[33]. Therefore, the spatial extent is limited to NCPG for the purpose of determining the build margin emission factor.

For the purpose of determining the operating margin emission factor, use one of the following options to determine the CO_2 emission factor(s) for net electricity imports ($EF_{grid,import,y}$) from a connected electricity system within the same host country(ies):

(a) 0 tCO_2/MWh, or

(b) The weighted average operating margin (OM) emission rate of the exporting grid, determined as described in step 4 (d) below; or

(c) The simple operating margin emission rate of the exporting grid, determined as described in step 4 (a), if the conditions for this method, as described in step 3 below, apply to the exporting grid; or

(d) The simple adjusted operating margin emission rate of the exporting grid, determined as described in step 4 (b) below.

The option (a) is selected for the proposed project.

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

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[33] According to China Electric Power Yearbook (2006-2008), the electricity import of NCPG from NECPG and CCPG was: 2,618,060MWh and 497,060MWh in 2006, 1,789,750MWh and 803,000MWh in 2007, 5,286,140MWh and 0 MWh in 2008. (Source: The data from *China Electric Power Yearbook 2006-2008*for the calculation of OM issued on http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2552.pdf)

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.

According to the Approval of Electricity Connection to NCPG, all the power generated by the project activity will be supplied to the power grid company. Thus, the proposed project does not include off-grid power plants in the project electricity system and Option I is chosen.

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 the following methods:

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch Data Analysis OM, or
(d) Average OM.

Detailed information to carry out a dispatch data analysis is not publicly available; therefore, method (b) and method (c) is not suitable for the proposed project.

According to ACM0002, the Simple OM method is applicable to the project if the low-cost resources constitute less than 50% of total grid generation on average in the five most recent years or based on long-term normals for hydroelectric production.

The share of low-cost/must-run generation in NCPG is 1.188% in 2008, 0.752% in 2007, 0.745% in 2006, 0.749% in 2005, 0.708% in 2004[34]. The Simple OM method, therefore, is selected to calculate the Operating Margin emission factor of the proposed project.

The Simple OM can be calculated using either of the two following data vintages for years(s) y:

• (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.
• (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.

Here ex-ante vintage is chosen, and the $EF_{grid,OM}$ is fixed during the first crediting period.

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

(a) Simple OM

[34] *China Electric Power Yearook,2005-2009*

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

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

For the proposed project activity, the required data for the exercise of Option A is not available and those of Option B can be obtained from official sources, and off-grid power plants are not included in the calculation, therefore, Option B is chosen to calculate the operating margin emission factor:

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

$$EF_{grid,OMsimple,y} = \frac{\sum_{i,m} FC_{i,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{\sum_{m} EG_{y}} \quad (2)$$

Where:

$EF_{grid,OMsimple,y}$	=	Simple operating margin CO_2 emission factor in year *y* (tCO_2e/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_2e/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

For this approach (simple OM) to calculate the operating margin, 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 including electricity imports to the grid. Electricity imports should be treated as one power plant source.

Regarding parameter selection, local values of $NCV_{i,y}$ and $EF_{CO2,i,y}$ should be used where available. If no such values are available, IPCC world-wide default values are preferable. The Net Calorific Value ($NCV_{i,y}$) of each type of fossil fuel used in the calculation comes from China Energy Statistic Yearbook 2009. Emission factors ($EF_{CO2,i,y}$) of each type of fossil fuel come from IPCC 2006 default values.

On the basis of the data available, the three-year (2006-2008) average operating margin emission factor is calculated by the DNA as a full-generation-weighted average of the emission factors:

$EF_{grid,OMsimlpe}$ = 0.9914 tCO_2e/MWh

Step 5. Calculate the build margin (BM) emission factor
The sample group of power units *m* used to calculate the build margin consists of either:

(a) The set of five power units that have been built most recently, or

(b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

Project participants should use the set of power units that comprises the larger annual generation.

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

Option 1. For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. This option does not require monitoring the emission factor during the crediting period.

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

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

Where:

$EF_{grid,BM,y}$	=	Build margin CO_2 emission factor in year *y* (tCO_2e/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_2e/MWh)
m	=	Power units included in the build margin
y	=	Most recent historical year for which power generation data is available

Currently, it is very difficult to get the capacity margin data of power plants in China, since these data as well as net quantity of electricity generated and delivered to the grid and fuel consumption data in power unit *m* are regarded as commercial secrets or only for internal usage. Then the following deviation[35] approved by the EB was adopted to calculate the Build Margin emission factor.

According to the guidance from the CDM Executive Board for a deviation of the baseline methodology of AM0005, which had combined into the baseline methodology of ACM0002, the following deviation was adopted to calculate the Build Margin emission factor.

1) Use the efficiency level of the best technologies commercially available in the provincial/regional or national grid of China, as a conservative proxy, for fuel *i* consumption estimation to estimate the $EF_{grid,BM,y}$.

2) Use capacity additions during last several years for estimating the $EF_{grid,BM,y}$, i.e. the capacity addition over last several years, whichever results in a capacity addition that is closest to 20% of total installed capacity. For the proposed project, the data from Year 2006 to 2008 are used to calculate $EF_{grid,BM,y}$.

3) Use installed capacity to replace annual power generation to estimate weights.

The BM emission factor in this PDD is calculated as follows.

Sub-step 1. Calculation of weights of CO_2 emissions of solid, liquid and gaseous fossil fuels in total emissions for power generation

$$\lambda_{Coal,y} = \frac{\sum_{i \in COAL, j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,y}} \quad (4)$$

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

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

Where:

$F_{i,j,y}$	=	Amount of fossil fuel type *i* consumed in province *j* in year *y* (mass or volume unit)
$NCV_{i,y}$	=	Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ/t or GJ/m^3)
$EF_{CO2,i,y}$	=	CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2e/GJ)

Coal, *Oil* and *Gas* refer to the group of solid, liquid, and gaseous fossil fuels, respectively.

[35]Source: http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_QEJWJEF3CFBP1OZAK6V5YXPQKK7WYJ

Sub-step 2: Calculation of Emission Factor of Relevant Thermal Power

$$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y} \qquad (7)$$

Where:
$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ refer to the emission factors representing best technologies commercially available for coal, oil and gas fired power plants, respectively.

Sub-step 3: Calculation of BM of the Grid
Using the share of different type of capacity in total capacity addition as weight, the weighted average of emission factors of different type capacity is calculated as the Build Margin emission factor $EF_{grid,BM,y}$ of NCPG.

$$EF_{grid,BM,y} = \frac{CAP_{Thermal,y}}{CAP_{Total,y}} \times EF_{Thermal,y} \qquad (8)$$

Where:
CAP_{Total} = The total newly added electricity generation capacity (MW)
$CAP_{Thermal}$ = The newly added electricity generation capacity of thermal power (MW)

Following the four steps above, the build margin emission factor $EF_{grid,BM,y}$ of the NCPG is calculated to be: 0.7495 tCO_2e/MWh (see Annex 3 for more details).

Step 6. Calculate the combined margin emission factor
The baseline emissions factor (EF_{CM}) is calculated as the weighted average of the Operating Margin emission factor and Build Margin emission factors following ACM0002. For wind projects, the default weights are as follows: w_{OM} = 0.75 and w_{BM} = 0.25:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \qquad (9)$$

Where:

$EF_{grid,BM,y}$	=	Build margin CO_2 emission for the project electricity system factor in year *y* (tCO_2e/MWh)
$EF_{grid,OM,y}$	=	Operating margin CO_2 emission factor for the project electricity system in year *y* (tCO_2e/MWh)
w_{OM}	=	Weighting of operating margin emissions factor (%)
w_{BM}	=	Weighting of build margin emissions factor (%)

On the basis of these weights for the first crediting period, the combined margin emission factor is calculated, and fixed ex-ante:

$EF_{grid,CM,y}$ = 0.9914 × 0.75 + 0.7495 × 0.25 = 0.9309 tCO_2/MWh
Baseline emissions (BE_y) now can be calculated as the combined margin CO_2 emission factor ($EF_{grid,CM,y}$) multiplied by the annual net generation of the Proposed Project ($EG_{PJ,y}$).

Calculation of $EG_{PJ,y}$

The proposed 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:

$$EG_{PJ,y} = EG_{facility,y} \qquad (10)$$

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)

2 Calculating the Project Emission (*PE_y*)

According to ACM0002 (version 12.2.0), for most renewable power generation project activities, PE_y = 0.

3 Calculating the Leakage Emission (*LE_y*)

According to ACM0002 (version 12.2.0), no leakage is considered. The main emissions potentially giving rise to leakage are neglected.

4 Calculating the Emission Reduction (*ER_y*)

The annual emission reductions ER_y for the project activity are calculated as the baseline emissions minus the project emissions and minus the leakage emissions. Being the project of a zero-emission activity the final GHG emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y \qquad (11)$$

where:

ER_y	=	Emission reductions in year *y* (t CO2e/yr)
BE_y	=	Baseline emissions in year *y* (t CO2/yr)
PE_y	=	Project emissions in year *y* (t CO2e/yr)

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

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Data / Parameter:	***$FC_{i,m,y}$***
Data unit:	tonnes or m^3
Description:	Amount of fossil fuel type *i* consumed by power plant / unit *m* 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 statistical data
Any comment:	

Data / Parameter:	$NCV_{i,y}$
Data unit:	kJ/kg or kJ/m^3
Description:	Net calorific value (energy content) of fossil fuel type *i* in year *y*
Source of data used:	China Energy Statistical Yearbook（2009）
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistical data
Any comment:	

Data / Parameter:	$EF_{CO2,i,y}$
Data unit:	tc/TJ
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
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC default value
Any comment:	

Data / Parameter:	**Installed Capacity**
Data unit:	MW
Description:	The Installed Capacity of the power plants in the grid in the year y
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 statistical data
Any comment:	

Data / Parameter:	GEN_y
Data unit:	MWh
Description:	The electricity generation of the power plants in the grid in the year y
Source of data used:	China Electric Power Yearbook (2007-2009)
Value applied:	See Annex 3 for details
Justification of the choice of data or	Official statistical data

description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	Efficiency of the best technology commercially
Data unit:	%
Description:	Best commercial available efficiency of coal, gas, oil fuel power plant
Source of data used:	Chinese DNA's Guideline of emission factors of Chinese grids
Value applied:	Best efficiency for coal plant is 39.08% Best efficiency for oil plant is 51.46% Best efficiency for gas plant is 51.46%
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistic value
Any comment:	Applied for calculating BM

B.6.3 Ex-ante calculation of emission reductions:

>>

As described in B.3., the emission reductions of the proposed project are calculated as follows:

Baseline emissions

Annual generation (net of auxiliary power i.e. the on-site electricity usage for the operation of the wind farm) is estimated as 90,997MWh.

$EF_{grid,OM,y}$ = 0.9914 tCO_2/ MWh
$EF_{grid,BM,y}$ = 0.7495 tCO_2/ MWh

$EF_{grid,CM,y}$ = 0.9914 × 0.75 + 0.7495 × 0.25 = 0.9309 tCO_2/MWh
BEy = 90,997× 0.9309 = 84,709 tCO2e

The ex-ante baseline emission factor: **0.9309 tCO_2/ MWh**
Annual baseline emissions: **84,709 tCO2e** (details in Annex 3)

Project emissions

According to ACM0002 (version 12.2.0), for wind power generation project activities, PE_y = 0.

Leakage

According to ACM0002 (version 12.2.0), no leakage is considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, and transport). These emissions sources are neglected.

Project Emission Reductions

$ER_y = BE_y - PE_y$

The total annual baseline emissions are 84,709 tCO_2e.
The total annual project emissions are 0 tCO_2e.
The total annual leakage emissions are 0 tCO_2e.

$ER_y = BE_y - PE_y = 84{,}709 – 0 = 84{,}709\ tCO_2e$

The annual emission reductions are estimated to be: 84,709 tCO_2e. The proposed project activity is expected to achieve 592,963tCO2e of net emission reductions during the first 7-year crediting period.

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)**
01/03/2012-28/02/2013	0	84,709	0	84,709
01/03/2013-28/02/2014	0	84,709	0	84,709
01/03/2014-28/02/2015	0	84,709	0	84,709
01/03/2015-29/02/2016	0	84,709	0	84,709
01/03/2016-28/02/2017	0	84,709	0	84,709
01/03/2017-28/02/2018	0	84,709	0	84,709
01/03/2018-28/02/2019	0	84,709	0	84,709
Total (tonnes of CO_2e)	**0**	**592,963**	**0**	**592,963**

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 to the Grid in year y.
Source of data to be used:	Calculation by $EG_{output,y}$, $EG_{import,y}$ and $EG_{im\text{-}spare,y}$
Value of data applied for the purpose of calculating expected emission reductions in	90,997

section B.5	
Description of measurement methods and procedures to be applied:	The net electricity supplied to the Grid by the proposed project will be calculated through electricity supplied by the project to the grid ($EG_{output,y}$) minus electricity purchased from the Grid ($EG_{import,y}$) and electricity purchased from the 10 kV spare line ($EG_{im-spare,y}$).
QA/QC procedures to be applied:	$EG_{output,y}$ and $EG_{import,y}$ will be monitored by the main meter at the connection point between the proposed project and the Grid. The project operator is responsible for recording such data. Cross check the meter reading with sales receipts. $EG_{im-spare,y}$ will be measured based on the amount on the sales receipts from the local power distributor.
Any comment:	NA

Data / Parameter:	$EG_{output,y}$
Data unit:	MWh
Description:	Electricity supplied to the grid by the proposed project in year y.
Source of data to be used:	The readings of the main meter at the connection point between the proposed project and the Grid.
Value of data applied for the purpose of calculating expected emission reductions in section B.6	90,997
Description of measurement methods and procedures to be applied:	The data will be continuously measured and monthly recorded. Data will be archived for 2 years following the end of the last crediting period.
QA/QC procedures to be applied:	The meter at the substation will be calibrated once a year according to the national standards. Electricity supplied to the grid will be double checked according to sales receipts.
Any comment:	NA

Data / Parameter:	$EG_{import,y}$
Data unit:	MWh
Description:	Electricity purchased from the grid by the proposed project in year *y*.
Source of data to be used:	The readings of the main meter at the connection point between the proposed project and the Grid
Value of data applied for the purpose of calculating expected emission reductions in section B.6	0

Description of measurement methods and procedures to be applied:	The data will be continuously measured and monthly recorded. Data will be archived for 2 years following the end of the crediting period.
QA/QC procedures to be applied:	The meter at the substation will be calibrated once a year according to the national standards. Electricity purchased from the grid will be double checked according to sales receipts.
Any comment:	NA

Data / Parameter:	***$EG_{im\text{-}spare,y}$***
Data unit:	MWh
Description:	Electricity purchased from the gird through a 10 kV spare line in the year y
Source of data to be used:	Based on the amount on the sales receipts from the local power distributor.
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 local power distributor will measure the $EG_{im\text{-}spare,y}$ by metering instrument owned, operated and installed at the project site. Only the local power distributor is accessible to the meter. Sales receipts will be issued accordingly in an approach which is agreed by both the local power distributor and the project owner.
QA/QC procedures to be applied:	The meter will be calibrated once a year according to the national standards. Reading recording, operation and maintenance of this meter was implemented by the local power distributor (the owner of the metering instrument).
Any comment:	NA

B.7.2 Description of the monitoring plan:

>>

The proposed project adopts the approved consolidated baseline and monitoring methodology ACM0002 “Consolidated baseline methodology for grid-connected electricity generation from renewable sources” (version 12.2.0) to determine the emission reductions from the net electricity generation from the wind farm. This plan describes in more detail the process.

1. Monitoring Object

The monitoring is to justify the realistic amount of emission reduction from the CDM project. The monitoring plan will provide credible, accurate, transparent and conservative monitoring data and ensure the real, measurable, long-term GHG emission reduction from this project.

2. Management Structure

The project owner will use this document as guideline in monitoring of the project emission reduction performance and will adhere to the guidelines set out in this monitoring plan to ensure that the monitoring is credible, transparent and conservative.

The responsibilities of the project staff are as follows:

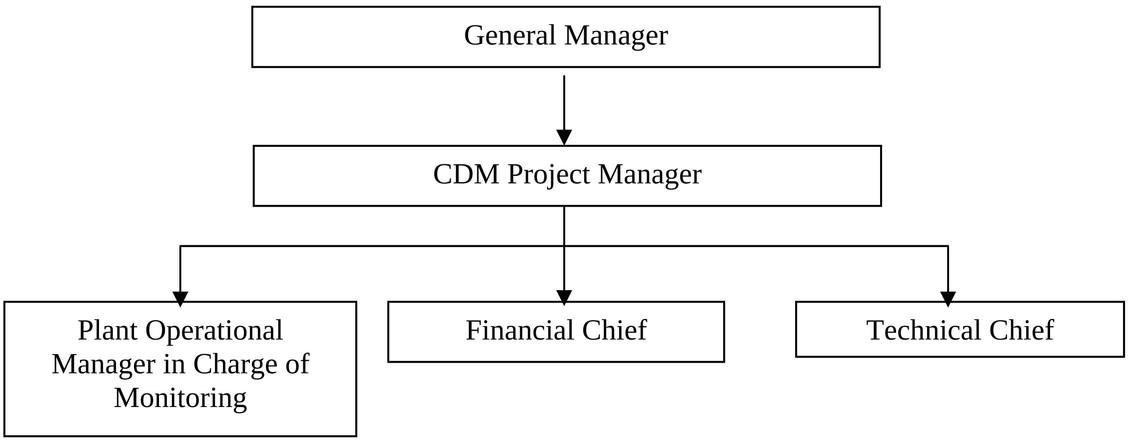
General Manager: To be responsible for supervising the whole monitoring procedure.

CDM Project Manager: To be responsible for data management and compiling monitoring report.

Operational and monitoring manager: To be responsible for collecting data and do internal audit.

Financial chief: To be responsible for collection of sales receipts.

Technical chief: To be responsible for preparing operational reports of the project activity, recording the daily operation of the wind farm, including operating periods, equipment defects, etc.



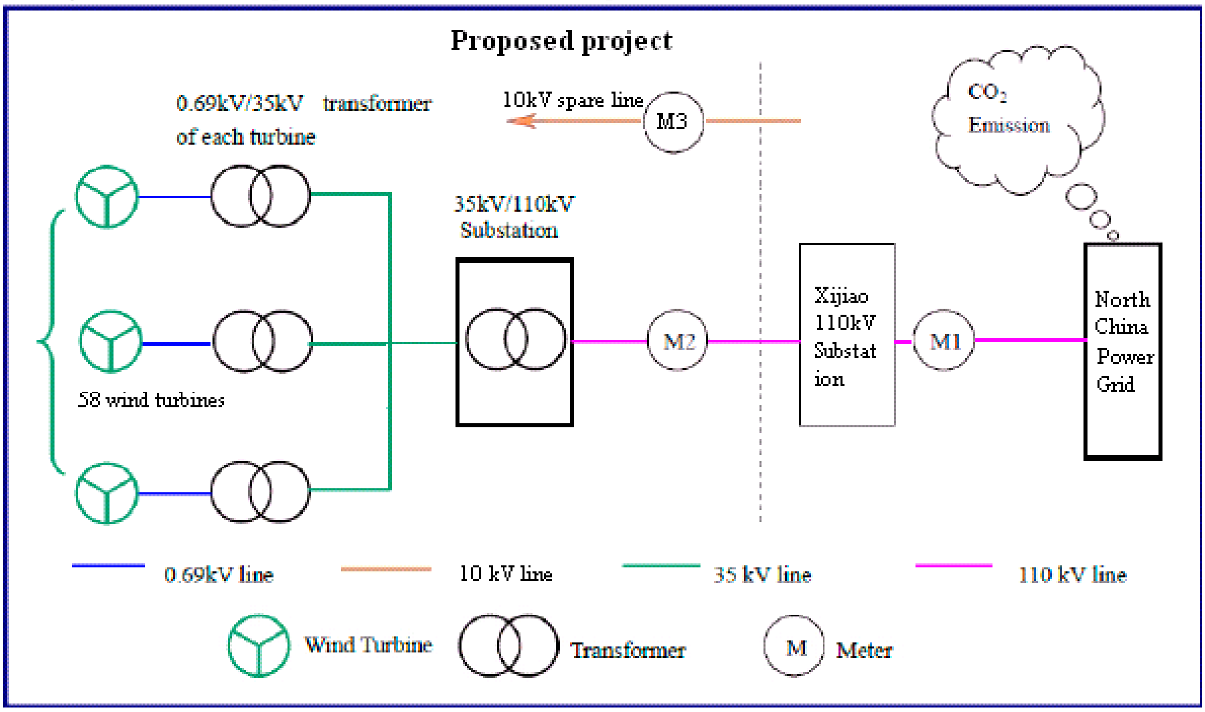
3. Monitoring Program and Equipments

The bi-directional electricity meter (M1) is installed on the substation to measure directly and continuously the electricity supplied to the grid by the project activity and the electricity purchased from the grid to the project site. The supplied and purchased electricity will be double checked with the sales receipts.

The back-up meter (M2) will be installed in the 110kV substation in the wind farm. The sales receipts of the electricity supplied to the grid by this proposed project and the electricity purchased from the grid will be issued based on the power purchase agreement (PPA) signed between the project entity and the power grid company and the readings from the main meter (M1). The reading of meter (M2) is carried out by the project owner just for cross check against reading of M1, taken the line loss into consideration. The accuracy of M1 and M2 is no lower than 0.5s, and the calibration frequency of M1 and M2 is once a year in line with the national standards.

A 10kV spare line will be used for supplied electricity to the proposed project when the main power line fails to supply power. A meter (hereafter referred as meter M3) will be installed to measure the electricity imported via this line. This meter is owned, maintained and monitored by the local power distributor. The accuracy of the meter is not lower than 2.0, and the calibration frequency of the meter M3 is once a year in line with the national standards.

A diagram shows how parameters are monitored is presented as follows:



Before the project is in operation, both the project owner and the grid company will check the equipments to ensure their work properly. The accuracy of M1 and M2 is no lower than 0.5s while that of M3 is no lower than 2.0.

4. Data Collection

The verification will use the main meter's data as long as the inaccuracy of the meter is within the permissible tolerance. The main procedures are as follows:

I According to the requirements of power purchase/sales agreement, the project owner and the grid company should collect the three meters' data periodically, and check them at the same time.

II The project owner supplies the electricity to the grid company, and provides sales receipt to the Grid Company. A copy of the sales receipt is stored by the project owner, together with a record of the payment by the grid company.

III When the electricity generated by this project cannot meet the electricity requirement of the power plant, the grid company supplies the electricity to the project owner. The Grid Company provides an electricity sales receipt to the project owner and the sales receipt are stored by the project owner.

IV The project owner records the power supplied to and purchased from the grid, and hence calculate the net electricity supplied to the grid;

V The project owner keeps the records of the meter readings for verification by the DOE.

If the fault of the main meter exceeds the allowable tolerance or its malfunction occurs, the grid-connected electricity generated by the proposed project will be resolved by following measures:

I Adopting the backup meter's data (after taking the line losses into consideration), unless a test by either party reveals it is inaccuracy;

II If the inaccuracy of the backup meter is not within the acceptable limits or it cannot work properly, the project owner and the grid company shall jointly prepare a new agreement of correct reading;

III If the project owner and the grid company fail to reach an agreement concerning the correct reading, this matter will be submitted for arbitration according to agreed procedures.

5. Calibration of Meters & Metering

The metering equipment will be properly calibrated and checked according to the national standards. The project owner will prepare backup procedures to deal with any errors occurred to the meters. The calibration records carried out by the grid company should be provided to the proposed project owner, and these records will be maintained by the proposed project owner and the third party designated.

Meters should be tested by a qualified metric organization co-authorized by the project owner and the grid company within 10 days after:

I The detection of the reading difference between the main meter and the backup meter that exceeds the allowable tolerance.

II The equipments malfunction caused by improper operation

All the calibration test records should be maintained safely for the verification.

6. Data Management System

To keep safely the record of the data collected during monitoring, this project will set up a complete data management system. The project will perfect the whole monitoring procedure by developing the CDM manual, tracking information from the primary source to the end-data calculations in paper document format. It is the responsibility of the proposed project owner to provide additional necessary data and information for validation and verification requirements of respective DOE. Physical documentation such as paper-based maps, diagrams and environmental assessment will be collated in a central place, together with this monitoring plan. All paper-based information will be stored by the proposed project owner and kept at least one copy.

At the end of each month, the monitoring data will be filed in a spreadsheet, and the paper-based printout will be also archived as well. Furthermore, the project owner collects the sales receipts for the electricity supplied to the grid as a cross-check, and compiled the monitoring report including the monitoring data and relevant evidence at the end of each crediting year.

All the data will be kept for two years following the end of the last crediting period.

7. Monitoring Report

After the CDM project manager collects and sorts the monitored data, the monitoring report is prepared by a CDM Consultancy Company. The CDM Consultancy Company has to make sure that the format and content of the monitoring report are consistent with the monitoring methodology in the registered PDD.

8. **Quality Assurance and Quality Control**

The workers are trained to be competent and the metering equipments are calibrated and sealed as per the industry practices at regular intervals, with the purpose to provide credible, accurate, transparent and conservative monitoring data and ensure the real, measurable, long-term GHG emission reduction from this project.

Monthly metering data of the supplied and purchased electricity by the proposed project will be approved and signed off by the Manager before it is accepted and stored. This audit will check compliance with monitoring procedures in this monitoring plan. This internal audit will also identify potential improvements to procedures to improve monitoring and reporting in future years. The monitoring officers will also attend a training session organized by the CDM consultant. The purpose of training is to assure those staffs are competent to conduct the monitoring plan, thus to make the monitored data accurate.

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 baseline and monitoring methodology study: 24/01/2011

Name of person/entity determining the baseline:

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Above persons and entity are not Project Participants.

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:

>>
03/02/2010 (Wind Turbine Contract signed)

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

>>
20 years 0 month

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

C.2.1. Renewable crediting period

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

>>
01/03/2012[36]

C.2.1.2. Length of the first crediting period:

>>
7 years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
Not applicable

C.2.2.2. Length:

>>
Not applicable

[36] It is the expected registration date.

SECTION D. Environmental impacts

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

>>
The environmental impact assessment for this project was carried out by Shandong Academy of Environmental Science in April, 2008 and approved by Shandong Environmental Protection Bureau on 24/06/2008. A summary of the report is illustrated as below:

Ambient air
The impact on ambient air quality of the proposed project is mainly from dust during construction stage. The excavation work is the primary emission source, however, it is a ground source and the particle size is quite large so that dust will deposit quickly on the ground. Immediately replant the areas where construction has completed, and by sprinkling water frequently and timely clearing can reduce the dust pollution. When the project is in operational period, there will be no air pollutions. In conclusion, the proposed project will not pose any threat on the quality of ambient air.

Impact from noise
There is some noise during the operation of wind turbines. The equipments and techniques with lower noise will be chosen to apply. Improvement on construction process and strengthening of equipment maintenance is emphasized. *Noise Limits in Construction site (GB12523-90)* and *Emission standard for industrial enterprise noise at boundary (GB12348-2008)* Level II noise standard would be fulfilled during the construction and operational period. Besides, some noise control measures on the noise source control and sensitive object protection would be taken to mitigate the noise at the maximum limit. Consequently, the noise of operation has little impact to the surrounding environment. Hence, the noise will not impact the work and daily life of local residents.

Electromagnetic impact
The operation of the wind farm will generate electromagnetic pollution, whereas the pollution is slight. Some measures on the prevention and control of electromagnetic influence, for example, strengthen the training on the electromagnetic knowledge for the workers and organise and manage the work time, will be taken to reduce the electromagnetic impact during the operation phase. In addition, the wind turbines are very far from local residents and village. Therefore, the electronic magnetic pollution to the surrounding environment is insignificant.

Impact from Solid waste
Solid wastes generated from the proposed project activity are excavated earth material and municipal solid waste. Part of the excavated earth material will be backfilled, and the rest will be used for land levelling and road construction near the project site. The municipal solid waste will be collected and treated together with the waste from local residents. As the report indicates, solid waste is handled properly.

Impact from Wastewater
Wastewater is mainly domestic wastewater. Wastewater quantity is fairly small and treatment methods will be applied for on-site primary treatment, and then the wastewater will be treated

together with the local wastewater. Small-scale septic tanks should be built on the site, through which the discharging wastewater can reach the *Water quality standard for urban miscellaneous water consumption (GB/T18920-2002)*. Therefore, the impact of wastewater is limited and mitigated.

No migrating birds have been found in the project field. Therefore, the project is not located on the passage of migrating birds, and the project construction will not influence the migration of birds.

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

>>

The environmental impacts of the Shandong Wendeng Zhangjiachan Wind Farm Project are not considered as significant.

SECTION E. Stakeholders' comments

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

>>

Wendeng Zhangjiachan Wind Power Co., Ltd. put up a notice of Stakeholder Consultation Meeting Notification of Shandong Wendeng Zhangjiachan Wind Power Project to invite comments on the construction of the proposed project on 19/11/2009. Stakeholder Consultation Meeting of the project was held at Wendeng Detai Hotel on 21/11/2009 to guarantee the successful implementation of proposed project with the interest of stakeholder being taken into account. The project owner also distributed public participation questionnaires at the project location Zhangjiachan Town to collect advice and opinions on the proposed project from local stakeholders.

48 out of 50 copies of questionnaires were collected. Among the interviewees, there were 27 farmers, 14 workers, and 7 government officials; 36 of them had junor high school education or below while 12 had high school level education. The questions in the questionnaire were mainly as follows:

a) How do you think of the local environmental quality in general?
b) Is there any electromagnetic radiation disturbance when you watch TV?
c) Do you think the construction of the project will have any negative effect on you and your family?
d) Will the project promote the local economy?
e) How do you think the project will affect the acoustic environment (noise) quality?
f) What is your most concerned environmental issue during the construction and operation of the project?
g) Do you favour the construction of the project?
h) Do you have any advice about the selection of environmental protection measures?
i) Do you have any other suggestions to the proposed project?

E.2. Summary of the comments received:

>>

The summary of survey is listed as the following:

- 88% of the interviewee think good of the general local environmental quality, 12% of them think it average;
- 90% of them think there is no electromagnetic radiation disturbance when they watch TV， 8% are not sure about it and 2% of them think there is;
- 96% of them think the construction of the project will have no negative effect on them and their family while 4% of them think it will;
- 96% of them think the project will promote the local economy while 4% are not sure;
- 77% of them think the project will not affect the acoustic environment (noise) quality, 4% think it will and 19% are not sure;
- 29% of them consider electromagnetic disturbance their most concerned environmental issue during the construction and operation of the project, 64% are most concerned about noise effect and 7% are most concerned about wastewater discharge;
- 94% of them support the construction of the project and 6% are not sure.

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

>>

The vast majority of public opinions received were supportive. Some of local residents were concerned with temporary land occupation and construction waste and some of them showed concern about wastewater during construction period. As discussed in the EIA report, these issues are well illuminated and specific instructions were given to mitigate the potential impacts of these issues. In addition, the proposed project site is designed to be far enough away from the residential area. Wastewater during the construction and operation phase will be removed periodically. The environmental impacts can be avoided, controlled or mitigated via thorough implementation of the mitigation measures. Therefore, the proposed project can be carried out as planned.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Represented by:	Shi Lei
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding for the Shandong Wendeng Zhangjiachan Wind Farm Project.

Annex 3
BASELINE INFORMATION

All the tables related to the calculation of baseline emission reduction are presented below:

Calculation of Operating Margin (OM)

Table A1. Simple OM Emission Factor of North China Power Grid in 2006

Fuel types	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Subtotal	Carbon Content (tc/TJ)	Oxidation rate (%)	Emission Coefficient of Fuel ($kgCO_2/TJ$)	Average low Caloric value (MJ/t, km^3)	CO_2 emission (tCO_2e) L=G×J×K/100000 (unit of mass)
		A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	J	K	L=G×J×K/10000 (unit of volume)
Raw coal	10000 ton	796.63	1639.2	6867.99	6968.88	8404.05	10930.66	**35607.41**	25.8	100	87,300	20,908	649,930,803
Cleaned coal	10000 ton						39.77	**39.77**	25.8	100	87,300	26,344	914,643
Other washed coal	10000 ton	6.36		214.13	371.14	61.77	544.6	**1198**	25.8	100	87,300	8,363	8,746,477
Briquette	10000 ton	7.97					27.77	**35.74**	26.6	100	87,300	20,908	652,351
Coke	10000 ton						3.23	**3.23**	29.2	100	95,700	28,435	87,896
Coke oven gas	10^8m^3	0.38	0.63	5.8	22.32	0.64	5.79	**35.56**	12.1	100	37,300	16,726	2,218,517
Other coal gas	10^8m^3	20.66	6.58	69.72	13.79	22.76	7.22	**140.73**	12.1	100	37,300	5,227	2,743,772
Crude oil	10000 ton					0.74		**0.74**	20	100	71,100	41,816	22,001

Gasoline	10000 ton			0.01				**0.01**	18.9	100	67,500	43,070	291
Diesel	10000 ton	0.21		3.01		0.07	6.32	**9.61**	20.2	100	72,600	42,652	297,577
Fuel oil	10000 ton	6.38		0.08			4.1	**10.56**	21.1	100	75,500	41,816	333,391
LPG	10000 ton						0.01	**0.01**	17.2	100	61,600	50,179	309
Refinery gas	10000 ton			2.43			2.32	**4.75**	15.7	100	48,200	46,055	105,443
Natural gas	10^8m^3	3.41	0.73		0.53			**4.67**	15.3	100	54,300	38,931	987,216
Other oil product	10000 ton						0.28	**0.28**	20	100	72,200	41,816	8,454
Other coking product	10000 ton							**0**	25.8	100	95,700	28,435	0
Other fuel	10000 tce	6.83		47.11	230.76	12.51	132.29	**429.5**	0	0	0	0	0
												Subtotal	667,049,139

Source: China Energy Statistical Yearbook 2007

TableA2. Thermal Power Generation of North China Power Grid in 2006

Province	**Power Generation (MWh)**	**Ratio of Self Power Consumption of Plant (%)**	**Power Supply(MWh)**
Beijing	20,705,000	7.51	19,150,055
Tianjin	35,924,000	6.86	33,459,614
Hebei	143,888,000	6.63	134,348,226
Shanxi	150,250,000	7.45	139,056,375
Inner Mongolia	139,593,000	7.58	129,011,851

Shandong	230,922,000	7.12	214,480,354
Total	721,282,000		669,506,473

Source: China Electric Yearbook 2007

Table A3. Emission Factor of North China Power Grid in 2006

	Parameter	Unit	Value	Source
A	Net Import from Northeast China Power Grid to North China Power Grid (MWh)	MWh	2,618,060	China Power Industry Statistics 2007
B	Total Emissions of Northeast China Power Grid	tCO_2e	211,421,263	Calculation based on data from China Electric Power Yearbook and China Energy Statistical Yearbook
C	Total Power Supply of Northeast China Power Grid	MWh	183,890,005	China Electric Power Yearbook 2007
D	Average Emission Factor of Northeast China Power Grid	tCO_2e /MWh	1.14972	D=B/C
E	Net Import from Central China Power Grid to North China Power Grid (MWh)	MWh	497,060	China Power Industry Statistics 2007
F	Total Emissions of Central China Power Grid	tCO_2e	378,031,235	Calculation based on data from China Electric Power Yearbook and China Energy Statistical Yearbook
G	Total Power Supply of Central China Power Grid	MWh	337,056,176	China Electric Power Yearbook 2007
H	Average Emission Factor of Central China Power Grid	tCO_2e /MWh	1.12157	H=F/G

I	Total Power Supply of North China Power Grid	MWh	672,621,593	E=Total Power Generation of North China Power Grid－A+E
J	Total Emissions of North China Power Grid	tCO_2e	670,617,037	
K	Emission Factor of North China Power Grid	tCO_2e /MWh	0.99702	G=J/I

China Energy Statistical Yearbook 2007

Table A4. Simple OM Emission Factor of North China Power Grid in 2007

Fuel types	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Subtotal	Carbon Content (tc/TJ)	Oxidation rate (%)	Emission Coefficient of Fuel ($kgCO_2$/TJ)	Average low Caloric value (MJ/t,km3)	CO_2 emission (tCO_2e) L=G×J×K/100000 (unit of mass)
		A	**B**	**C**	**D**	**E**	**F**	**G=A+B+C+D+E+F**	**H**	**I**	**J**	**K**	**L=G×J×K/10000 (unit of volume)**
Raw coal	10000 ton	816.17	1753.99	7716.13	7510.06	10434.25	11884.83	**40115.43**	25.8	100	87,300	20,908	732,214,267
Cleaned coal	10000 ton						18.43	**18.43**	25.8	100	87,300	26,344	423,859
Other washed coal	10000 ton	5.76		156.89	478.81	48.57	756.84	**1446.87**	25.8	100	87,300	8,363	10,563,452
Briquette	10000 ton	7.93					42.86	**50.79**	26.6	100	87,300	20,908	927,054

Coke	10000 ton			0.02			4.09	**4.11**	29.2	100	95,700	28,435	111,843
Coke oven gas	10^8m^3	0.07	0.72	3.13	25.46	2.58	13.61	**45.57**	12.1	100	37,300	16,726	2,843,020
Other coal gas	10^8m^3	11.8	7.6	88.38	72.8	28.17	29.64	**238.39**	12.1	100	37,300	5,227	4,647,821
Crude oil	10000 ton							**0**	20	100	71,100	41,816	0
Gasoline	10000 ton			0.01				**0.01**	18.9	100	67,500	43,070	291
Diesel	10000 ton	0.33		2.35		0.62	5.08	**8.38**	20.2	100	72,600	42,652	259,490
Fuel oil	10000 ton	4.74		0.18			2.35	**7.27**	21.1	100	75,500	41,816	229,522
LPG	10000 ton							**0**	17.2	100	61,600	50,179	0
Refinery gas	10000 ton	0.06		2.85			1.65	**4.56**	15.7	100	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	100	54,300	38,931	2,225,993
Other oil product	10000 ton	1.72						**1.72**	20	100	72,200	41,816	51,929
Other coking product	10000 ton	4.74						**4.74**	25.8	100	95,700	28,435	128,986
Other fuel	10000 tce	11.94		77.25	360.26	30.75	163.48	**643.68**	0	0	0	0	0
												Subtotal	754,728,750

Source: China Energy Statistical Yearbook 2008

Table A5. Thermal Power Generation of North China Power Grid in 2007

Province	Power Generation (MWh)	Ratio of Self Power Consumption of Plant (%)	Power Supply(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

Source: China Electric Yearbook 2008

Table A6. Emission Factor of North China Power Grid in 2007

	Parameter	Unit	Value	Source
A	Net Import from Northeast China Power Grid to North China Power Grid	MWh	1,789,750	China Power Industry Statistics 2008
B	Total Emissions of Northeast China Power Grid	tCO_2e	219,122,791	Calculation based on data from China Electric Power Yearbook and China Energy Statistical Yearbook
C	Total Power Supply of Northeast China Power Grid	MWh	202,542,560	China Electric Power Yearbook 2008
D	Average Emission Factor of Northeast China Power Grid	tCO_2e /MWh	1.08186	D=B/C
E	Net Import from Central China Power Grid to North China Power	MWh	803,000	China Power Industry Statistics 2008

	Grid			
F	Total Emissions of Central China Power Grid	tCO_2e	419,013,395	Calculation based on data from China Electric Power Yearbook and China Energy Statistical Yearbook
G	Total Power Supply of Central China Power Grid	MWh	380,239,080	China Electric Power Yearbook 2008
H	Average Emission Factor of Central China Power Grid	tCO_2e /MWh	1.10197	H=F/G
I	Total Power Supply of North China Power Grid	MWh	778,939,080	I=Total Power Generation of North China Power Grid＋A＋E
J	Total Emissions of North China Power Grid	tCO_2e	757,552,268	
K	Emission Factor of North China Power Grid	tCO_2e /MWh	0.97254	K=J/I

Table A7. Simple OM Emission Factor of North China Power Grid in 2008

Fuel types	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Subtotal	Carbon Content （tc/TJ）	Oxidation rate （%）	Emission Coefficient of Fuel $(kgCO_2/TJ)$	Average low Caloric value （MJ/t,km3）	CO_2 emission （tCO_2e） L=G×J×K/100000 （unit of mass）

		A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	J	K	L=G×J×K/10000 (unit of volume)
Raw coal	10000 ton	755.75	1,800.12	7,353.33	7,854.39	12,607.82	12,360.75	**42,732.16**	25.8	100	87300	20,908	779,976,613
Cleaned coal	10000 ton						23.88	**23.88**	25.8	100	87300	26,344	549,200
Other washed coal	10000 ton	5.05		134.52	582.39	66.2	691.21	**1,479.37**	25.8	100	87300	8,363	10,800,731
Briquette	10000 ton	5.66			32.49		45.38	**83.53**	26.6	100	87300	20,908	1,524,647
Coke	10000 ton			0.02			6.07	**6.09**	29.2	100	95700	28435	165,723
Coke oven gas	10^8m^3	0.11	0.86	8.37	24.55	3.55	16.2	**53.64**	12.1	100	37300	16,726	3,346,491
Other coal gas	10^8m^3	10.4	9.08	187.54	36	34.32	29.76	**307.10**	12.1	100	37300	5,227	5,987,440
Crude oil	10000 ton					0.02		**0.02**	20	100	71100	41,816	595
Gasoline	10000 ton							**0.00**	18.9	100	67500	43,070	0
Diesel	10000 ton	0.15		3.08		0.35		**3.58**	20.2	100	72600	42,652	110,856
Fuel oil	10000 ton	2.56		0.25				**2.81**	21.1	100	75500	41,816	88,715
LPG	10000 ton							**0.00**	17.2	100	61600	50,179	0
Refinery gas	10000 ton	0.44		2.93				**3.37**	15.7	100	48200	46,055	74,809
Natural gas	10^8m^3	11.09	0.7		0.97	2.12		**14.88**	15.3	100	54300	38,931	3,145,563
Other oil product	10000 ton	1.45						**1.45**	20	100	72200	41,816	43,777
Other coking product	10000 ton	7.97		7.61				**15.58**	25.8	100	95700	28,435	423,968
Other fuel	10000 tce	4.9	2.34	61.02	466	63.72	141.71	**739.69**	0	0	0	0	0
												Subtotal	806,239,12

													6

Source: China Energy Statistical Yearbook 2009

Table A8. Thermal Power Generation of North China Power Grid in 2008

Province	Power Generation (MWh)	Ratio of Self Power Consumption of Plant (%)	Power Supply(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			802,797,350

Source: China Electric Yearbook 2009

Table A9. Emission Factor of North China Power Grid in 2008

	Parameter	Unit	Value	Source
A	Net Import from Northeast China Power Grid to North China Power Grid	MWh	5,286,140	China Power Industry Statistics 2009
B	Total Emissions of Northeast China Power Grid	tCO_2e	231,611,818	Calculation based on data from China Electric Power Yearbook and China Energy Statistical Yearbook
C	Total Power Supply of Northeast China Power Grid	MWh	209,625,110	China Electric Power Yearbook 2009
D	Average Emission	tCO_2e /MWh	1.104886	D=B/C

	Factor of Northeast China Power Grid			
E	Total Power Supply of North China Power Grid	MWh	808,083,490	E=Total Power Generation of North China Power Grid＋A
F	Total Emissions of North China Power Grid	tCO_2e	812,079,707	
G	Emission Factor of North China Power Grid	MWh	1.00495	G=F/E

Table A10. Operating Margin Emission Factor of North China Power Grid

		Year 2006	Year 2007	Year 2008	Total
A	Emissions (tCO_2e /year)	670,616,651	757,549,895	812,079,707	2,240,246,253
B	Power Supply (MWh)	672,621,593	778,939,080	808,083,490	2,259,644,163
C	CO2 Emission Factor (tCO2e/MWh)	C = A/B			0.99142

Calculation of Build Margin (BM):

Step 1. Calculation of weights of CO2 emissions of solid, liquid and gas fuel in total emissions for power generation

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

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

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

Where:

$FC_{i,j,y}$: Amount of fossil fuel type *i* consumed in province *j* in year *y* (mass or volume unit, for solid and wet fuel, the unit is ton, for gas fuel, the unit is m^3);

NCV_{ij} : Net thermal value of fuel type *i* in year *y* (for solid and wet fuel, the unit is GJ/t, for gas fuel, the unit is GJ/m^3);

$EF_{CO2,i,y}$: CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2 /GJ);
COAL,OIL and GAS respectively refers to the group of solid, liquid, and gas fuels.

Based on China Energy Statistical Yearbook 2009, the calculation of the weights of solid, liquid, and gas fuels in North China Power Grid are:

λ_{Coal} =98.41%， λ_{Oil} =0.03%， λ_{Gas} =1.56%

Step 2: Calculation of Emission Factor of Relevant Thermal Power

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

Where: $EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ respectively refers to the emission factor representing best technology commercially available for fuel of coal, oil or gas fired power plants. For specific workings, see the following:

Table A11. Emission factor representing best technology commercially available for fuel of coal, oil or gas fired power plants

	Variable	Efficiency of Power Supply(%)	Emission Coefficient of Fuel ($kgCO_2/TJ$)	Oxidation Rate	Emission Factor (tCO_2e/MWh)
		A	B	C	D=3.6/A/1,000,000×B×C
Coal-fired Power Plant	$EF_{Coal,Adv}$	39.08	87,300	1	0.8042
Oil-fired Power Plant	$EF_{Oil,Adv}$	51.46	75,500	1	0.5282
Gas-fired Power Plant	$EF_{Gas,Adv}$	51.46	54,300	1	0.3799

$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv}$ =0.7975 (tCO_2/MWh)

Step 3: Calculation of BM of the Grid

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

Where: CAP_{Total} is the total of new capacity additions, and $CAP_{Thermal}$ is the new capacity addition of thermal power.

Table A12. Installed Capacity of North China Power Grid in 2008

Installed Capacity	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Thermal	MW	4,760.0	7,490.0	29,870.0	35,250.0	45,740.0	55,930.0	179,040.0

Power								
Hydropower	MW	1,050.0	0.0	1,540.0	790.0	830.0	1,050.0	5,260.0
Nuclear Power	MW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wind Power and Others	MW	0.0	0.0	700.0	0.0	2,300.0	370.0	3,370.0
Total	MW	5,810.0	7,490.0	32,110.0	36,040.0	48,860.0	57,350.0	187,660.0

Source: China Power Yearbook 2009

Table A13. Installed Capacity of North China Power Grid in 2007

Installed Capacity	**Unit**	**Beijing**	**Tianjin**	**Hebei**	**Shanxi**	**Inner Mongolia**	**Shandong**	**Total**
Thermal Power	MW	3,900	6,920	29,020	30,950	39,870	54,140	164,800
Hydropower	MW	1050	10	780	790	830	1,050	4,510
Nuclear Power	MW	0	0	0	0	0	0	0
Wind Power and Others	MW	2.7	0	410	0	1,096.5	210	1,719.2
Total		4,952.7	6,930	30,210	31,740	41,796.5	55,400	171,029.2

Source: China Power Yearbook 2008

Table A14. Installed Capacity of North China Power Grid in 2006

Installed Capacity	**Unit**	**Beijing**	**Tianjin**	**Hebei**	**Shanxi**	**Inner Mongolia**	**Shandong**	**Total**
Thermal Power	MW	3,984	6,512	26,087	26,661	28,899	49,395	141,538

Hydropower	MW	1,053	5	785	790	818	553	4,004
Nuclear Power	MW	0	0	0	0	0	0	0
Wind Power and Others	MW	24	24	218	0	565	106	937
Total	MW	5,061	6,541	27,090	27,451	30,282	50,054	146,479

Source: China Power Yearbook 2007

Table A15. Calculation of BM of North China Power Grid (MW)

	Installation in year 2006	Installation in year 2007	Installation in year 2008	New Additions from 2006 to 2008*	New Additions from 2007 to 2008*	Ratio in New Additions
	A	B	C	D	E	F
Thermal Power（MW）	141,538	164,800	179,040	46111	17,847	93.98%
Hydro Power（MW）	4,004	4,510	5,260	520	9	1.06%
Nuclear Power（MW）	0	0	0	0	0	0.00%
Wind Power and Others（MW）	937	1,719	3,370	2433	1,651	4.96%
Total（MW）	146,479	171,029	187,660	49,064	19,508	100.00%
Percentage compared with installation of 2008				26.15%	10.40%	

*Calculated with the consideration of installed, shut-down and pumped storage capacity

$EF_{grid,BM,y}$ =0.7975×93.98%=0.7495 tCO_2/MWh

Table A16. Baseline Emission Factor of North China Power Grid

	Parameter	Unit	Amount
A	Operating Margin Emission Factor	tCO_2/MWh	0.9914
B	Build Margin Emission Factor	tCO_2/MWh	0.7495

C	Combined Emission Factor (C=0.75*A+0.25*B)	tCO_2/MWh	**0.9309**

Table A17. Electricity Generation Baseline Emissions

	Parameter	Unit	Amount	Source or Equation
A	Project installed capacity	MW	49.3	Feasibility Study
B	Annual electricity supplied	MWh	90,997	Feasibility Study
C	Baseline Emissions Factor	tCO_2/MWh	0.9309	Table A16
D	Electricity generation baseline emissions	$tCO_2/year$	**84,709**	D= B * C

Annex 4

MONITORING INFORMATION

Please refer to B.7.2. in the PDD.