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:

Shandong Laizhou phaseⅡWind Power Project
Version：02
Date: 23/04/2009
Revision history of PDD

Version Number of PDD	Date	Remark
Version 01	19/06/2008	Version for GSP
Version 02	23/04/2009	Revisions addressing the comments posed by DOE in the draft validation report

Date: 23/04/2009

A.2. Description of the project activity:

The proposed Shandong Laizhou phaseⅡ Wind Power Project (hereafter referred to as the project) is located in Tushan Town, Laizhou City, Shandong Province, P.R.C.

The implementation of the proposed project will achieve CO_2 emission reduction by replacing electricity generated by fossil fuel fired power plants. The purpose of the proposed project is to generate wind power and deliver it to North China Power Grid (NCPG). For the proposed project, the scenario existing prior to the start of the implementation of the project activity is NCPG providing the same electricity service as the proposed project. The baseline scenario is the same as the scenario existing prior to the start of implementation of the project activity.

The proposed project involves the installation of 33 turbines, each of which has a rated output of 1500kW, providing a total capacity of 49.5MW. The annual output of the proposed project is estimated to be 94,450MWh, and the annual average operating hour is 1908h (load factor 0.22). The expected operational lifetime is 20 years. The electricity to be generated will be sold to the Shandong provincial power grid that is part of the North China Power Grid (NCPG) through Power Purchase Agreement (PPA).The project will help reduce GHG emissions generated from the high-growth, coal-dominated power generation. The estimated annual GHG emission reductions are 101,580 tCO2e.

The proposed project will contribute to the sustainable development of the host country through the following aspects:

- Reducing the emission of other pollutants resulting from local coal-based power plants compared to a business-as-usual scenario;
- Creating approximately 15[1] employment opportunities during the project operation;
- Promoting the local tourism industry and improving the livelihoods of local people;
- Help promote localization of manufacture of wind power generator and its parts, therefore speedup the development of wind power generation in China. At a larger scale, the project will assist China in stimulating and accelerating the commercialization of grid-connected renewable energy technologies

[1] Feasibility Study Report

and markets in China.

A.3. Project participants:

Name of Party involved (*)((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
People's Republic of China (host)	Datang Laizhou Wind Power Co., Ltd (project owner)	No
The United Kingdom of Great Britain and Northern Ireland	Credit Suisse International	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.		

Although the EPRA was signed on April 15, 2008, when the PDD was webhosted on June 27, 2008, "the buyer is to be determined" was still mentioned in A.3 of PDD, it is because the ERPA has not become effective after signature until the Due Diligence was finished and satisfied by the buyer, the time limit of Due Diligence is September 30, 2008, therefore, the buyer was not listed in PDD as project participant at the time of GSP[2].

Please see Annex 1 for detailed contact information.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

People's Republic of China

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

Shandong Province

A.4.1.3. City/Town/Community etc:

Laizhou City, Tushan Town

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[2] The stipulation of the Due Diligence terms was supplemented in ERPA supplement agreement and has been provided to DOE.

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

The project site is located inTushan Town, Laizhou city, Shandong Province, P.R.C. Tushan town is in the northwest of Laizhou city, 22km from the centre of Laizhou city. The geographical coordinates of the project is east longitude 119° 43′ 34′ ′ ~119° 46′ 7′ ′ and north latitude 37° 06′ 17′ ′ ~37° 08′ 26′ ′ .

Figure A-1shows the location of the proposed project.

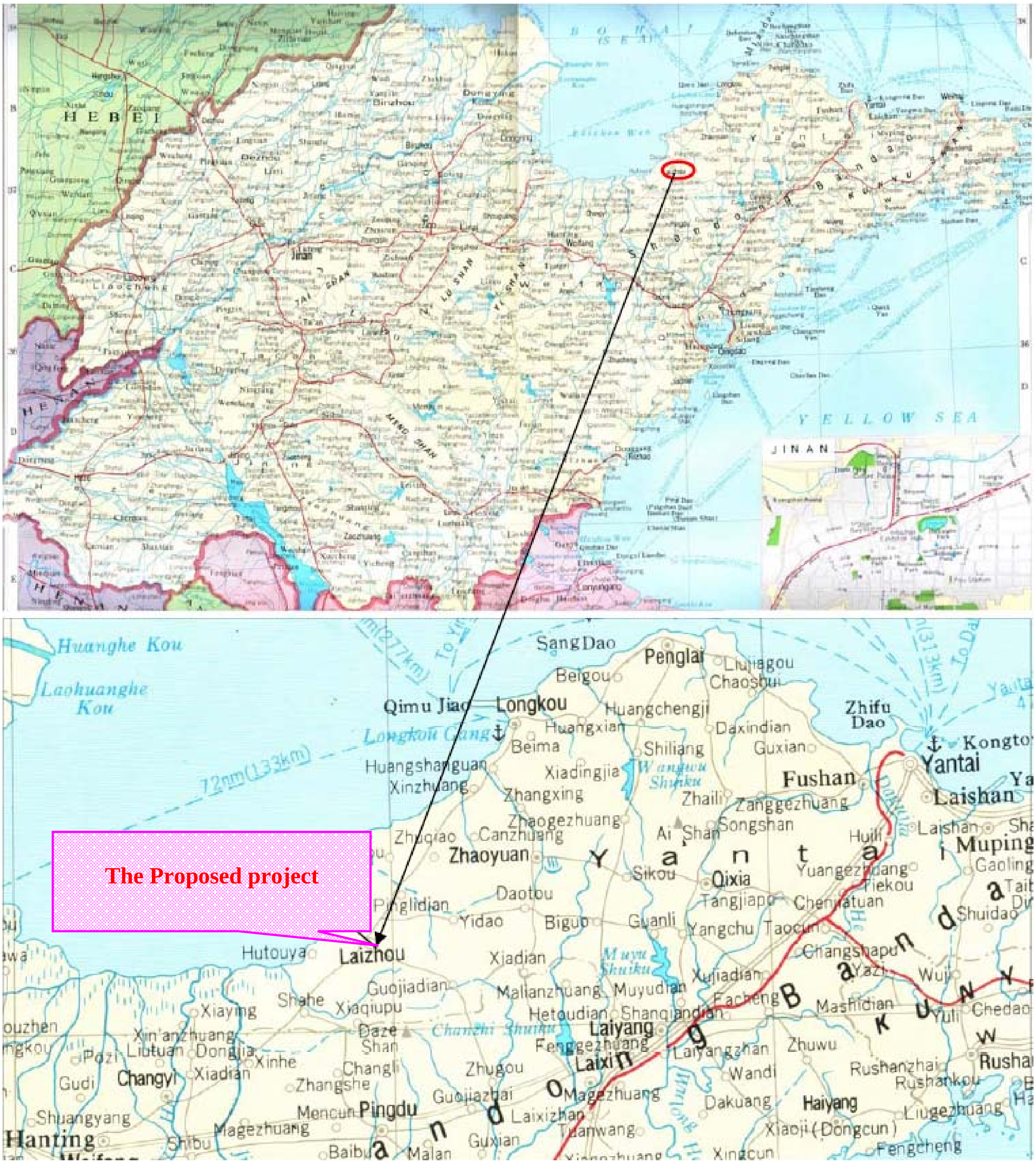


Figure A-1: Location of the proposed project

Figure A-2: Shandong Province in China

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

Sectoral scope 1: energy industries (renewable sources)

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

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

a) The scenario existing prior to the start of the implementation of the project activity is NCPG providing the same electricity service as the proposed project;

b) The project scenario is the implementation of the propose project, 33 type of FL1500/77 KW turbines manufactured by Sinovel Windtec Co., Ltd will be installed, each of which has 1500kW capacity, providing a total capacity of 49.5MW. Sinovel Windtec Co., Ltd is a domestic company engaged in developing; manufacturing the wind turbines generator system. It is expected that the annual average operating hour is 1908h (load factor 0.22), electricity delivered to the grid is 94,450 MWh to NCPG and replace the same amount of electricity generated by fossil fuel fired power plants connected to NCPG. The expected operational lifetime of the proposed project is 20years.

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

Key technical specifications of FL1500/77KW turbines are listed as Table A-1 below.

Table A-1 Key Technical specifications of FL1500/77Kw turbines

Parameters Name	Unit	Value
Nominal output	kW	1500
Number of blades	piece	3
Diameter	m	77.4
Swept area	m^2	4657
Operational interval	rpm	9.7~19
Nominal wind speed	m/s	11
Hub height	m	65
Rated voltage	V	690
Rated frequency	Hz	50

According to the turbine layout, each turbine will be equipped with one transformer. The construction will also include a 35kV/220kV step-up substation at the site, which connects the proposed project to another step-up substation via 220kv transmission lines, and then the power produced by the wind farm can be transmitted to the Shandong Power Grid, which is an integral part of NCPG. Therefore the proposed project can replace electricity generated from fossil fuel fired power plant connected to the Grid and reduce GHG emissions. As a result, 101,580 tCO2 emission reduction will be generated annually.

The wind turbines and transmission facility could be monitored and controlled by onsite central control room and the net electricity delivered to the grid will be measured by electronic meters with acceptable accuracy.

All the technology of project activity doesn't involve technology transfer.

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

The project activity is expected to generate an estimated annual emission reduction of 101,580 tCO_2e and 711,060 tCO_2e during the first crediting period of the project (2009-2016).

Year	Annual estimation of emission reductions(tCO_2 e)
01/10/2009 -31/12/2009	25,395
2010	101,580
2011	101,580
2012	101,580
2013	101, 580
2014	101,580
2015	101,580
01/01/2016~30/09/2016	76,185
Total estimated reductions(tCO_2e) during the first crediting period	711,060
Total number of crediting years	7
Annual average of estimated reductions over the crediting period(tCO_2e)	101,580

A.4.5. Public funding of the project activity:

There is no public funding from Annex I Parties for this Project.

SECTION B. Application of a baseline and monitoring methodology

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

- Version 07 of ACM0002: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002/ Version 07, Sectoral Scope: 01, EB36)[3]
- Version 01.1 of the tool to calculate the emission factor for an electricity system")[2]
- Version 05.2of the tool for demonstration and assessment of additionality[2]

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

The approved methodology ACM0002: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" is applicable to the proposed project activity, because:

- The proposed project involves the electricity capacity additions from wind sources;
- The geographic and system boundary of the NCPG can be clearly identified and information on the characteristics of the grid is available;
- The proposed project does not involve switching from fossil fuels to renewable energy at the site of the project activity;
- The monitoring methodology is used in conjunction with the approved baseline methodology ACM0002, and the proposed project has adopted the baseline methodology ACM0002.

Therefore, the approved consolidated baseline methodology, ACM0002: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" is applicable to the proposed project.

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

Table B-1 Emission sources and GHG included in the project boundary

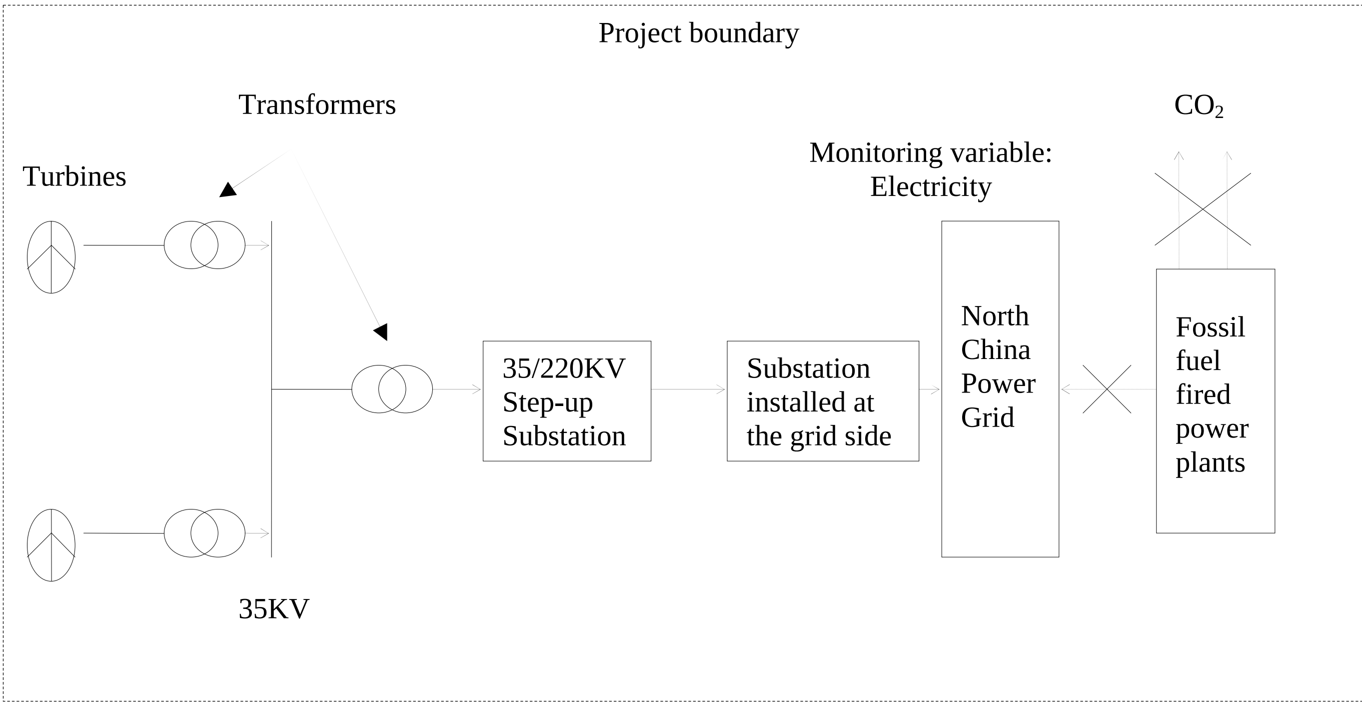
	Source	Gas	Included?	Justification/Explanation
Baseline	Electricity generation in fossil fuel fired power that is dispatched due to the project activity	CO_2	Yes	Main emission source.
		CH_4	No	Minor emission source.
		N_2O	No	Minor emission source.
Project Activity	Proposed project	CO_2	No	The Project is a wind power project that the project emissions should not be considered

[3] http://cdm.unfccc.int/methodologies/approved

		CH_4	No	as per ACM0002 (Version 07).
		N_2O	No	

The spatial extent of the proposed project boundary includes the proposed project site and all power plants connected physically to the NCPG. According to the "Tool to calculate the emission factor for an electricity system", the delineation of grid boundaries as provided by the DNA of China is used. NCPG including Beijing, Tianjin, Hebei, Shanxi, Inner Mongolia and Shandong is the project electricity system, which is defined by the spatial extent of the power plants that can be dispatched without significant transmission constrains. Figure B-1 shows the flow diagram of the project boundary.

The flow diagram of the project boundary is delineated as FigureB-1:



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

According to the description in the approved baseline methodology ACM0002, if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

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

According to the Tool to calculate the emission factor for an electricity system (EB 35/Annex 12), if the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used.

The electricity generated by the proposed project will be sold to NCPG according to the delineation which is published by the Chinese DNA, So NCPG is considered as the "electricity system", which is defined as the "project boundary" of the proposed project. Therefore, being a project with the boundary of NCPG that does not modify or retrofit an existing electricity generation facility, the baseline scenario of the proposed project can be identified as the following:

> Electricity delivered to the grid by the proposed project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources within the NCPG, as reflected in the combined margin (CM) calculated described latter.

The analysis and description in B.5 and B.6 will support the baseline scenario shown above. And the provision of an equivalent amount of annual power output by the grid is the baseline scenario.

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):

So far,in Tushan town, Laizhou City, Datang Hebei Power Generation Ltd has invested two wind power projects in Laizhou city, which are the Shandong Laizhou Phase I & II wind power projects . Be referenced with *"Initial guidance on feed-in tariff of Laizhou Phase Ⅰwind power project",* the project owner Datang Laizhou Wind Power Co., Ltd (a wholly-owned subsidiary of Datang Hebei Power Generation Ltd.) realized that the potential investment risk may faced just as the Phase I project did. Encouraged by local government and agreed by all board of directors, a board decision was made to introduce CDM in order to improve the project's financial index and reduce investment risk. After these deep consideration and preparation, the project owner began to work on the project and signed the CDM consulting contract with CWEME on 2, April. 2008, both sides decide to develop the project as a CDM project. On this basis, an Emission Reduction Purchase Agreement (ERPA) was signed on 15 April 2008. Latterly, the project owner signed the wind turbines contract on 9, May2008.

An overview of key events is given in the table below.

Date	Key Event
July 2007	The feasibility study report (FSR) was completed
16 August 2007	"Initial guidance on feed-in tariff of Laizhou Phase I wind power project" was issued by local government.
20 August 2007	CDM was seriously considered and has been involved in the decision making of implement the project in the board meeting organized by project owner.
17January2008	*The Letter of Approval* of the FSR of the project was obtained from Provincial Development & Reform Committee of Shandong, in which the CDM has been recommended by Shandong DRC.
27 January 2008	The "*construction service contract"* was signed.
1 February 2008	The construction permit was obtained.
2 April 2008	Authorization letter of CDM Consultation Service was signed.
15 April 2008	The Emission Reduction Purchase Agreement was signed
9 May 2008	Contract of wind turbines was turbines.
14 July 2008	Staring of GSP

As the signed date of construction service contract is the earliest of the date in the implementation timeline of the project activities, therefore, this date has been identified as the starting date of the project activity.

The project uses the *Tool for the Demonstration and Assessment of Additionality* (version 05.2), which was revised in the EB 39, to demonstrate its additionality. The tool includes the following steps:

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

The object of the Step1 is to define realistic and credible alternatives to the project activity(s) that can be (part of) the baseline scenario through the following sub-steps:

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

Plausible and credible alternatives available to the Project that provide outputs or services comparable to the proposed CDM project activity include:

AlternativeⅠ: The proposed project itself, but not undertaken as a CDM project activity.

AlternativeⅡ: Construction of a coal-fired power plant with equivalent installed capacity or annual electricity generation.

AlternativeⅢ :Construction of a power plant using other renewable energy, such as hydro,sloar PV and biomass power plant with equivalent installed capacity or annual electricity generation.

AlternativeⅣ: Provision of an equivalent amount of annual power output by the grid into which the Project is connected.

The AlternativeⅢ is also unrealistic and should be eliminated from the following consideration. Besides wind energy, other kinds of energy like solar PV, geothermal, biomass and hydro are the possible grid-connected renewable energy technologies that could be applied in China. Due to the technology development status and the high cost for solar PV, geothermal and biomass of the similar installed capacity as the proposed project are alternatives far from being attractive investment in the grid in China[4]. Only hydropower projects have an investment return that can compete over that of wind power projects in China. However, the site where the project located, covered with shoal and salina soil, lacks in commercially exploitable exploitable hydro power resources on-site or around the project site[5].

In conclusion, Alternative Ⅲ is not feasible.

Outcome of Step 1a:

To summarize, the realistic and creditable alternatives that can provide the same output or services as the proposed project are AlternativeⅡand Ⅳ.

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

For AlternativeⅡ:The capacity of the proposed project is 49.5MW, with annual estimated net generation of 94,450MWh per year. If a coal-fired power plant is built with the same annual electricity generation as the proposed project, considering the average operation hour (5364 hours[6]) of coal-fired power plants in Shandong Grid, the installed capacity of a coal-fired power plant is built with the same annual electricity generation is calculated as 17.6MW (94,450MWh/5364h), far less than 135MW. According to China's power regulations, coal-fired power plants of less than 135MW, if without special permission, are

[4] http://nyj.ndrc.gov.cn/zywx/t20060206_58771.htm Directive Catalogue on Renewable Industry Development, No. 2517 of NDRC Energy.

[5] http://www.sdhh.gov.cn/news/Article_show.asp?ArticleID=12491 ,*Hydro power resources of Laizhou city.*

[6] China Electric Power Yearbook (2007), page626

prohibited for construction in the areas covered by large grids and the installation of coal-fired power units with less than 100MW is under tight control[7]. Alternative Ⅱ is not in compliance with legal and regulatory requirements. Therefore it is not a realistic alternative.

For AlternativeⅢ:Construction of a power plant using other renewable energy with equivalent installed capacity or annual electricity generation. AlternativeⅢ is in compliance with legal and regulatory requirements, however, it is excluded from baseline scenario in sub-step 1a with reasonable explanation.

For AlternativeⅣ: Provision of an equivalent amount of annual power output by the grid into which the Project is connected. AlternativeⅣ is in compliance with legal and regulatory requirements.

Outcome of Step 1b:
In conclusion, the AlternativeⅣ is the only realistic, credible alternative which is in compliance with all applicable legal and regulations, which is considered as the baseline scenario of the proposed project.

Step 2. Investment Analysis

Determine whether the proposed project activity is not:

a) The most economically or financially attractive; or
b) Economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs)

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

Sub-step 2a. Determine appropriate analysis method

The *Tools for the Demonstration and Assessment of Additionality* recommends three analysis methods, including simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III).

The proposed wind power project generates financial and economic benefits through the sales of electricity other than CDM related income therefore the simple cost analysis (Option I) cannot be taken. And the investment comparison analysis (Option II) is only applicable to projects where alternatives should be similar investment projects. The alternative baseline scenario of the proposed project is the NCPG rather than a new investment project. Out of the investment comparison analysis (Option II) and the benchmark analysis (Option III), the benchmark analysis (Option III) shall be chosen.

Sub-step 2b. Option III. Apply benchmark Analysis

In accordance with *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects* issued by former State Power Corporation of China in 2002, the financial benchmark total investment Internal rate of return (project IRR) excluding income tax of Chinese electricity industry is 8% which has been used widely in feasibility studies of new power plants, including wind power projects in China. If the total investment IRR (project IRR) of the project is higher than or equivalent to this benchmark, the proposed project is financially feasible.

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[7] Notice on Strictly Prohibiting the Installation of Fuel fired Generators with the Capacity of 135MW or below issued by the General Office of the State Council, Decree No. [2002]6.

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

1) Parameters needed for calculation of key financial indicators

According to the approved feasibility study report of proposed project, parameters needed for calculation of key financial indicators are as follows:

Table B-2 Basic Parameters for Financial Analysis

Items	Unit	Data Value	Data Source
Installed capacity	MW	49.5	FSR
Annual Grid-connected output	MWh	94,450	FSR
Total static investment	Million RMB	474.24	FSR
Expected tariff	RMB/kWh (Incl. VAT)	0.660	See Footnote[8]
Value-added tax rate	%	8.50	FSR
Income tax rate	%	25	FSR
Operational Lifetime	Year	20	FSR
Crediting period	Renewable/Fixed	Renewable	Selected
Expected CERs price	EUR/ tCO_2e	12.5	Market price
Currency exchange rate	RMB/Euro:	8.8:1	Currency Exchange

The input values used in the investment analysis are based on two data source: Ones are derived from the approved FSR[9], and the tariff is the one forecasted by local government. Therefore, all the values applied in the investment analysis can be considered accurate and trustworthy.

[8] Regarding the basis of tariff in the FSR, i.e., 0.723RMB/kWh Incl.VAT) is not an approved or implied tariff in any official sense, instead it is only a price estimated by the FSR designer based on the specific circumstances of the proposed project. Furthermore, only when the feed-in tariff reaches to 0.723RMB/kWh (Incl.VAT), the proposed project IRR begin to reach the benchmark (i.e., 8%), in other words, this tariff would be the "critical point" for the project owner to ensure certain level of profit. Comparing with wind farms contemporaneous both in Shandong Province and other regions of China, this optimistic and higher tariff quoted from FSR could not be acquired in reality,
Referenced with *"Initial guidance on feed-in tariff of Laizhou Phase Ⅰ wind project",* a propositional letter issued by local DRC, a forecasted feed-in tariff of 0.66 RMB(Incl, VAT)was clearly indicated in the letter. Considering the same investment environment (policy of grid connected, investor entity) with Laizhou Phase Ⅰ proejct, this tariff has been applied for investment analysis accordingly.

[9] The feasibility study report of Shandong Laizhou Phase Ⅱ Wind Power Project, was conducted by the third independent party named as Hebei Electric Power Design & Research Institute (rated as "A" degree for power designing), and the FSR has been approved by Shandong Development and Reform Commission in Jan. 2008.

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

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

Table B-2 shows the project IRR of the proposed project with and without the sales of CERs. Without the sales of CERs the project IRR is 6.68 percent which is lower than the financial benchmark. Thus the proposed project is not considered to be financially attractive.

However, taking into account the CDM revenues, the project IRR is 9.87 percent, this is higher than the financial benchmark. Therefore the CDM revenues enable the project to overcome the investment barrier and demonstrate the addtionality of the proposed project.

Table B-3 Project IRR of the proposed project

	Project IRR
Without CERs	6.68%
With CERs	9.87%

Sub-step 2d. Sensitivity analysis

The sensitivity analysis shall show whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions. For the proposed project, four parameters were selected as sensitive factors to check out the financial attractiveness:

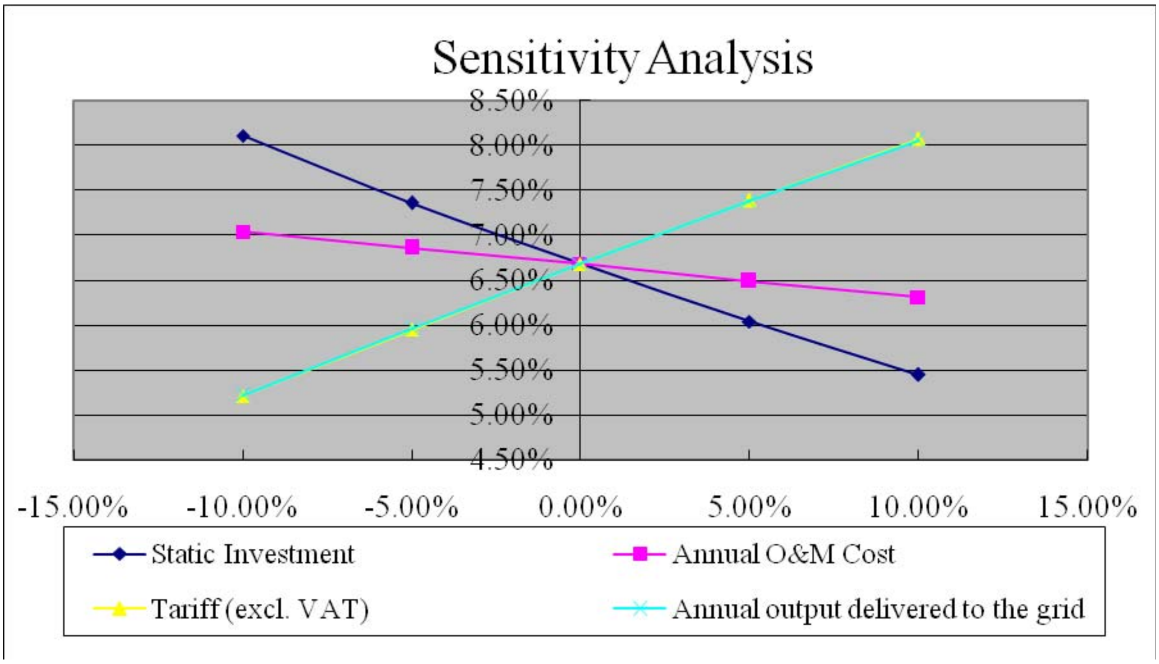
1) Total Static investment
2) Annual O&M cost
3) Expected tariff (Excl. VAT)
4) Annual output delivered to the grid

The results of sensitive analysis are shown in Table B-3 and Figure B-1 below.

Table B-4 Sensitivity analysis of the proposed project

	-10.00%	*-5.00%*	*0.00%*	*5.00%*	*10.00%*
Total Static Investment	8.11%	7.36%	6.68%	6.04%	5.45%
Annual O&M Cost	7.04%	6.86%	6.68%	6.49%	6.31%
Tariff (excl. VAT)	5.21%	5.95%	6.68%	7.39%	8.07%
Annual output delivered to the grid	5.22%	5.96%	6.68%	7.38%	8.06%

Figure B-2 Sensitivity analysis of the proposed project



The sensitivity analysis examines the variation of the other financial parameters when the project IRR reaches the benchmark, here is the result, see table B-5 given below,

Table B-5 Variation of financial parameters with project IRR of 8%

Variation of the parameter to make the IRR reach 8%	Total static investment	Annual Grid-connected output	Expected tariff (Excl.VAT)	O&M cost
	-9.3%	9. 55%	9.45%	-37.7%

1) Total Static investment

From the table B-5, the static investment decreases by 9.3%, the IRR of the proposed project begins to exceed the benchmark. As the prices, including those of the spare parts of equipments and commodities, also the labour costs have been increasing in recent years; a significant reduction in the level of investment is particularly unlikely[10].

2) Tariff

Next, the expected power tariff increases by 9. 45%, the IRR of the proposed project begins to exceed the benchmark, however this growth rate of tariff is unlikely to occur given by following reasons:

According to the current regulation on tariff of wind power project in China, the tariff should be

[10] http://energy.people.com.cn/GB/5720709.html

determined by government[11].Comparing with other local wind farm projects' tariff in 2008[12], the value of 0.66yuan/kWh applied is already 7% higher than that price level. Therefore, the 9.45% increase of feed-in tariff is extremely improbable during the project's operational lifetime.

3) Annual output delivered to the grid

The annual power output is estimated by Hebei Electric Power Design & Research Institute; an independent qualified design institute (with highest grade, Grade A) specializes in power industry, using scientific methods as applied internationally. The estimated annual output in FSR can be regarded as authentic and accurate. The annual output quoted from FSR and applied in the PDD is 94,450MWh, which means the annual operation hour of this project is about 1908h, and the load factor of this proposed project is 0.22.[13]

For the proposed project, the power generation is calculated based on the meteorological records of the average annual wind speed from 1976 to 2005, and the annual generation represents a long-term average power supply throughout the lifetime of wind farm, where the yearly variation have already been taken into account. . Meanwhile, according to the "Methodology of wind energy resource assessment for wind farm"(GB/T 18710-2002) used in FSR, Laizhou wind farm with a Wind Power Class rating of 3,we can see that the wind condition in terms of wind speed and wind power density in this area is relatively poor when comparing other regions with good wind condition[14].Therefore, the power generation of the proposed project is hardly to increase by 9.55%

Compared with the total investment and expected tariff, the annual O&M cost has little effect on the impact of IRR. Thus, the annual O&M cost therefore shall be regarded as an insensitive factor.

Outcome of Step 2:

The sensitivity analysis shows that without CER revenue, IRR of the project is difficult to reach the benchmark, which supports the conclusion, that the proposed project is unlikely to be financially attractive.

Step 4 Common practice analysis

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

The Table B-5 shows the wind farms installed in Shandong province without CDM support.

Table B-6 Wind Farms installed in Shandong Province

Name of wind farm	Capacity (MW)	No. of sets	Location	Applying for CDM Project	Project Owner
Shandong Changdao Wind Farm	21.45MW	30	Shandong Changdao	No	Shandong Luneng Group

[11] Provisional Administrative Measure on Pricing and Cost Sharing for Renewable Energy Power Generation issued by NDRC on 4 January 2006, http://www.ndrc.gov.cn/jggl/zcfg/t20060120_57586.htm

[12] http://www.sdpc.gov.cn/zcfb/zcfbtz/2008tongzhi/W020080813574224669079.pdf

[13] FSR,page9

[14] FSR,page 42

Shandong Jimo Qingdao Huawei Wind Farm	16.4MW	15	Shandong Jimo	No	Qingdao Dongyi Co., Ltd

Source:
Statistics on China Wind Farm installed capacity 2007 *(Shi Pengfei,Deputy Director of Chinese Wind Energy Association)*
http://www.qdda.gov.cn/yqlj/jimoshi/wenquanxinmao.htm
http://www.lunenggroup.com/new/2007-1/2007112111712.htm

As the proposed project is a new built 49.5MW wind power project sited in Shandong Province, for this proposed project activities similar to the Project should be wind farms with an installed capacity t bigger than 15MW.

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

The Shandong Changdao21.45MW Wind Farm has been approved in 1998 by the Shandong Province Planning Commission; the German Government offered favorable terms, including a lower soft loan. The Jimo Qingdao Huawei Wind Farm, a joint-venture project between Qingdao Dongyi Co., Ltd and Nordex Energy GmbH, started relatively earlier. In total there are 15 wind turbines installed and providing a total capacity of 16.4MW.In addition, in China, the Chinese-foreign joint-venture enterprise has the favorable taxation policy compared with domestic company in terms of lower income tax and so on[15].

From the analysis and discussion mentioned above, there are essential distinctions between proposed project and other wind farm projects in terms of sources of investment and or enjoying certain benefits from soft loan. With the assistance, they no longer face barriers that the proposed project is subject to.
Without the CDM revenues, the project activity would not be implemented. Instead, the equivalent electricity service will be provided by the NCPG. As a result, the reduction of GHG emissions would not be realized. The common practice analysis does not oppose but confirm the additionality of the proposed project.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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The consolidated methodology ACM0002 is applied in the context of the proposed project though the following four steps:

- ✧ First, calculate the baseline GHG emissions;
- ✧ Second, calculate the proposed project GHG emissions;
- ✧ Third, calculate the proposed project leakage;
- ✧ Last, calculate the emission reductions.

1. Baseline emissions

1.1 To calculate the baseline emissions (BE_y)

15 http://www.canet.com.cn/tax/ssyh/swyh/200807/21-50282.html *Favourable taxation policy of Chinese-foreign joint venture enterprise*

According to the ACM0002, baseline emissions included only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity, calculated as follows:

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

Where:
BE_y = Baseline emissions in year y (tCO_2/yr)
EG_y = Electricity supplied by the project activity to the grid (MWh)
$EG_{baseline}$ = Baseline electricity supplied to the grid in the case of modified or retrofit facilities (MWh). For new power plants this value is taken as zero.
$EF_{grid,CM,y}$ = 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".

1.2 To calculate the emission factor for an electricity system

According to the *Tool to calculate the emission factor for an electricity system* (Version 01.1), the baseline GHG emissions should be calculated by following six steps:

STEP 1. Identify the relevant electric power system:

According to the *Tool to calculate the emission factor for an electricity system*, 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. Since Chinese DNA has published a delineation of the project electricity system and connected electricity systems[16], these delineations should be applied for the proposed project. According to the delineations, the North China Power Grid (NCPG) is identified as the relevant electric power system of the proposed project, which includes the grids of Beijing Grid, Tianjin Grid, Hebei Grid, Shanxi Grid, Shandong Grid, and Inner Mongolia Grid. Hence, the project belongs to the Shandong Grid, which is part of NCPG, and the connected electricity system is Northeast China Grid (NECPG).
There is electricity transferring from the connected electricity systems to the project electricity system, so the CO_2 emission factor for net electricity imports (EFgrid,import,y) from the connected electricity system should be determined using one of the following options for the purpose of determining the operating margin emission factor:
(a) 0 tCO2/MWh, or
(b) The weighted average operating margin (OM) emission rate of the exporting grid; or
(c) The simple operating margin emission rate of the exporting grid; or
(d) The simple adjusted operating margin emission rate of the exporting grid.
The option (b) is selected to calculated the CO2 emission factor(s) for net electricity imports (EFgrid,import,y) according to the delineation.
The electricity imports from the Northeast Power Grid to the North China Power Grid has not changed significantly from 2003 to 2005 (see Annex 3),

[16] http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=1889

STEP 2. Select an operating margin (OM) method

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

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

The Simple OM method (a) can only be applied when low operating cost/must run resources[17] constitute less than 50% of total grid generation in average of the five most recent years. According to the data from China Electric Power Yearbook 2006, the total electric power generation of the NCPG in 2005 is 607.782TWh[18], in which low cost/must run resources generation is 4.551TWh, accounting for only 0.8%, which is less than 50% of total amount of power generation. The statistic data from other four years are similar, the generation from low-cost/must run resources are all less than 1% of total generation of the NCPG in last 5 years and this percentage has not changed significantly during that period. Detailed statistic data can be clearly seen from Table B-1.Therefore, it is reasonable to select the method (a) to calculate the OM emission factor.

Table B-7 Low-cost/must-run generation in NCPG[19]

Year	Total generation (TWh)	Of which low-cost/must run (TWh)	Share
2001	361.12	3.05	0.8%
2002	407.545	3.160	0.8%
2003	461.653	3.978	0.9%
2004	530.804	4.032	0.8%
2005	607.782	4.551	0.8%

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

- ex ante option: 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, without requirement to monitor and recalculate the emission factor during the crediting period, or

- Ex post option: The year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required calculating the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year (y-1) may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year (y-2) may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

Here ex ante option is chosen, and $EF_{grid,OMsimple,y}$ is fixed during the crediting period.

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[17] Low-cost/must-run resources are defined as power plants with low marginal generation costs or power plants that are dispatched independently of the daily or seasonal load of the grid. They typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. If coal is obviously used as must-run, it should also be included in this list, i.e. excluded from the set of plants.

[18]Data Source: China Electric Power Yearbook 2006.

[19]Data Source: China Electric Power Yearbook (2002-2006).

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

According to the *tool to calculate the emission factor for an electricity system* (Version 01.1), there are three options to calculating the Simple OM emission factor ($EF_{grid,OMsimple,y}$):

- Based on data on fuel consumption and net electricity generation of each power plant / unit[20] (Option A), or
- Based on data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit (Option B), or
- Based on data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system (option C)

Option A and Option B should be preferred and must be used if fuel consumption data or average efficiency and fuel type(s) used are available for each power plant / unit. However, the required data for each power plant / unit is unavailable in China. So option C is applied to calculate the operating margin emission factor.

The formula of $EF_{grid,OMsimple,y}$ calculation is

$$EF_{grid,OMsimple,y} = \frac{\sum_{i,j} FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_y} \quad (1)$$

Where:

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

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

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

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

EG_y = Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year y (MWh)[21]

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

y = Either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option) or the applicable year during monitoring (ex post option), following the guidance on data vintage in step 2

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[20] Power units should be considered if some of the power units at the site of the power plant are low-cost / must-run units and some are not. Power plants can be considered if all power units at the site of the power plant belong to the group of low-cost / must-run units or if all power units at the site of the power plant do not belong to the group of low-cost / must-run units.

[21] Electricity imports to the grid should be included, and an import from a connected electricity system should be considered as one power source.

If available, $NCV_{i,y}$ and $EF_{CO2,i,y}$ from the fuel supplier of the power plants in invoices may be used; or, regional or national average default values may be used. In this PDD, $NCV_{i,y}$ of different fuels are obtained from *China Energy Statistical Yearbook 2006*. With regard to the fuel types where $NCV_{i,y}$ fluctuate in a certain range, the floor values of the fluctuation range are used for conservatism. $EF_{CO2,i,y}$ of fossil fuel comes from 2006 IPCC default values.

The Simple OM Emission Factor ($EF_{grid,OMsimple,y}$) of the proposed project is calculated on the basis of the fuel consumption data for electricity generation of the NCPG, not including those of low-operating cost and must-run power plants, such as wind power, hydropower and nuclear etc. These data are obtained from the *China Electric Power Yearbook* (2002~2006, published annually) and *China Energy Statistical Yearbook* (2000~2006. Based on these data, the Simple OM Emission Factor ($EF_{grid,OMsimple,y}$) of the NCPG is calculated as 1.1208 tCO_2e/MWh (see Annex 3 for details).

For the proposed project, the renewable crediting period, i.e. 7*3 years, is adopted.

Step 4. Identify the cohort of power units to be included in the build margin

The sample group of power units m used to calculate the build margin consists of either[22]:

(a) The set of five power units that have been built most recently, or
(b) The power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently[23].

The one with larger annual generation should be used.

In the NCPG, the information on the five power plants built most recently is not available. According to the EB's guidance on DNV deviation request, the EB accepted the following deviation[24]:

-Use of capacity additions during last 1 - 3 years for estimating the build margin emission factor for grid electricity;
-Use the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy, for each fuel type in estimating the fuel consumption to estimate the build margin (BM).

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[22] If this approach does not reasonably reflect the power plants that would likely be built in the absence of the project activity, project participants are encouraged to submit alternative proposals for consideration by the CDM Executive Board.

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

[24] http://cdm.unfccc.int/Projects/Deviations

On 7 October 2005 DNV requested guidance for projects in China. The EB guidance was given in a response letter entitled "Several projects in China (application of approved methodology AM0005), see http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_QEJWJEF3CFBP1OZAK6V5YXPQKK7WYJ. While the request for deviation was submitted relating to AM0005, the guidance can also be used for ACM0002 as this directly replaces AM0005 and all OM and BM calculations in these two methodologies are the same.

Step 5. Calculate the build margin emission factor

According to ACM0002, $EF_{grid,BM,y}$ is determined by the formula as follow:

$$EF_{grid,\ BM,\ y} = \frac{\sum_{m} EG_{m,\ y} \times EF_{EL,\ m,\ y}}{\sum_{m} EG_{m,\ y}} \tag{2}$$

Where:

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

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

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

m = Power units included in the build margin

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

As we stated in step 4, the information on the five power plants built most recently is not available. Therefore, this proposed project uses the alternative method to calculate $EF_{grid,BM,y}$.

ACM0002 allows project participants to choose between two given options for calculating the Build Margin for the project, one is ex-ante calculation, and the other is annual ex-post updating in the first crediting period. For this project the first option is chosen. The Build Margin Emission Factor therefore is based ex-ante on the most recent information available on plants already built at the time of PDD submission. The $EF_{grid,\ BM,\ y}$ therefore is fixed for the first crediting period.

Due to the unavailability of data, some changes have been made and approved by CDM EB. That is to calculate the incremental installed capacity and the mix of power generating techniques first, and then calculate the weight of the incremental installed capacity created by all kinds of power generating techniques and finally calculate emission factors by using the maximized efficiency figures of techniques. Since the figures of the capacity of coal-fired, oil-fired and gas-fired power generation cannot be separated from the statistics of thermal power generation, the following measures will be taken in calculation: first, work out the proportion of CO_2 emission caused by solid, liquid or gas fuels to the total emission based on the available data of energy balance in the recent year; second, taking the proportion as the weight, calculate the emission factor of thermal power generation for each grid based on the emission factor at the maximized efficiency level of techniques; finally, BM of the grid equals to the emission factor of thermal power generation multiplied the weight of the thermal power installed capacity in the increase of total installed capacity which is close but not exceeding 20% of existing installed capacity.

The calculation steps and formulas are as follows:

Sub-step 5.1 *Calculate the proportion of CO_2 emission caused by solid, liquid and gas fuels in the total emission respectively:*

$$\lambda_{Coal,y} = \frac{\sum_{i\in COAL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}} \quad (3)$$

$$\lambda_{Oil,y} = \frac{\sum_{i\in OIL,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}} \quad (4)$$

$$\lambda_{Gas,y} = \frac{\sum_{i\in GAS,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}} \quad (5)$$

Where:

$F_{i,j,y}$ = the amount of fuel i (in a mass or volume unit) consumed by province j in year(s) y

$NCV_{i,y}$ = the weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit)

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

Step 5.2 *Calculate the emission factor of thermal power generation*

$$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y} \quad (6)$$

Where:

$EF_{Coal,Adv,y}$, $EF_{Oil,Adv,y}$ and $EF_{Gas,Adv,y}$ are emission factor proxies of efficiency level of the best coal-fired, oil based and gas-based power generation technology commercially available in China.

Sub-step 5.3 *Calculate BM of the grid*

$$EF_{grid,BM,y} = \frac{CAP_{Thermal,y}}{CAP_{Total,y}} \times EF_{Thermal,y} \quad (7)$$

Where:

$CAP_{Total,y}$ = the total amount of incremental installed capacity;

$CAP_{Thermal,y}$ = the increased installed capacity of thermal power generation.

The data on different fuel consumptions for power generation and the net caloric values of the fuels are obtained from the China Energy Statistical Yearbook 2006. The emission factors and oxidation factors of the fuels adopted are obtained from Table 1-4 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook. With reference to the Notification on Determining Baseline Emission Factor of China's Grid, the weighted average fuel consumption for power generation of 15 sets of 600MW sub-critical coal-fired power generators built in 2005 (343.33 gce/kWh) and the 200 MW oil/gas based combined cycle power generators (258 gce/kWh) are taken as the efficiency level of the best technology commercially available in China.

Referring to the Notification on Determining Baseline Emission Factor of China's Grid (9, August, 2007), the build margin emission factor ($EF_{grid,BM,y}$) of the NCPG is calculated ex ante as 0.9397 tCO_2e/MWh (see Annex 3 for details).

Step6. Calculate the combined margin emission factor

Based on the *tool to calculate the emission factor for an electricity system* (Version 01.1) the combined margin emissions factor $EF_{grid,CM,y}$ is calculated as follows:

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

Where:
$EF_{grid,CM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year y (tCO_2/MWh)
w_{OM} = Weighting of operating margin emissions factor (%)
w_{BM} = Weighting of build margin emissions factor (%)

The combined margin emissions factor $EF_{grid,CM,y}$ should be calculated as the weighted average of the Operating Margin emission factor ($EF_{grid,OM,y}$) and the Build Margin emission factor ($EF_{grid,BM,y}$), where w_{OM}= 0.75 and w_{BM}= 0.25 for wind project (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods. The ($EF_{grid,OM,y}$) and ($EF_{grid,BM,y}$) are calculated as described in Step 3 and 5.

$$EF_{grid,CM,y} = 1.1208*0.75+0.9397*0.25 = 1.0755(tCO_2e/MWh) \quad (9)$$

2. Project Emission

The emissions of the proposed project activity is zero, PEy=0

3. Leakage

According to ACM0002, no leakage is considered for the proposed project.

4. Calculate Emission Reduction

The emission reduction (ERy) by the project activity during a given year y is the difference between baseline emissions (BEy), project emissions (PEy) and emissions due to leakage(Ly), as follows:

$$ER_y=BE_y-PE_y-L_y \quad (9)$$

Since PE_y and L_y are zero as described before, ER_y can be calculated as follows:

$$ER_y=BE_y=EG_y* EF_y \quad (10)$$

Where:
ER_y = Emission reductions in year y (t CO2e/yr).
BE_y = Baseline emissions in year y (t CO2e/yr).
PE_y = Project emissions in year y (t CO2/yr).
L_y = Leakage emissions in year y (t CO2/yr).

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

Data / Parameter:	$FC_{i,y}$
Data unit:	Mtons, Mm^3
Description:	the amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources j in year(s) *y*
Source of data used:	China Energy Statistical Yearbook 2004-2006
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
Data unit:	TJ/ mass or volume unit of a fuel
Description:	the net calorific value (energy content) per mass or volume unit of a fuel *i*
Source of data used:	China Energy Statistical Yearbook 2006
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Local values
Any comment:	

Data / Parameter:	$GEN_{j,y}$
Data unit:	MWh
Description:	The electricity (MWh) delivered to the gird by source j in year y
Source of data used:	China Electric Power Yearbook 2005-2006
Value applied:	Details see Annex3
Justification of the choice of data or description of measurement methods and procedures actually applied :	China Electric Power Yearbook is a reliable data source

Data / Parameter:	EFc,i,y
Data unit:	tc/TJ
Description:	C Emission Factor of fossil fuel type i in year y
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories

Value applied:	Details see Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC default value
Any comment:	

Data / Parameter:	Installed capacity of power generation source j
Data unit:	*MW*
Description:	Installed capacity of power generation source j
Source of data used:	China Electric Power Yearbook
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	China Electric Power Yearbook is a reliable data source
Any comment:	

Data / Parameter:	GENEbest,coal/oil/gas
Data unit:	%
Description:	Best commercial available efficiency of coal, gas, oil fuel power plant
Source of data used:	http://cdm.ccchina.gov.cn/web/main.asp?ColumnId=25 China DNA: Bulletin on Baseline Emission Factor of 2007 China Region Grid the calculation of baseline Build Margin emission factor for 2007.
Value applied:	Best efficiency for coal plant is 35.82% Best efficiency for oil plant is 47.67% Best efficiency for gas plant is 47.67%
Justification of the choice of data or description of measurement methods and procedures actually applied :	Statistical data issued by DNA.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

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According to the description in B.6.1 and B.6.2, both project emissions and leakage are zero, therefore $PE_y + L_y$=0.

As calculated before, the baseline emission factor of the first crediting period is 1.0549tCO_2e /MWh, i.e. $EF_{grid,CM,y}$ = 1.0755tCO_2e /MWh (more information are shown in Annex 3).

According to the feasibility study of the proposed project, the net electricity generated is approximately 94,450MWh, i.e. EG_y= 94,450MWh

As per calculation formulae of baseline emission, the estimated anthropogenic emission of the first crediting period is as follows:

$BE_y = EG_y * EF_{grid,CM,y}$ =101,580tCO_2e

With the emissions from the proposed project being zero, the emission reductions of the project activity are equivalent to the emissions of the baseline. The annual emission reduction of the first crediting period is about101, 580 tCO_2e.

$ER_y=BE_y=EG_y* EF_{grid,CM,y}$ =101,580tCO_2e

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

Year	Estimation of project activity emissions (tonnes of CO_2 e)	Estimation of baseline emissions (tonnes of CO_2 e)	Estimation of leakage (tonnes of CO_2 e)	Estimation of emission reductions (tonnes of CO_2 e)
01/10/2009~31/12/2009	0	25,395	0	25,395
2010	0	101,580	0	101,580
2011	0	101,580	0	101,580
2012	0	101,580	0	101,580
2013	0	101, 580	0	101, 580
2014	0	101,580	0	101,580
2015	0	101,580	0	101,580
01/01/2016~30/09/2016	0	76,185		76,185
Total(tonnes of CO_2 e)	0	711,060	0	711,060

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

B.7.1 Data and parameters monitored:

Data / Parameter:	EGexport,y
Data unit:	MWh
Description:	Electricity supplied by the project activity to the grid in year y

Source of data to be used:	Measured by metering equipment with acceptable accuracy.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Estimated to be 94,450 MWh according to FSR
Description of measurement methods and procedures to be applied:	Hourly measured and monthly recorded
QA/QC procedures to be applied:	Metering equipment will be calibrated according to the sectoral requirement. Data measured will be cross checked by sales receipts or Electricity Transaction Notes (ETNs). Other QA/QC procedures in section B.7.2
Any comment:	-

Data / Parameter:	EGimport,y
Data unit:	MWh
Description:	Electricity imported by the project activity from the grid in year y
Source of data to be used:	Measured by metering equipment with acceptable accuracy
Value of data applied for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Hourly measured and monthly recorded
QA/QC procedures to be applied:	Metering equipment will be calibrated according to the sectoral requirement. Data measured will be cross checked by sales receipts or Electricity Transaction Notes (ETNs). Other QA/QC procedures in section B.7.2
Any comment:	-

B.7.2 Description of the monitoring plan:

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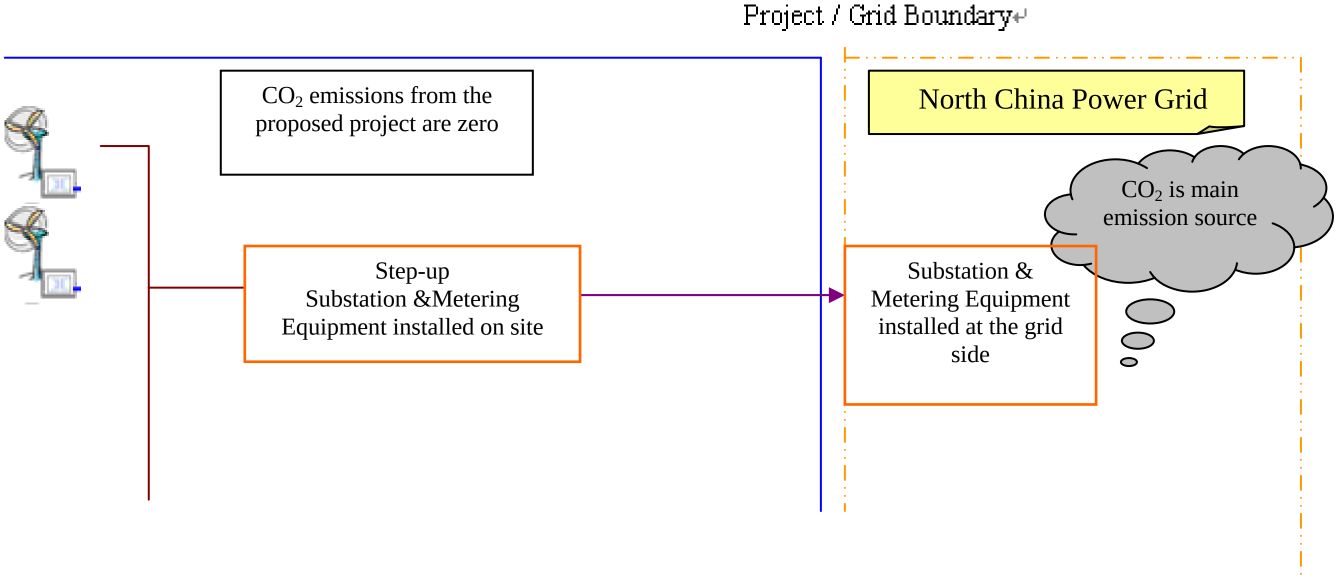
The approved monitoring methodology ACM0002 is used for developing the monitoring plan. Monitoring tasks must be implemented according to the monitoring plan in order to ensure that the real, measurable and long-term greenhouse gas (GHG) emission reductions for the proposed project is monitored and reported.

1. Description of the monitoring system

Bidirectional metering equipment with acceptable accuracy will be installed at the project site. Meanwhile, two meters (bidirectional, with accuracy of 0.5) will be installed at the substation of grid side; one is the main meter, the other is the backup meter which will be used in case of main meter is out of order.

Figure B-3 illustrates the positioning of monitoring equipment. The above mentioned monitoring parameters $EG_{export,y}$ and $EG_{import,y}$ will be measured simultaneously.

The connection of meters could be seen in Figure B-3 below:



If, in the future, new projects are constructed which would need to share the same metering equipment with this project, separate metering equipment will be installed at the project site to ensure that the parameters can be measured directly. The implementation of the monitoring system will be strictly in line with the Power Interchange Agreement to be signed between the project company and the grid company.

2. Management Structure

A CDM Monitoring Team will be established consisting of three units, which are data recording, data management and QA/QC. The staffs of the team will be selected from different departments of the project company. The Team Leader holds the overall responsibilities to the monitoring of the proposed project. His/her role is to ensure that the data monitored are accurately recorded, properly archived, QA/QC procedure is timely carried out and the entire monitoring process is strictly in line with the CDM requirements. He/she will also act as a liaison with the project manager of the consultancy company on a needy basis. The organizational structure of the CDM Monitoring Team and work scope of each unit is illustrated in Figure B-4. The details about QA/QC unit are further elaborated in a below separate section.

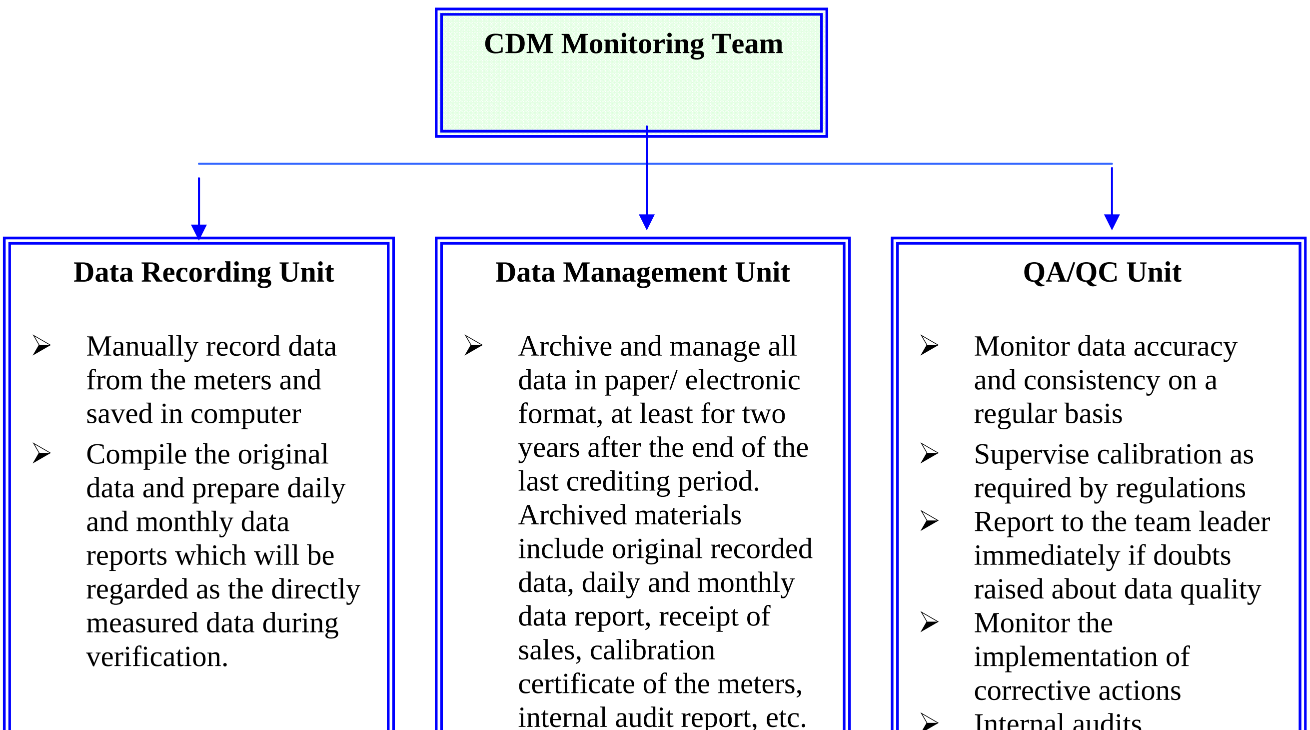


Figure B-4 Management Structure of the CDM Monitoring Team

3. Quality Assurance and Quality Control (QA/QC)

QA/QC is to ensure the accuracy of data collected through measures including periodic calibration of monitoring meters, corrective actions, and internal audits.

3.1 Data quality monitoring

QA/QC unit is responsible for comparing daily and monthly data report with on-site original data to ensure consistency before transferring the reports to the data management unit. If inconsistency exists, QA/QC unit manager will report to the team leader immediately.

Should any reading of the main meter be inaccurate by more than the allowable error, or otherwise functioned improperly, the monitored data shall be determined by the other meter.

3.2 Calibration

One of the responsibilities of the QA/QC unit manager is to ensure that the meters will be calibrated according to the requirements of meter manufacturers and national regulations.

Procedure about calibration will be consistent with what is stipulated in the Power Interchange Agreement. The meters will be calibrated by an accredited calibration agency periodically according to the sectoral requirement. Calibration Certificates and relevant documents will be collected by the QA/QC unit and handed to data management unit for archiving.

3.3 Corrective actions

If problems which can affect the quality of data occur, the QA/QC unit manager will initiate and supervise the implementation of corrective actions. For instance, metering equipment installed shall be inspected by an accredited inspection agency after the repair of all or part of meter caused by the failure of one or more parts to operate in accordance with the specifications.

3.4 Internal audits

Internal audit procedure will be initiated under any of the below circumstances:

- modification of the monitoring system
- two months prior to verification

Firstly, the monitoring system will be checked on if the system functions properly and if the monitored results are correct. Secondly, spot check of daily/monthly data report will be undertaken. Internal audit report will be submitted upon completion of the procedure.

4. Monitoring Training

Monitoring training is critical to ensure that all members of the CDM Monitoring Team has a thorough understanding of the monitoring procedure and are able to carry out the monitoring tasks strictly in line with the CDM requirements. The team leader is responsible for evaluating training outcome. Only qualified staffs can work on duty. The training will include:

Training on operation and monitoring system of the wind farm
This is the type of training which are routinely carried out by the wind farm itself for new staffs.

Training on CDM basics with focus on monitoring
It will be carried out by the CDM consultancy company before the project is implemented. The CDM monitoring manual will be used as the primary training materials. The training includes the following contents:
- CDM project cycle and the significance of monitoring
- Management structure and work scope of each team member
- Components of the monitoring plan
- QA/QC procedure
- Monitoring report template
- Preparation for verification
- Questions and answers

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)

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The baseline study of the proposed project was completed on 19,June. 2008 by CWEME (China National Water Resources & Electric Power Materials & Equipment Co., Ltd.)

The persons involved in baseline study are listed as follows, and CWEME is not the project participant:
1) Ms. Bian Jing, CDM Office of CWEME, E-mail: bianjing@cweme.com, TEL: +86 10 5196 7720;
2) Mr.Tang Renhu, CDM Office of CWEME, E-mail: tangrenhu@cweme.com, TEL: +86 10 5196 7725

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:

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27/01/2008
This date is the earliest of the date in the implementation timeline of the project activities. The course to decide this starting date has been described in Section B.5. The project participant has provided the Construction Service contract of the project to DOE as the evidence of this starting date.

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

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21years (1 construction year, 20 operational years)

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

-

C.2.1. Renewable crediting period

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

>>
01/10/2009(or the date of registration, whichever is later)

C.2.1.2. Length of the first crediting period:

>>
7 years, 0 month

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
Not applicable

C.2.2.2. Length:

>>
Not applicable

SECTION D. Environmental impacts

>>

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

>>
According to China Environmental Protection Law, the Environmental Impact Assessment (EIA) must be completed before the development and construction of the proposed project. Thus, the project owner authorized a third party to carry out the EIA report. The project was approved by the Environmental Protection Bureau of Shandong Province on 2, November 2007. The environmental impacts of the proposed project are analyzed as the following:

Land Use

Most of the construction area of this proposed project is designed to be within an area of 16.94 Km^2, most of it being occupied for temporary use. The terrain of this wind farm is delta plain covered with shoal and salina soil. In this area, there is no suitable land for cultivating or living. The construction work of the project will have some influences on the local ecological environment such as intensified soil erosion, and weakening of the anti-eclipse ability of the regolith.
By strictly managing the construction action, building bulkheads at the slope faces, backfilling the excavated soil and rock, and restoring the destroyed ground and vegetation, we could limit the disturbance and damage of the land surface to a minimal scope, and enforce the ecological environment protection for the project operation and the sustainable development.

Waste water and sewage

The total amount of waste water and sewage from daily life and industry will be very small. Before wastewater and sewage are discharged, they will be processed by using sedimentation pond and septic tank to reach the class one of Chinese environmental standard (GB/T18920-2002), which shows no impact on the surrounding environment.

Solid Wastes

During the construction period, by refilling the excavated soil as much as possible, the discharged waste slag will be reduced. The wastes must be piled up in designated waste disposal sites. During the operation, the solid wastes generated mainly from daily life of employees in the wind farm and which will be collected and transported to local Environmental Hygiene Department for disposal. Therefore, the local environment will be kept off pollution arising from solid wastes.

Dust and Air Quality

The air impact during the construction period mainly comes from flying dust produced by excavating land and transportation vehicles, and some exhaust discharge from using and moving construction machinery. By regularly spraying and cleaning the branch roads, material dump sites and other construction work surfaces, the influences could be reduced under the construction standards set by governments and environmental protection departments.

Noise

The noise pollution mainly comes from the instantaneous demolition noise, manual drills, cement mixers, and transportation vehicles during construction period, and aerodynamic interaction between the wind and turbine blades during operation period. Since the demolition times are limited and all equipments will be operated during daytime hours, the noise levels will be controlled and naturally attenuated by ambient conditions within the standards set as Chinese environmental guidelines (GB3096-93).

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

>>

According to the results of EIA and the reply from the Environmental Protection Bureau, the impacts on the environment are not significant.

SECTION E. Stakeholders' comments

>>

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

>>

To investigate the impacts on local ecological environment, on 14, December 2007 a survey was made among the potential stakeholders, mostly including local residents. The survey was arranged through a one-page questionnaire, which was designed to be easily filled in with the following sections:

1) Project introduction

2) Respondent's basic information and education level
3) Questions on:

- Do they have any knowledge or understanding about wind farm projects?
- Will the Project bring improvements to their livelihoods?
- What would the overall influence be for the construction and implementation of the Project?
- Do they agree with the construction of the Project?
- What other comments and suggestions do the respondents have for the company regarding the Project?

4) Space for the respondents' signature and date

E.2. Summary of the comments received:

>>

The survey had a 100% response rate (23questionnaires returned out of 23) and the following is a summary of the key findings:

Table E-1 Information about the respondents

		Number	Percentage
Gender	Male	18	78%
	Female	5	22%
Education level	Others middle level	4	18%
	High school and above	19	82%
	Unknown	0	0%

- 95.7% of the respondents have some knowledge and understandings about wind farm projects.
- 100% of the respondents support the development of the Project.
- 100% of the respondents believe that the Project will mainly have positive impacts on their livelihoods, and no respondents refer to the problems on their livelihoods.

Conclusion

The survey shows that the proposed project receives strong support from local people, which is closely linked to the fact that the majority of local residents have some understandings with wind power projects. All the respondents believe that the Project will have overall positive impacts on their livelihoods with increase of job opportunities, increase of income and others. 100% of the investigated people are supportive to the project construction. The government and authorities at all levels support the project construction actively, confirm its social and environmental benefits, and wish the construction could be started early and accelerated.

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

>>

No negative comments have been received on the project. Moreover, the local community possesses strong positive comments on the effects that the proposed project will make on the local economy and infrastructure. There has therefore been no need to modify the project due to comments received. And meanwhile, the project owner will concern much on the suggestions from stakeholders and put all of the

measures listed in the EIA into effect during construction and operation, so as to achieve environmental, social and economic benefits.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding for the proposed project.

Annex 3

BASELINE INFORMATION

The following tables summarise the numerical results from the equations listed in the ACM0002 Baseline methodology for grid-connected electricity generation from renewable sources. The information listed in the tables includes data, data sources and the underlying computations.

Calculation of the OM emission factor of the North China Power Grid

Table An3-1. Fired Electricity generated & delivered to the North China Power Grid in 2003

Provinces in the regional grid	Elec. Generated (year of 2003)	Rate of Plant Consumption	Elec. Delivered to Power Grid
	（MWh)	（%）	（MWh)
Beijing	18608000	7.52	17208678.4
Tianjin	32191000	6.79	30005231.1
Hebei	108261000	6.5	101224035
Shanxi	93962000	7.69	86736322.2
Inner Mongolia	65106000	7.66	60118880.4
Shandong	139547000	6.79	130071758.7
Total			**425364905.8**
《China Electric Power Yearbook 2004》			

Table An3-2. Fired Electricity generated & delivered to the North China Power Grid in 2004

Provinces in the regional grid	Elec. Generated (year of 2004)	Rate of Plant Consumption	Elec. Delivered to Power Grid
	（MWh)	（%）	（MWh)
Beijing	18579000	7.94	17,103,827
Tianjin	33952000	6.35	31,796,048
Hebei	124970000	6.5	116,846,950
Shanxi	104926000	7.7	96,846,698
Inner Mongolia	80427000	7.17	74,660,384
Shandong	163918000	7.32	151,919,202
Total			**489,173,110**
《China Electric Power Yearbook 2005》			

Table An3-3. Fired Electricity generated & delivered to the North China Power Grid in 2005

Provinces in the regional grid	Elec. Generated (year of 2005)	Rate of Plant Consumption	Elec. Delivered to Power Grid
	（MWh)	（%）	（MWh)
Beijing	20880000	7.73	19,265,976
Tianjin	36993000	6.63	34,540,364
Hebei	134348000	6.57	125,521,336
Shanxi	128785000	7.42	119,229,153
Inner Mongolia	92345000	7.01	85,871,616
Shandong	189880000	7.14	176,322,568
Total			**560,751,013**
《China Electric Power Yearbook 2006》			

Table An3-4 Calculation of simple OM emission factor of the North China Power Grid (2003)

Fuel types	unit	Provinces in the Regional Grid						Subtotal	Effective CO2 Emission Factor(tCO2/TJ)	average low Caloric value (MJ/t,m^3,tce)	CO_2 emisson (tCO_2e)
		Beijing	Tianjin	Hebei	Shanxi	Shandong	Inner Mongolia				
		A	*B*	*C*	*D*	*E*	*F*	*F=A+B+C+D+E+F*	*G*	*H*	*=F*G*H*
raw coal	Mtons	7.1473	10.5274	54.8264	45.2851	68.08	39.4932	225.3594	94.6	20908	445737636.1
cleaned coal	Mtons	0	0	0	0	0.0941	0	0.0941	94.6	26344	234510.5998
other washed coal	Mtons	0.0631	0	0.6728	2.0821	4.509	0	7.327	94.6	8363	5796681.315
coke	Mtons	0	0	0	0	0	0.028	0.028	94.6	28435	75318.628
coke oven gas	Mm^3	24	171	0	90	2	21	308	44.4	16.726	168578.0088
other gas	Mm^3	1692	0	1063	0	156	1032	3943	44.4	5.227	915086.7084
crude oil	Mtons	0	0	0	0	0.2968	0	0.2968	73.3	41816	909725.479
Gasoline	Mtons	0	0	0	0	0.0001	0	0.0001	69.3	43070	298.4751
Kerosene	Mtons	0	0	0	0	0	0	0	71.5	43070	0
Diesel Oil	Mtons	0.0029	0.0135	0.04	0	0.054	0.0291	0.1395	74.1	42652	440891.5914
fuel oil	Mtons	0.1395	0.0002	0.0111	0	0.1007	0.0065	0.258	77.4	41816	835032.0672
LPG	Mtons	0	0		0	0	0	0	63.1	50179	0
Refinery gas	Mtons	0	0	0.0027	0	0.0083	0	0.011	57.6	46055	29180.448
Natural gas	Mm^3	0	50	0	0	108	0	158	56.1	38.931	345076.5978
Other Petroleum Products	Mtons	0	0	0	0	0	0	0	73.3	41816	0
Other Coking Products	Mtons	0	0	0	0	0	0	0	107	29271.2	0
fired electricity generated	TWh	17.2086784	30.0052311	101.224035	86.7363222	130.071759	60.1188804	425.3649058			429.609286
electricity imported	TWh							4.24438		Total tCO2e Emission:	455,551,793.43
Result	a. total CO2 emission in North China Power Grid(tCO2e)								455,551,793.43		
	b. total generatoin in North China Power Grid(TWh)								429.6089058		
	c. OM emission factor (tCO2/MWh)		(a/b/10^6)						1.071615		
Data Source	Effective CO2 Emission Factor: 2006 IPCC Guidelines for National Greenhouse Gas Inventories										
	Fuel Consumption ,Fire Generated Electricity Data and Average Low Caloric Value: China Energy Statistical Yearbook										
	Electricity Imported: China Electric Power Yearbook										

Table An3-5 Calculation of simple OM emission factor of the North China Power Grid (in 2004)

Fuel types	unit	Provinces in the Regional Grid						Subtotal	Effective CO2 Emission Factor	average low Caloric value	CO_2 emisson
		Beijing	Tianjin	Hebei	Shanxi	Shandong	Inner mongolia		(tCO2/TJ)	(MJ/t,m^3,tce)	(tCO_2e)
		A	*B*	*C*	*D*	*E*	*F*	*F=A+B+C+D+E+F*	*G*	*H*	*=F*G*H*
raw coal	Mtons	8.2309	14.1	62.998	52.13	85.5	49.322	272.2809	94.6	20908	538543520.8
cleaned coal	Mtons	0	0	0	0	0.4	0	0.4	94.6	26344	996856.96
other washed coal	Mtons	0.0648	0	1.0104	3.5417	2.8422	0	7.4591	94.6	8363	5901190.882
coke	Mtons	0	0	0	0	0	0.0022	0.0022	94.6	28435	5917.8922
coke oven gas	Mm^3	55	0	54	532	873	40	1554	44.4	16.726	1154053.858
other gas	Mm^3	1774	0	2425	820	141	1647	6807	44.4	5.227	1579760.392
crude oil	Mtons	0	0	0	0	0	0	0	73.3	41816	0
Gasoline	Mtons	0	0	0	0	0	0	0	69.3	43070	0
Kerosene	Mtons	0	0	0	0	0	0	0	71.5	43070	0
Diesel Oil	Mtons	0.0039	0.0084	0.0466	0	0	0	0.0589	74.1	42652	186154.2275
fuel oil	Mtons	0.1466	0	0.0016	0	0	0	0.1482	77.4	41816	479657.9549
LPG	Mtons	0	0	0	0	0	0	0	63.1	50179	0
Refinery gas	Mtons	0	0.0055	0.0142	0	0	0	0.0197	57.6	46055	52259.5296
Natural gas	Mm^3	0	37	0	19	0	0	56	56.1	38.931	126673.6878
Other Petroleum Products	Mtons	0	0	0	0	0	0	0	73.3	41816	0
Other Coking Products	Mtons	0	0	0	0	0	0	0	107	29271.2	0
fired electricity generated	TWh	17.10383	31.79605	116.847	96.846698	151.9192024	74.6603841	489.1731099			493.687660
electricity imported	TWh							4.5		Total tCO2e Emission:	549,031,577.7
	a. total CO2 emission in North China Power Grid(tCO2e)								549,031,557.7		
Result	b. total generatoin in North China Power Grid(TWh)								493.687660		
	c. OM emission factor (tCO2/MWh)			(a/b/10^6)					1.122840		
	Effective CO2 Emission Factor: 2006 IPCC Guidelines for National Greenhouse Gas Inventories										
Data Source	Fuel Consumption ,Fire Generated Electricity Data and Average Low Caloric Value: China Energy Statistical Yearbook										
	Electricity Imported: China Electric Power Yearbook p297										

Table An3-6 Calculation of simple OM emission factor of the North China Power Grid (2005)

Fuel types	unit	Provinces in the Regional Grid						Subtotal	Effective CO2 Emission Factor (tCO2/TJ)	average low Caloric value ($MJ/t,m^3$,tce)	CO_2 emisson (tCO_2e)
		Beijing	Tianjin	Hebei	Shanxi	Shandong	Inner mongolia				
		A	B	C	D	E	F	F=A+B+C+D+E+F	G	H	=F*G*H
raw coal	Mtons	8.9775	16.752	67.265	61.765	104.054	62.7723	321.5858	94.6	20908	636062535.8
cleaned coal	Mtons	0	0	0	0	0.4218	0	0.4218	94.6	26344	1051185.664
other washed coal	Mtons	0.0657	0	1.6745	3.7365	1.0869	0	6.5636	94.6	8363	5192725.191
coke	Mtons	0	0	0	0	0.0011	0.0021	0.0032	94.6	28435	8607.8432
coke oven gas	Mm^3	64	75	62	2108	0	39	2348.0000	44.4	16.726	1742396.483
other coal gas	Mm^3	1609	786	3883	988	0	1837	9103.0000	44.4	5.227	2111027.27
crude oil	Mtons	0	0	0	0	0	0.0073	0.0073	73.3	41.816	22385.49867
gasoline	Mtons	0	0	0.0001	0	0	0	0.0001	69.3	43070	298.4751
kerosene	Mtons	0	0	0	0	0	0	0.0000	71.5	43070	0
diesel oil	Mtons	0.0048	0	0.0354	0	0	0.0012	0.0414	74.1	42652	130786.3867
fuel oil	Mtons	0.1225	0	0.0023	0	0	0.0006	0.1254	77.4	41816	405689.6325
LPG	Mtons	0	0	0	0	0	0	0.0000	63.1	50179	0
Refinery gas	Mtons	0	0	0.0902	0	0	0	0.0902	66.7	46055	277221.0107
Natural gas	Mm^3	28	8	0	276	0	0	312.0000	56.1	38.931	681417.0792
other petroleum products	Mtons	0	0	0	0	0	0	0.0000	73.3	38369	0
other coking products	Mtons	0	0	0	0	0	0	0.0000	107	28435	0
fired electricity generated	TWh	19.265976	34.540364	125.521336	119.229153	176.322568	85.871616	560.751013			584.174013
electricity imported	TWh							23.423			
										Total tCO2e Emission	647,686,276.3
Result	a. total CO2 emission in North China Power Grid(tCO2e)									647,686,276.3	
	b. total generatoin in North China Power Grid(TWh)									584.174013	
	c. OM emission factor (tCO2/MWh) ($a/b/10^6$)									1.155145	
Data Source	Effective CO2 Emission Factor: 2006 IPCC Guidelines for National Greenhouse Gas Inventories										
	Fuel Consumption ,Fire Generated Electricity Data and Average Low Caloric Value: China Energy Statistical Yearbook										
	Electricity Imported: China Electric Power Yearbook										

Table An3-7Generation weighted OM Factor

	OM	Electricity generated (TWh)	Generation Weight	weight*OM
OM 2003	1.071615	429.609286	28.49867743%	0.305396102
OM2004	1.122840	493.687660	32.74939773%	0.367723337
OM 2005	1.155145	584.174013	38.75192484%	0.447640922
Generation-weighted OM (/tCO2MWh)	1.1208			

Calculation of the BM Emission Factor of North China Power Grid

Table An3-8. Installed capacities of North China Power Grid (2003)

	Hydro	Coal	Nuclear	Other	Total
Beijing	1058.1	3347.5	0	0	4405.6
Tianjin	5	6008.5	0	0	6013.5
Hebei	764.3	17698.7	0	13.5	18476.5
Shanxi	795.7	15035.8	0	0	15831.5
Shandong	50.8	30494.4	0	0	30545.2
Inner Mongolia	592.1	11421.7	0	76.6	12090.4
Total	3266	84006.6	0	90.1	87362.7

Data Source：China Electric Power Yearbook 2004，P709

Table An3-9. Installed capacities of North China Power Grid (2004)

	Hydro	Coal	Nuclear	Other	Total
Beijing	1055.9	3458.5	0	0	4514.4
Tianjin	5	6008.5	0	0	6013.5
Hebei	783.8	19932.7	0	13.5	20730
Shanxi	787.3	17693.3	0	0	18480.6
Shandong	50.8	32860.4	0	12.3	32923.5
Inner Mongolia	567.9	13641.5	0	111.7	14321.1
Total	3250.7	93594.9	0	137.5	96983.1

Data Source：China Electric Power Yearbook 2005，P473

Table An3-10. Installed capacities of North China Power Grid (2005)

	Hydro	Coal	Nuclear	Other	Total
Beijing	1025	3833.5	0	24	4882.5
Tianjin	5	6149.9	0	24	6178.9
Hebei	784.5	22333.2	0	48	23165.7
Shanxi	783	22246.8	0	0	23029.8
Shandong	50.8	37332	0	30.6	37413.4
Inner Mongolia	567.9	19173.3	0	208.9	19950.2
Total	3216.2	111068.7	0	335.5	114620.5

Data Source：China Electric Power Yearbook 2006，P571

Table An3-11----Calculation of CO2 Emission of Solid, Liquid and Gas Fuel for Power Grid

Fuel types	unit	Provinces in the Regional Grid						Subtotal	Effective CO2 Emission Factor	average low Caloric value	CO_2 emisson
		Beijing	Tianjin	Hebei	Shanxi	Shandong	Inner mongolia		(tCO2/TJ)	(MJ/t,m^3,tce)	(tCO_2e)
		A	B	C	D	E	F	F=A+B+C+D+E+F	G	H	=F*G*H
raw coal	Mtons	8.9775	16.752	67.265	61.765	104.054	62.7723	321.5858	94.6	20908	636062536
cleaned coal	Mtons	0	0	0	0	0.4218	0	0.4218	94.6	26344	1051186
other washed coal	Mtons	0.0657	0	1.6745	3.7365	1.0869	0	6.5636	94.6	8363	5192725
coke	Mtons	0	0	0	0	0.0011	0.0021	0.0032	94.6	28435	8608
subtotal											**642315054**
crude oil	Mtons	0	0	0	0	0	0.0073	0.0073	73.3	41.816	22385
gasoline	Mtons	0	0	0.0001	0	0	0	0.0001	69.3	43070	298
kerosene	Mtons	0	0	0	0	0	0	0.0000	71.5	43070	0
diesel oil	Mtons	0.0048	0	0.0354	0	0	0.0012	0.0414	74.1	42652	130786
fuel oil	Mtons	0.1225	0	0.0023	0	0	0.0006	0.1254	77.4	41816	405690
other petroleum products	Mtons	0	0	0	0	0	0	0.0000	73.3	38369	0
subtotal											**559160**
Natural gas	Mm^3	28	8	0	276	0	0	312.0000	56.1	38.931	681417
coke oven gas	Mm^3	64	75	62	2108	0	39	2348.0000	44.4	16.726	1742396
other coal gas	Mm^3	1609	786	3883	988	0	1837	9103.0000	44.4	5.227	2111027
other coking products	Mtons	0	0	0	0	0	0	0.0000	107	28435	0
LPG	Mtons	0	0	0	0	0	0	0.0000	63.1	50179	0
Refinery gas	Mtons	0	0	0.0902	0	0	0	0.0902	66.7	46055	277221
subtotal											**4812061**
TOTAL									**Total tCO2e Emission**		**647686276**

Table An3-12----Emission factor of best technology

	Variable	Electricity supply effciency	Emission Factor of fuel (tc/TJ)	Emission Factor ($tC0_2$/MWh)
		A	B	D=3.6/A/1000*B*C*44/12
Coal-based power plants	$EF_{Coal,Adv}$	35.82%	25.8	0.9508
Gas-based power plants	$EF_{Gas,Adv}$	47.67%	15.3	0.4237
Oil-based power plants	$EF_{Oil,Adv}$	47.67%	21.1	0.5843

According to the table **An3-11**and formula(4),(5) and (6) : λ_{coal}=99.17%, λ_{oil}=0.08%, λ_{gas}=0.74%.

Calculation of $EF_{thermal} = \lambda_{coal} \times EF_{coal,adv} + \lambda_{oil} \times EF_{oil,adv} + \lambda_{gas} \times EF_{gas,adv} = 0.9465\ tCO2/MWh$

Table An3-13 Incremental installed capacity from 2003 to 2005

TABLE A3	A	B	C	D	E
	Installed Capacity 2003	Installed Capacity 2004	Installed Capacity 2005	New Capacity Additions 2005-2003	Ratio of Thermal Capacity Additions to Total Capacity Additions
	MW	MW	MW	MW	%
				=C-A	
Hydro	3266.00	3250.70	3216.20	-49.80	-0.18%
Coal	84006.60	93594.90	111068.70	27062.10	99.28%
Nuclear	0.00	0.00	0.00	0.00	0.0000%
Other (wind)	90.10	137.50	335.50	245.40	0.90%
Total	87362.70	96983.10	114620.40	27257.70	100%
Percent of Installed Capacity to 2005 Capacity	76.22%	84.61%	100%		

$$EF_{BM,y}=0.9465 \times 99.28\%=0.9397 tCO2/MWh$$

Table An3-14 Calculation of combined emission factor

OM Factor(tCO_2e/MWh)	BM Factor (tCO_2e/MWh)	Combined Emission Factor* (tCO_2e/MWh)
1.1208	0.9397	**1.0755**

***Combined Emission Factor =0.75* OM+0.25*BM**

Annex 4

MONITORING PLAN

No additional information.