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:

Title: Hebei Chengde Weichang Yudaokou Pasture 150MW Wind Farm Project
Version: 0.3
Date: 08/02/2010

A.2. Description of the project activity:

Hebei Chengde Weichang Yudaokou Pasture 150MW Wind Farm Project (hereinafter referred to as "the proposed project" or "the project") is a new grid-connected renewable power generation project, which is located in Weichang Manchu & Mongolia Autonomous County, Chengde City, Hebei province, China. The project is constructed and operated by Hebei Construction Investment New Energy Co., Ltd.

The project will involve in installation and operation of 100 sets of SL1500/77 wind turbines with a unit capacity of 1.5MW. The total installed capacity of the project will be 150MW, and the estimated net power supplied to the grid is 312,700MWh per year. The power generated by the proposed project will be transmitted to the North China Power Grid (hereinafter referred to as "NCPG").

The electricity generated by the project should have been supplied by the NCPG prior to the start of the implementation of the project activity, which is the same as the baseline scenario.

The project transmits renewable wind power to the NCPG, and substitutes for relevant power generation by fossil fuel power plants of the NCPG (main emissions: CO_2), and reduce Greenhouse Gas emissions amount to 329,852tCO_2e annually.

This wind power generation project is a mean to generate renewable energy with no fossil fuels consumptions, and strengthen the generation capability in the NCPG. The development of the project is in compliance with the developing objective of the Chinese energy industry, and it will contribute to the sustainable development in the energy sector, especially for the electricity industry. The main contribution includes:

- Reducing reliance on exhaustible fossil fuel;
- Reducing global emissions of greenhouses gases resulting of burning fossil fuel;
- Reducing local air pollution caused by burning fossil fuel;
- Providing sufficient electricity power for life and manufacture of local residents;
- Increasing employment opportunities and incomes for local residents, improving the life quality of local residents.

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)	Hebei Construction Investment New Energy Co., Ltd.	Yes

	(as the project owner)	
(*) 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.		

For more detailed contact information on participant in the project activities, please refer to Annex 1.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

People's Republic of China

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

Hebei Province

A.4.1.3. City/Town/Community etc:

Weichang Manchu & Mongolia Autonomous County, Chengde City

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity:

The proposed project is located in Weichang Manchu & Mongolia Autonomous County, Chengde City, Hebei province, P.R. China. The central geographical coordinates of the project is longitude 116°57′05″E and latitude 42°11′21″N.

The location of the project is provided in Fig. A.1:

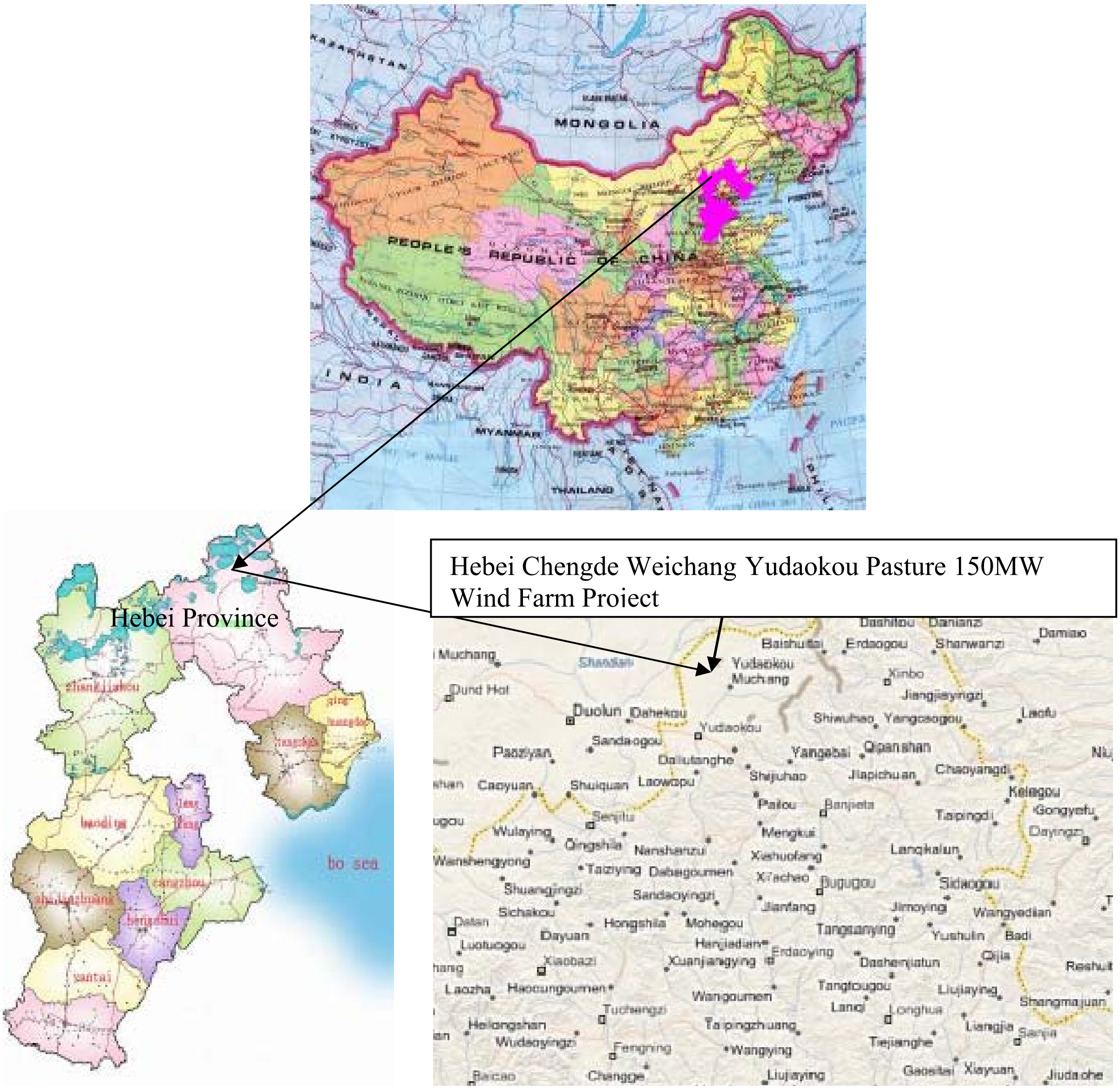

Fig. A.1 The Location of Hebei Chengde Weichang Yudaokou Pasture 150MW Wind Farm Project

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

The project activity falls under the category described under CDM as "Sectoral Scope Number 1: Energy Industries – Renewable Sources".

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

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

The electricity generated by the project would have been supplied by the NCPG, prior to the start of the implementation of the project activity, which is the same as the baseline scenario. The NCPG is dominated by electricity generated by fossil fuel fired power plants, whose by-products are GHGs (main emissions: CO_2).

The project scenario:

This project will employ 100 sets of wind turbines. The total installed capacity is 150MW with a unit capacity of 1.5MW, and the power load factor (PLF) of the proposed project is 23.8%[1]. The key technical parameters are provided in Table A.1:

Table A.1 Key Technical Parameters

Key Technical Parameters		Value
Wind Turbine	Type	SL1500/77
	Manufacturer	Huarui Windpower Technology Co., Ltd
	Rotate Speed of Wheel Hub	9.7 -19r/min
	Number of Blades	3
	Fan Diameter	77.4m
	Swept Area	4,657m^2
	Cut in Wind Speed	3 m/s
	Rated Wind Speed	12m/s
	Cut out Wind Speed	20 m/s
Generator	Type	Asynchronous bidirectional
	Rated Capacity	1.50MW
	Rated Voltage	690V
	Rated Frequency	50Hz
Main Transformer	Type	SFZ10-100000/220
	Rated Frequency	50Hz
	Rated Voltage	High side: 242kV Low side: 38.5kV

Note: the lifetime of the equipments is 20 years referring to the Feasibility Study Report (FSR) of the project.

The power generated by the proposed project will be transmitted via the Yudaokou 220kV Switching Station, and finally to the NCPG. Electric meters will be employed in the project area to finally obtain net electricity supplied to the grid by the project. (See details in Section B.7.2).

The project will have a limited impact on the local environment and most of the impacts are temporary and the project will employ a series of measures to minimize the impacts. More detailed information regarding the impact on the environment is provided in Section D.1 of this PDD.

There is no direct technology transfer related to the project activity since all the technology employed is from domestic manufacturers.

The project owner will carry out training to enable staff become familiar with the operation of wind farm project. Besides, the manufacturer of the equipments will also provide on-site trainings regarding the turbines and generators operations. Additionally, Beijing Tianqing Power International CDM consulting Co., Ltd. (hereinafter referred to as “TQ power”) will train the project owner on CDM monitoring.

[1] It sourced from page 20of the FSR which complied by Hydro China Xibei Engineering Corporation (contracted with the PP) which has the A Grade in survey and design, issued by Chinese NDRC.

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

The project activity employs the renewable crediting period (7years×3), and the estimated emission reduction in the first crediting period (from July 2010 to June 2017) is presented in Table A.2. Estimated emission reductions in the first crediting period are 2,144,038 tCO_2e.

Table A.2 The estimated Emission Reductions in the First Crediting Period

Years	Annual estimation of emission reductions (tCO_2e)
Year 1: 01/07/2010~30/06/2011	164,926[2]
Year 2: 01/07/2011~30/06/2012	329,852
Year 3: 01/07/2012~30/06/2013	329,852
Year 4: 01/07/2013~30/06/2014	329,852
Year 5: 01/07/2014~30/06/2015	329,852
Year 6: 01/07/2015~30/06/2016	329,852
Year 7: 01/07/2016~30/06/2017	329,852
Total estimated reductions of the first crediting period (tCO_2e)	2,144,038
Total number of the first crediting period (year)	7
Annual average reductions over the first crediting period (tCO_2e)	306,291

A.4.5. Public funding of the project activity:

There is no public funding from Annex I parties available to the project.

[2] The project will start commission and operating on July 1, 2010, but it is not full-load operating during the first operating year. According to FSR of the project, the electricity generated from July 2010 to June 2011 is 156,350MWh, and the corresponding estimated emission reduction is 164,926 tCO_2e.

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:

Baseline and monitoring methodology:

Approved consolidated baseline and monitoring methodology ACM0002 (Version 10): Consolidated baseline and monitoring methodology for grid-connected electricity generation from renewable sources.

"Tool to calculate the emission factor for an electricity system" (Version 2.0) is applied to calculated emission factors.

"Tool for the demonstration and assessment of additionality" (Version 5.2) is applied to demonstrate the additionality of the project.

All above methodologies and tools can be found at the UNFCCC website:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

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

The baseline methodology ACM0002 (Version 10) is applicable to the proposed project, because the project meets all the applicability criteria stated in the methodology:

1. The project is a grid-connected wind power generation project, and the project is a new installation of wind power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant) with the total installed capacity of 150MW, which did not involve in any capacity addition, retrofit or replacements;
2. The project does not involve a switching from fossil fuels to renewable energy sources at the site of the project activity.

Therefore, the baseline methodology is applicable to the project.

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

According to the definition of project boundary by ACM0002, the project boundary includes the project power plant, and all power plants connected physically to the electricity system where the proposed project is connected to.

The electricity system is defined according to *"Tool to calculate the emission factor for an electricity system" Version 2.0.*

In this specific case, the electricity generated by the project will be transferred to NCPG. The NCPG consists of Beijing Grid, Tianjin Grid, Hebei Grid, Shandong Grid, Shanxi Grid and Inner Mongolia Grid. The NCPG has electricity importing from Central China Power Grid (CCPG) and Northeast China Power Grid (NEPG). According to the guidance given above, it is justifiable to identify the power plant located on the NCPG, CCPG and NEPG as the correct project boundary for this proposed project.

Table B.1 Emissions sources included in or excluded from the Project Boundary

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

The below flow diagram physically delineates the project activity and its relevant information.

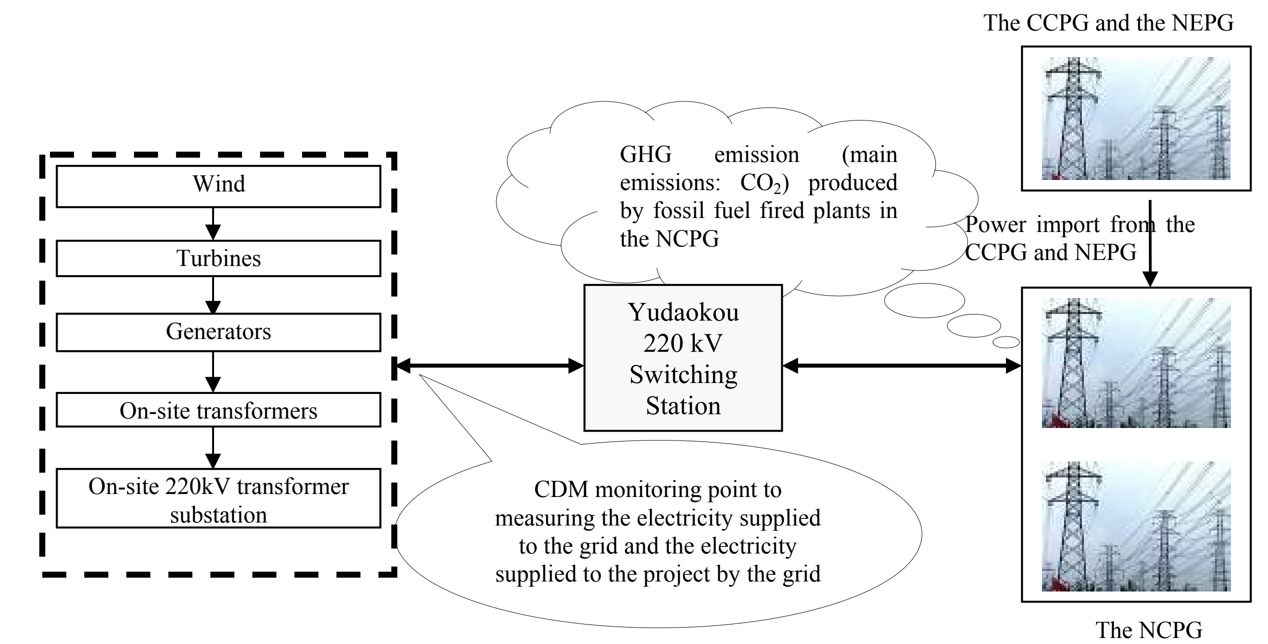

Fig. B.1 Project Boundary

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

The proposed project is the installation of a new grid-connected renewable power plant, and the baseline scenario is the following as per ACM0002 (Version 10):

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

The power generated by the proposed project is transmitted to the NCPG. Therefore, the baseline scenario of the proposed project is as follows:
The equivalent annual electricity generated by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources connected to the NCPG, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".

The basic parameters used for calculating baseline emissions of the project are provided in Table B.2:

Table B.2 Basic parameters used for calculating baseline emissions

Parameters	Value	Data sources
The Operating Margin Emission Factor ($EF_{grid,OM,y}$) of the NCPG(tCO_2e/MWh)	1.1169	Chinese DNA: *2008 Baseline Emission Factors for Regional Power Grids in China*. (See details in Annex 3)
The Build Margin Emission Factor($EF_{grid,BM,y}$) of the NCPG(tCO_2e/MWh)	0.8687	Chinese DNA: *2008 Baseline Emission Factors for Regional Power Grids in China*. (See details in Annex 3)
Total net electricity supplied to grid($EG_{facility,y}$,MWh)	312,700	FSR

About calculation for baseline emissions as per *Tool to calculate the emission factor for an electricity system (Version 2.0)* and basic parameters used for calculating baseline emissions are provided in section B.6.

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):

The FSR was completed in August 2008 by Hydro China Xibei Engineering Corporation (hereinafter referred to "Institute"). In the FSR, the IRR is far lower than the benchmark of 8%, which means the project is not financially attractive. Fortunately, the project owner was in an early stage aware of the potential CDM to support its activities as early in 2006, and five wind farm projects owned by the project owner have been registered as CDM projects[3].
Based on the successful experience on CDM application, the project owner made a board decision to apply for CDM on September 19, 2008, and held CDM stakeholder meeting for meeting the requirement of

[3] http://cdm.unfccc.int/Projects/DB/DNV-CUK1169475281.64/view
http://cdm.unfccc.int/Projects/DB/DNV-CUK1169559890.44/view
http://cdm.unfccc.int/Projects/DB/TUEV-SUED1218534453.07/view
http://cdm.unfccc.int/Projects/DB/TUEV-SUED1218616949.73/view
http://cdm.unfccc.int/Projects/DB/TUEV-SUED1218101320.07/view

CDM application in November 2008. At the same time, the project owner started to seek for the CDM consultant, and after serious research, the project owner signed the Service Agreement on the development of CDM Project with TQ Power on March 27, 2009. And then TQ Power started to collect information for PDD writing, and at the same time, the project owner started to look for appropriate DOE.

Only after these serious CDM considerations, the project owner signed Equipment Purchase Contract on April 1, 2009, which is the earliest starting date of the project activity. It is obvious that all date related to the preparation of CDM application are earlier than the earliest starting date of the project and the project owner was in an early stage seriously aware of the potential of CDM to support its activity.

In order to accelerate the CDM application process, the project owner sent the notification of CDM application to the Chinese DNA in April and got the confirmation in the same month. During this period, TQ Power completed the PDD and submitted the PDD to China DNA for approval in May 2009, and then the project was approved by Chinese DNA and the project owner received the paper-pattern LoA from Chinese DNA for CDM application in July, 2009. Also, the PDD started to GSP on July 3, 2009. From then on, the CDM application work was going on smoothly.

The above events clearly demonstrate that the real and continue actions were taken to secure CDM status for the project activity in parallel with its implementation.

The main events related to the consideration of CDM in the decision to proceed with the project activity are illustrated in the table below. An overview of key events is given in Table B.3

Table B.3 Overview of key events in the development of the project

Date	Key Events
August 2008	FSR was finished
September 10,2008	Assessment Opinion on the FSR was issued by Hebei Province Engineering Consulting Institute to confirm the FSR is appropriate
September 19, 2008	Directorate decided to apply the project as a CDM project.
November 02, 2008	Stakeholder meeting was held.
March 27, 2009	Service Agreement on the development of CDM Project was signed between the project owner and TQ Power.
April 01, 2009	Equipment Purchase Contract of Main Transformer was signed between the project owner and manufacturer. **(The starting date of the project).**
April 03, 2009	Equipment Purchase Contract of Wind Turbine was signed between the project owner and manufacturer.
April 07, 2009	Equipment Purchase Contract of Wind Turbine Tower was signed between the project owner and manufacturer.
April 10 2009	Send the notification of CDM application to the Chinese DNA
April 15, 2009	Construction Contract was signed.
April 27, 2009	The confirmation of the CDM application from Chinese DNA was received.
May 11, 2009	The project started construction.
May 18, 2009	The project was submitted to Chinese DNA for CDM approval
July 3, 2009	The project began to GSP
July, 2009	The project owner received the paper-pattern LoA from Chinese DNA for CDM application
July 01, 2010	The project will start commission and operating (expected)

The additionality of the project activity is demonstrated by using the steps described in *the Tool for the Demonstration and Assessment of Additionality (Version 5.2)* as proposed on the 39th EB meeting.

Step 1: Identification of Alternatives to the Project Activity Consistent with Current Laws and Regulations

Sub-Step1a. Define alternatives to the project activity

This methodological step requires a number of sub-steps, the first of which is the identification of realistic and credible alternatives to the project activity. There are only a few alternatives that are prima facie realistic and credible in the context of the NCPG:

1. The proposed wind power activity undertaken without being registered as a CDM project activity.
2. Thermal power plant generation with equivalent annual power generation.
3. Other renewable sources power plant generation with equivalent annual power generation.
4. The equivalent annual electricity is supplied by the NCPG.

Except wind power generation technology, power generation technologies based on other renewable energies available in China include biomass generation technology, geothermal generation technology, solar photovoltaic technology and hydro-power generation technology. Due to the technology development status and the high cost for power generation, solar PV[4], geothermal[5] and biomass[6] of the similar output as the proposed project are unattractive alternatives in China. In addition, as Hebei province faces problem of lack of water resource[7], there are no exploitable resources for hydropower development nearby or at the project site. The alternative 3 is not feasible.

Sub-Step1b. Consistency with Mandatory Laws and Regulations

There is a great difference in the utilization hours and stability of wind resources supply between a thermal power plant and a wind power with equivalent installed capacity. The average generation hours for fossil fuel fired power plants are 5,344[8] hours in 2007. An alternative fossil fuel power plant that can provide the equivalent generation of the wind power plant would be one with an installed capacity less than 135MW. However, according to the regulations from the National Development and Reform Commission in China[9], thermal power plants with capacity below 135MW are prohibited for construction within the grid connected area. Therefore it should be eliminated because it does not comply with the national regulation for controlling small scale thermal power plant. Consequently, the Alternative 2 is not feasible;

The first and the fourth alternatives are in compliance with Chinese relevant laws and regulations, but not the mandatory project. Therefore, the project activity is not the only alternative consistent with Chinese current laws and regulations, it satisfies the pre-requisite for additionality.

Step 2 Investment Analysis

Sub-step 2a. Determine appropriate analysis method

The analysis will be analyzed through Option III of the additionality tool, i.e. Benchmark analysis. This method is applicable because:

- Option I: Simple cost analysis, does not apply as the project generates economic returns through the sales of electric power to the grid.

[4] http://www.21tyn.com/news/0712/04/728f121i21o.htm
[5] http://www.crein.org.cn/view/viewnews.aspx?id=20080131103909265
[6] http://www.86ne.com/Biomass/200712/Biomass_103227.html
[7] Http://ghjh.mwr.gov.cn/dfxx/hb/1999tianjin/
[8] <China Electric Power Yearbook 2008>, P53
[9] Notice on Strictly Prohibiting the Installation of Fuel-fired Generators with the Capacity of 135 MW or below issued by the General Office of the State Council, decree no. 2002-6.

- Option II: Investment comparison analysis is not appropriate as, the only realistic alternative to the project not being implemented as a CDM project activity involves the delivery of power by the grid, which is not a project.
- Option III, benchmark analysis is appropriate. According to Guidance on the Assessment of Investment Analysis (Version 02), the paragraph 15 states "*if the proposed baseline scenario leaves the project participant no other choice than to make an investment to supply the same (or substitute) products or services, a benchmark analysis is not appropriate and an investment comparison analysis shall be used. If the alternative to the project activity is the supply of electricity from a grid this is not to be considered an investment and a benchmark approach is considered appropriate" and "the benchmark approach is therefore suited to circumstances where the baseline does not require investment or is outside the direct control of the project developer, i.e. cases where the choice of the developer is to invest or not to invest"*. This method has also been used in other PDDs of grid connected renewable energy projects in China.

Conclusion: We conclude that only option III is appropriate for the analysis of the additionality of the project activity.

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

According to the *Economical Assessment Temporary Regulation on Electrical Technology Improvement Project*[10], published by China Electric Power Press, the post-tax Project IRR of electric power project should not be below the threshold of 8%.

Sub-step 2c. Calculation and comparison of financial indicators (only applicable to options II and III):

The approved FSR was completed in August 2008 by Hydro China Xibei Engineering Corporation which has the A Grade in survey and design, issued by Chinese NDRC. In addition, the FSR was completed before investment decision (April 1, 2009 the Equipment Purchase Contract signed date). As the FSR has been completed by an independent and certified institute and approved by government, and the period between the finalization of the FSR and the investment decision is sufficiently short, the FSR therefore can be considered as an independent and realistic assessment of the proposed project activity, including the parameters listed and used as input values in the IRR calculation.

The basic parameters for calculating of the key financial parameters are provided in Table B.4:

Table B.4 Basic Financial Parameters of the Project[11]

Basic parameters	Value	Source
Installed capacity	150MW	FSR
Annual net electricity supplied to the grid	312,700MWh	
Static Total Investment	1,339,176,000Yuan RMB	
Long-term loan	925,941,400 Yuan RMB	FSR
Tariff (with VAT)	0.5510YuanRMB/kWh (within 30,000 hours)	Based on the tariff approval and FSR
	0.3664Yuan RMB/ kWh (after 30,000 hours)	FSR

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

[11] Based on the Economical Assessment Temporary Regulation on Electrical Technology Improvement Project, fixed parameters should be used in the financial assessment. Therefore, the fixed parameters will be employed in the PDD

VAT	8.5%	
Interest	7.83%	
Residue value rate	5%	
Corporate Income Tax	25%	
Depreciation Rate	7%	
Average Annual Operation & Maintenance Cost	32,298,962 Yuan RMB	
Assessment period (years)	22（including 2 construction years）	
CER price	11€/tCO_2e	Estimated

The post-tax Project IRR of the project activity is shown in Table B.5.

Table B.5 post-tax Project IRR of the project activity

	Post-tax Project IRR
Without CDM revenue	5.79%
With CDM revenue	9.66%

Based on the benchmark IRR for financial evaluation according to the *Economical Assessment Temporary Regulation on Electrical Technology Improvement Project,* the post-tax Project IRR of a wind power project based should not be lower than the benchmark of 8%. The post-tax Project IRR is 5.77% without CDM revenue which is lower than the benchmark rate of 8%. So the project is unattractive to the investor without CDM revenue. But the post-tax Project IRR will achieve 9.66% with CER income (CERs price of €11/tCO_2e, Rate: 1€=9.35Yuan RMB). Therefore, the CDM revenue can improve the economical attraction of the project.

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

The sensitivity analysis is conducted to check whether, under reasonable variations in the critical assumptions, the results of the analysis remain unaltered. Following parameters are assumed to be critical assumptions:

- Static total investment
- Annual net electricity supplied to grid
- Tariff
- Annual operation & maintenance cost

According to the FSR, sensitivity analysis was conducted to check under variation of ±10%. So we make a sensitivity analysis under variations of ±10% in the critical assumptions. Table B.6 summarizes the results of the sensitivity analysis, while Fig. B.2 provides a graphic depiction.

Table B.6 Impact of Variations in Critical Assumptions on post-tax Project IRR

	-10%	-5%	0%	5%	10%
Static total investment	7.32%	6.53%	5.79%	5.09%	4.44%
Annual net electricity supplied to grid	4.22%	5.02%	5.79%	6.52%	7.21%
Tariff	4.19%	5.00%	5.79%	6.54%	7.27%
Annual operation & maintenance cost	6.10%	5.94%	5.79%	5.62%	5.46%

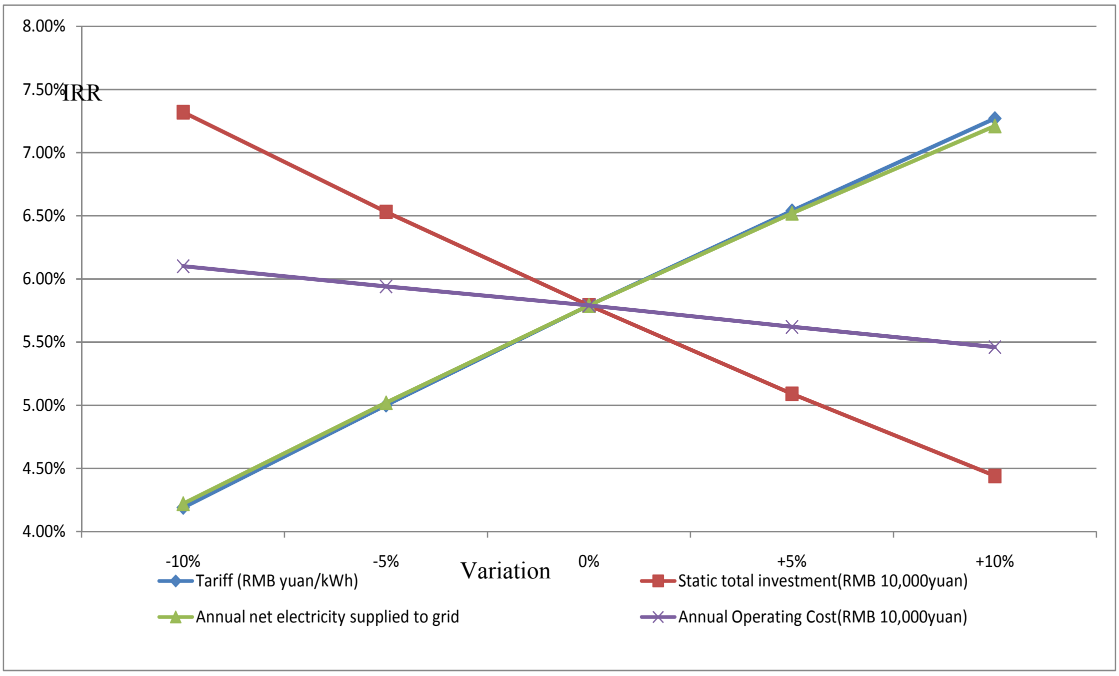

Fig. B.2 post-tax Project IRR Sensitivity Analysis when Static Total Investment, Annual net electricity supplied to grid, Tariff or Annual Operation & Maintenance Cost Changes

The benchmark analysis showed that the post-tax Project IRR of this project without CDM revenues is substantially below the benchmark rate of 8%. With maximum variations of 10% the post-tax Project IRR remains below the benchmark rate.

- With a decrease in the static total investment by 10%, the post-tax Project IRR is 7.30%, still lower than 8%. When a decrease in static total investment by 14 %, the post-tax Project IRR of the project can reach benchmark of 8%. However, according to the available contract of the project, the cost of equipment and construction costs [12] have almost reached the static total investment expected in FSR. Therefore the static total investment of the proposed project is unlikely to decrease by 14%. And it is impossible to improve the economic attraction due to the decrease in static total investment.

- With an increase in annual net electricity supplied to grid by 10%, the post-tax Project IRR of the project is 7.20% lower than 8%. When an increase in annual net electricity supplied to grid by 16% (equal to 2,398h), the post-tax Project IRR of the project can reach benchmark of 8%. According to the FSR of the proposed project, the annual power generation is estimated basing on the long term (1977-2006)[13] weather statistic data and one year of anemometric data measured onsite (2004 to 2005) provided by local meteorological station and wind resources measurement, so the probability that the annual net electricity supplied to the grid is 16% higher than the estimated value is very small. Therefore it is impossible to improve the economic attraction due to the increase in annual net electricity supplied to grid.

- With an increase in the tariff by 10%, the post-tax Project IRR of the project is 7.25% lower than

[12] All the related documents (eg: contract) have been sent to DOE and have been crosschecked.
[13] Sourced from FSR

8%. When an increase in tariff by 15%, the post-tax Project IRR of the project can reach benchmark of 8%. However, the tariff increase in this magnitude is very unlikely to happen as per *Tentative Measures for the Administration of Renewable Energy Power Price and Cost-sharing* issued by Chinese NDRC in 2006[14], the tariff of a wind power generation project should be confirmed by the government. Based on the approval issued by the National Energy Bureau, the tariff of the proposed project is 0.5510 RMB/kWh, which will keep fixed until the runtime reaches 30,000 hours, and after 30,000h is 0.3664 Yuan RMB/kWh[15] which is sourced from local average tariff. Therefore, the tariff used by the IRR calculation is unlikely increased by more than 15%.

- With a decrease in the annual operation & maintenance cost by 10%, the post-tax Project IRR of the project is 6.09% lower than 8%.When the annual operation & maintenance cost decreases by 75%, the post-tax Project IRR of the proposed project will achieve the benchmark of 8%. The annual operation & maintenance cost mainly include overhaul cost, employee wage, materials cost, insurance and miscellanea cost[16]. Due to sustained increases in employee wage and material price, it is unlikely that the annual operation & maintenance cost will reduce during the project lifetime[17]. Therefore, the annual operation & maintenance cost won't decrease, and it is impossible to improve the financial attraction through the adjustment in annual operation & maintenance cost.

Step 4 Common Practice Analysis

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

According to the definitions of other activities similar to the proposed project activity in "Tool for the Demonstration and Assessment of Additionality", the activities similar to the proposed project activity were selected according to the follow rules:

1. The activities should locate in the same province, because the wind power project was implemented under the administration of provincial level government. The activities in the same province have the similar wind resource, grid structure, geological and transportation conditions, economic developing status[18], the former two factors affected the estimated average annual output and the later three ones affected the total investment respectively.
2. In accordance with the *Notice on Issuing Electric Power Sector Reform Programme* by State Council on 10 February, 2002[19], a series of critical reform was conducted for the electric power sector. After that, the former national power company was divided into two separate sectors, i.e. the power grid sector and the power generation sector. The projects started before 10 February, 2002 should be obviously differentiated from those afterwards and, accordingly, were excluded from the issues to be discussed.

[14] http://www.52data.cn/dlfg/dlfg/200701/12143.html
[15] http://www.ndrc.gov.cn/zcfb/zcfbtz/2008tongzhi/t20080702_222220.htm
[16] It refers to management cost, training cost, travel cost, rent, etc.
[17] China Statistical Yearbook 2008 (http://www.stats.gov.cn/tjsj/ndsj/2008/indexch.htm) issued by National Bureau of Statistics of China. Related indices of employee wage are 113% in 2003, 114.1% in 2004, 114.6% in 2005, 114.4% in 2006, and 118.7% in 2007 respectively with preceding year of 100% (Source: Table 4-23, Chapter 4, China Statistical Yearbook 2008). Related indices of material price are 104.8% in 2003, 111.4% in 2004, 108.3% in 2005, 106.0% in 2006, and 104.4% in 2007 respectively (Source: Table 8-2, Chapter 8, China Statistical Yearbook 2008).
[18] China Wind Power Industry Development Report (2006), Shi Peng Fei, China Electric Year Book2007.
[19] State Council. 2002-02-10. *Notice on Issuing Electric Power Sector Reform Programme.* GuoFa [2002]5.
< http://www.competitionlaw.cn/show.aspx?id=3409&cid=32>

With reference to *China Wind Farm Capacity Statistic in 2007*[20], there are two similar wind farms as proposed project put into commission since April 2002 in Hebei Province without CDM support.

Table B.7 Similar scale wind farms located in Hebei Province

Wind Farm Installed	Time for commissioning	Capacity (MW)	Note
Chengde Hongsong	12/2004	51.3	Facing financial barriers, applying for VCS project, validated by DNV, follow the criteria of VCS (version 01)[21]
Shangyi Manjing	7/2005	34.5	Facing financial barriers, applying for VCS project, validated by DNV, follow the criteria of VCS (version 01)[22]

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

As discussed in Sub-step 4a, there are two similar activitys, which are named Chengde Hongsong Wind Farm Project and Shangyi Manjing Wind Farm Project, are observed and carried out without CDM support in Hebei Province. Both of the projects have been registered as VCS to improve its financial performance. Therefore, there is essential distinction between the projects above and the proposed project. The proposed project is not common practice in the Hebei Province.

Summary

This specific project activity isn't baseline scenario, which is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Project Emissions

The proposed project utilizes renewable wind energy to generate electricity. According to ACM0002 (version 10), project emissions during the year *y* (tCO_2/yr) is 0. $PE_y = 0$.

Baseline Emissions

The baseline scenario of the project is: electricity delivered to the grid by the project would have otherwise been generated by the operation of grid-connected power plants and addition of new generation sources. The baseline emissions calculated as follows:

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

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 CDM project activity in year y (MWh/yr);

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[20] *China Windfarm Capacity Statistic in 2007, by Shi pengfei, China Wind Energy Association*

[21] https://vcsprojectdatabase1.apx.com/mymodule/ProjectDoc/EditProjectDoc.asp?id1=71

[22] VCS report of Shangyi Manjing wind farm project by DNV

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO_2e/MWh).

The project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, according to the methodology ACM0002 (version 10),

$$EG_{PJ,y} = EG_{facility,,y} \quad \text{(Equation B.2)}$$

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 *y* (MWh/yr).

According to ACM0002 (Version 10), the calculation of emission factor should use the methodology tool "Tool to calculate the emission factor for an electricity system". The CO_2 emission factor for the displacement of electricity generated by power plants in an electricity system is determined by "combined margin"(CM) of the electricity system, which is the result of a weighted average of two emission factors pertaining to the electricity system: the "operating margin" (OM) and the "build margin" (BM).

The tool provides procedures to determine the following parameters:

Parameter	SI Unit	Description
$EF_{grid,CM,y}$	tCO_2e/MWh	Combined margin CO_2 emission factor for the project electricity system in year *y*
$EF_{grid,BM,y}$	tCO_2e/MWh	Build margin CO_2 emission factor for the project electricity system in year *y*
$EF_{grid,OM,y}$	tCO_2e/MWh	Operating margin CO_2 emission factor for the project electricity system in year *y*

Baseline

Project participants shall apply the following seven steps:

STEP 1. Identify the relevant electricity systems
STEP 2. Choose whether to include off-grid power plants in the project electricity system (optional).
STEP 3. Select a method to determine the operating margin (OM)
STEP 4. Calculate the Operating Margin Emission Factor according to the selected method
STEP 5. Identify the group of power units to be included in the build margin (BM)
STEP 6. Calculate the Build Margin Emission Factor
STEP 7. Calculate the combined margin (CM) emission factor

According to the *Bulletin on Baseline Emission Factors of China Regional Grid* renewed by the Director Office of National Climate Change Coordination of NDRC (Chinese DNA) on December 30, 2008, the OM Emission Factor is 1.1169tCO_2e/MWh, and the BM Emission Factor is 0.8687tCO_2e/MWh. Therefore, the Combined Baseline Emission Factor of the NCPG corresponds to **1.05485tCO_2e/MWh**.

The full process of the calculation of the emission factors and all underlying data are presented in Annex 3 to this PDD.

The Operating Margin Emission Factor ($EF_{grid,OM,y}$) and the Build Margin Emission Factor ($EF_{grid,BM,y}$) calculation for the NCPG is calculated as follows:

STEP 1. Identify the relevant electricity systems

The project employs the delineation of the project electricity system and connected electricity system published by Chinese DNA. The electricity generated by the project is connected to the NCPG. The NCPG includes the Shandong, Shanxi, Hebei, Tianjin, Beijing, Inner Mongolia grid. Therefore, the project selects the NCPG for the calculation of Operating Margin Emission Factor.

There is net imported electricity to the NCPG from the NEPG and CCPG. For the purpose of determining the Operating Margin Emission Factor, the tool provides four options to determine the CO_2 emission factor(s) for net electricity imports from a connected electricity system:

(a) 0 tCO_2/MWh; or

(b) The weighted average operating margin(OM) emission rate of the exporting grid, determined as described in step 4d of the "*Tool to calculate the emission factor for an electricity system*"; or

(c) The simple operating margin emission rate of the exporting grid, determined as described in step 4a of the "*Tool to calculate the emission factor for an electricity system*", 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 4b of the "*Tool to calculate the emission factor for an electricity system*".

Option b was chosen..

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

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

Based on the actual situation of China, the option Ⅰ has been chosen for the calculation (because the option Ⅱ aims to reflect that in some countries off-grid power generation is significant and can partially be replaced by CDM project activities).

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

The calculation of the Operating Margin emission factor(s) ($EF_{grid,OM,y}$) 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.

From 2002 to 2006, in the composition of gross annual generation power for NCPG, the ratio of power generated by hydro-power and other low cost/compulsory resources is as following: 0.89% in 2002, 0.86% in 2003, 0.76% in 2004, 0.75% in 2005, 1.04% in 2006, obviously far lower than 50%. Therefore, the simple OM is appropriate, because low cost/ must run resources account for far less than 50% of the power generation in the NCPG in most recent years.According to "Tool to calculate the emission factor for an electricity system" (Version 2.0), the Simple OM has been employed to calculate the OM.

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

- Ex ante option: If the *ex ante* option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation weighted average, based on the most recent data available at the time of submission of the CDM-PDD for validation, or
- Ex post option: If the *ex post* option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emission factor to be updated annually during monitoring. If the data required 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 the year y, the emission factor of the year preceding 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.

Project participant emp*loys "e*x-ante" for its operation margin calculation.

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

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 "*Tool to calculate the emission factor for an electricity system*" (Version 2.0) offers two options for the calculating the Simple OM.

Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit; or
Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system

Option B can only be used if:

(a) The necessary data for Option A is not available; and
(b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and
(c) Off-grid power plants are not included in the calculation (i.e., if Option Ⅰ has been chosen in Step-2).

As the net electricity generation and a CO_2 emission factor of each power unit are not available in China, and the nuclear and renewable power generations are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known in China, at the same time, off-grid power plants are not included in the calculation. So the project uses Option B for calculating the simple OM emission factor, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i (FC_{i,y} \times NCV_{i,y} \times EF_{CO_2,i,y})}{EG_y} \qquad \text{(Equation B.3)}$$

Where
$EF_{grid,OMsimple,y}$ =The simple operating margin CO_2 emission factor in year *y* (tCO_2/MWh);

$FC_{i,y}$ =Amount of fossil fuel type i consumed in the project electricity system in year *y* (mass or volume unit);
$NCV_{i,y}$ =Net calorific value (energy content) of fossil fuel type i in year *y* (GJ/mass or volume unit);
$EF_{CO_2,i,y}$ = CO_2 emission factor of fossil fuel type *i* in year y (CO_2/GJ);
EG_y =Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plants/units, in year y (MWh).
i =all fossil fuel types combusted in power sources in the project electricity system in year *y*;
y =the relevant year as per the data vintage chosen in Step 3.

The Operating Margin Emission Factor can be calculated using the full power supplied-weighted average for the most recent 3 years for which data are available at the time of PDD submission.

The Operating Margin emission factors for 2004, 2005 and 2006 are calculated. The three-year average is calculated as a 3-year generation-weighted average of the emission factors. The Operating Margin emission factor of the baseline is calculated ex-ante and will not be renewed in the first crediting period of the project activity.

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

According to the tool to calculate the emission factor for an electricity system, the sample group m consists of:
(1) The set of five power units that have been built most recently, or
(2) 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. [23]

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

However, in China it is very difficult to obtain the data of the five existing power plants built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that were built most recently. Taking notice of this situation, EB accepts the following deviation in methodology application (See details in Step 5).

The tool to calculate the emission factor for an electricity system provides the following two options for calculation of $EF_{grid,BM,y}$:

Option 1: For the first crediting period, calculate the Build Margin Emission Factor *ex-ante* based on the most recent information available on units already built for sample group *m* at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the Build Margin Emission Factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the Build Margin Emission Factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2: For the first crediting period, the Build Margin Emission Factor shall be updated annually, *ex-post*, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which

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

information is available. For the second crediting period, the build margin emissions factor shall be calculated *ex-ante*, as described in option 1 above. For the third crediting period, the Build Margin Emission Factor calculated for the second crediting period should be used.

Project participants have chosen Option 1, which requires the project participant to calculate the Build Margin Emission Factor $EF_{grid,BM,y}$ *ex-ante* based on the most recent information available already built for sample group m at the time of PDD submission.

STEP 6. Calculate the Build Margin Emission Factor

The Build Margin Emission Factor is the generation-weighted average emission factor (tCO_2e/MWh) of all power units *m* during the most recent year y for which power generation data is available, calculated as follows:

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

Where
$EG_{m,y}$ = 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).

Taking notice of this situation, EB accepts [24] the following deviation in methodology application:

1) Capacity addition from one year to another is used as basis for determining the build margin, i.e. the capacity addition over 1-3 years, whichever results in a capacity addition that is closest to 20% of total installed capacity.
2) Use proportional weights that correlate to the distribution of installed capacity in place during the selected period above, using plant efficiencies and emission factors of commercially available best practice technology in terms of efficiency. It is suggested to use the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy.

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

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

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

[24] This is in accordance with the “Request for guidance: Application of AM0005 and AMS-I.D in China”, a letter from DNV to the Executive Board, dated 07/10/2005, available online at: http://cdm.unfccc.int/UserManagement/FileStorage/6POIAMGYOEDOTKW25TA20EHEKPR4DM.

$$\lambda_{Coal} = \frac{\sum_{i \in COAL} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{\sum_{i} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}$$ (Equation B.5)

$$\lambda_{Oil} = \frac{\sum_{i \in OIL} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{\sum_{i} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}$$ (Equation B.6)

$$\lambda_{Gas} = \frac{\sum_{i \in GAS} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{\sum_{i} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}$$ (Equation B.7)

Where
$FC_{i,m,y}$ = the amount of fuel i consumed by power plant/unit *m* in year *y* (mass or volume unit);
$NCV_{i,y}$ =the net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ/mass or volume unit);
$EF_{CO_2,i,y}$ = the CO_2 emission factor of fossil fuel *i* in year *y*.
Coal, Oil and *Gas* is solid fuel, liquid fuel and gas fuel respectively.

Sub-step 2: Calculate the emission factor of fuel-based generation:

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv}$$ (Equation B.8)

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

A coal-fired power plant with a total installed capacity of 600MW is assumed to be the commercially available best practice technology in terms of efficiency, the estimated coal consumption of such a power station with a capacity of 600MW is 329.94gce/kWh, which corresponds to an efficiency of 37.28% for electricity generation.

For gas and oil power plants a 200MW combined cycle power plant with a specific fuel consumption of 252gce/kWh, which corresponds to an efficiency of 48.81% for electricity generation, is selected as commercially available best practice technology in terms of efficiency.[25]

The main parameters used for calculation of the thermal power plant emission factors $EF_{Coal,Adv}, EF_{Oil,Adv}, EF_{Gas,Adv}$ are provided in Annex 3:

Sub-step 3: Calculate the Building Margin emission factor

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

[25] "*2008 Baseline Emission Factors for Regional Power Grids in China*", which has been renewed by the Chinese DNA (Director Office of National Climate Change Coordination of NDRC) on December 30, 2008

Where

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

As mentioned above, the Build Margin Emission Factor of the baseline is calculated ex-ante and will not be renewed in the crediting periods of the project activity.

The data resources for calculating $EF_{grid,OM,y}$ and $EF_{grid,BM,y}$ are:

1. Installed capacity, power generation and the rate of internal electricity consumption of thermal power plants
   Source: *China Electric Power Yearbook* (2003-2007), *China Energy Statistical Yearbook 2007 and Abstract of Electric Power Industry Statistics 2005-2006;*
2. Fuel consumption and the net caloric value of thermal power plants
   Source: *China Energy Statistical Yearbook* (2005-2007);
3. Carbon emission factor of each fuel
   Source: *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, Volume 2 Energy, Table 1.3 of Page 1.21-1.22 in Chapter one.

STEP 7. Calculate the combined margin emission factor

The Baseline Emission Factor is calculated as a Combined Margin, using a weighted average of the Operating Margin and Build Margin.

$$EF_{grid,CM,y} = w_{OM} \times EF_{grid,OM,y} + w_{BM} \times EF_{grid,BM,y} \qquad \text{(Equation B.10)}$$

According to the *2008 Baseline Emission Factors for Regional Power Grids in China* renewed by Director Office of National Climate Change Coordination of NDRC (Chinese DNA) on December 30, 2008, the Operating Margin Emission Factor ($EF_{grid,OM,y}$) of the NCPG is **1.1169tCO_2e/MWh** and the Build Margin Emission Factor ($EF_{grid,BM,y}$) is **0.8687tCO_2e/MWh**. The defaults weights for wind projects during the crediting periods are used as specified in the tool to calculate the emission factor for an electricity system (version 2.0).

$$w_{OM} = 0.75\,; w_{BM} = 0.25$$

Using above mentioned values the Combined Baseline Emission Factor of the NCPG corresponds to **1.05485tCO_2e/MWh.**

Emission Reductions

The emission reductions ER_y by the project activity during a given year y calculation is as follows:

$$ER_y = BE_y - PE_y \qquad \text{(Equation B.11)}$$

Of which:

BE_y = baseline emissions during a given year y, the baseline emissions is calculated by:

$$BE_y = EG_{facility,y} \times EF_{grid,CM,y} \qquad \text{(Equation B.12)}$$

Where

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

$EF_{grid,CM,y}$ = baseline emissions factor, in tCO_2e/MWh.

PE_y = project emissions during a given year y.

According to the methodology ACM0002 (version 10): $PE_y = 0$.

Therefore, the emission reductions are equal to the baseline emissions, namely,

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

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

Data / Parameter:	$EGP_{y,j}$
Data unit:	MWh
Description:	The Generation of Power Sources j in (years) y (2002-2006,including Shandong, Shanxi, Hebei, Tianjin, Beijing, Inner Mongolia)
Source of data used:	*China Electric Power Yearbook 2003-2007* *China Energy Statistical Yearbook 2007*
Value applied:	See details in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official Statistical Data
Any comment:	/

Data / Parameter:	$GEN_{import,y}$
Data unit:	MWh
Description:	The Power Transmitted from the NEPG to the NCPG in (years) y (2004-2006) The Power Transmitted from the CCPG to the NCPG in (years) y (2006)
Source of data used:	*State Power Information Network :* *Abstract of Electric Power Industry Statistics 2005-2006*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official Statistical Data
Any comment:	To calculate the OM

Data / Parameter:	PR_y
Data unit:	%
Description:	The rate of internal electricity consumption of thermal power plants in year (s) y (2004-2006, including Shandong, Shanxi, Hebei, Tianjin, Beijing, Inner Mongolia)
Source of data used:	*China Electric Power Yearbook 2005-2007*
Value applied:	See details in Annex 3

Justification of the choice of data or description of measurement methods and procedures actually applied :	Official Statistical Data
Any comment:	/

Data / Parameter:	$FC_{i,y}$
Data unit:	10^4t or10^8m^3
Description:	The Fuel i Consumption of project electricity system in (years) y (2004-2006, including Shandong, Shanxi, Hebei, Tianjin, Beijing, Inner Mongolia)
Source of data used:	*China Energy Statistical Yearbook 2005-2007*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official Statistical Data
Any comment:	*To calculate OM and BM*

Data / Parameter:	$NCV_{i,y}$
Data unit:	GJ/ fuel in a mass or volume unit
Description:	The $NCV_{i,y}$ *of* Fuel i in a mass or volume unit in year *y*
Source of data used:	*China Energy Statistical Yearbook 2007*
Value applied:	See details in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official Statistical Data
Any comment:	To calculate OM and BM

Data / Parameter:	$EF_{CO_2,i,y}$
Data unit:	tC/GJ
Description:	The *Emission Factor of* Fuel i in a mass or volume unit in year *y*
Source of data used:	*2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	Provided in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC Default Value
Any comment:	To calculate OM and BM

Data / Parameter:	$\eta_{best,coal}$
Data unit:	%
Description:	Commercially available oil and gas power plant corresponding to the best practice in terms of efficiency
Source of data used:	*2008 Baseline Emission Factors for Regional Power Grids in China- 2008 the calculation of baseline BM emission factor for Regional Power Grids in China*
Value applied:	37.28%
Justification of the choice of data or description of	National Fixed Value

measurement methods and procedures actually applied :	
Any comment:	To calculate BM

Data / Parameter:	$\eta_{best,oil/gas}$
Data unit:	%
Description:	Commercially available oil and gas power plant corresponding to the best practice in terms of efficiency
Source of data used:	*2008 Baseline Emission Factors for Regional Power Grids in China- 2008 the calculation of baseline BM emission factor for Regional Power Grids in China*
Value applied:	48.81%
Justification of the choice of data or description of measurement methods and procedures actually applied :	National Fixed Value
Any comment:	To calculate BM

Data / Parameter:	$CAP_{y,j}$
Data unit:	MW
Description:	The Installed Capacity of Power Sources j in (years) y (2004-2006, Shandong, Shanxi, Hebei, Tianjin, Beijing, Inner Mongolia)
Source of data used:	*China Electric Power Yearbook 2005-2007*
Value applied:	See details in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official Statistical Data
Any comment:	To calculate BM

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

According to Annex 3, the baseline emission factor of the project is 1.05485tCO_2e/MWh in the first crediting periods. The estimated annual electricity supplied to the grid by the project is 312,700MWh.

Therefore, BE_y in the first crediting periods is to be calculated as follows:

$$BE_y = EG_{facility,y} \times EF_{grid,CM,y} = 329{,}852tCO_2e \quad \text{(Equation B.14)}$$

According to B.6.1, the emission reductions of the proposed project equal the baseline emission. Therefore, the annual emission reductions during the first crediting period are 329,852tCO_2e.

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

The total emission reductions of the project are 2,144,038 tCO_2e during the first crediting period.

Table B.8 Estimated Emission Reductions during the First Crediting Period

Year	Estimation of Project Activity Emissions	Estimation of Baseline Emissions (tCO_2e)	Estimation of Leakage (tCO_2e)	Estimation of overall Emission Reductions

	(tCO_2e)			(tCO_2e)
Year1: 01/07/2010~30/06/2011	0	164,926	0	164,926
Year2: 01/07/2011~30/06/2012	0	329,852	0	329,852
Year3: 01/07/2012~30/06/2013	0	329,852	0	329,852
Year4: 01/07/2013~30/06/2014	0	329,852	0	329,852
Year5: 01/07/2014~30/06/2015	0	329,852	0	329,852
Year6: 01/07/2015~30/06/2016	0	329,852	0	329,852
Year7: 01/07/2016~30/06/2017	0	329,852	0	329,852
Total(tCO_2e)	0	2,144,038	0	2,144,038

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

B.7.1. Data and parameters monitored:

We need to monitor the power supplied to the grid ($EG_{s,y}$) and the electricity use of power plant supplied by the grid ($PR_{g,y}$), and according to the two data, the net power supplied to the grid ($EG_{faacility,y}$) will be calculated ($EG_{faacility,y} = EG_{s,y} - PR_{g,y}$).

Data / Parameter:	$EG_{s,y}$
Data unit:	MWh
Description:	Power supplied to the grid in year y
Source of data to be used:	Measured by M1 located at the output of the on-site 220 kV transformer substation
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The power supplied to the grid by the project is estimated to be 312,700MWh
Description of measurement methods and procedures to be applied:	Measured continuously and recorded on a monthly basis
QA/QC procedures to be applied:	The meter will be annually calibrated according to the relevant national electric industry standards and regulations; power supplied to the grid will be double checked according to sales invoices.
Any comment:	Refer to B.7.2. Description of the monitoring plan

Data / Parameter:	$PR_{g,y}$
Data unit:	MWh
Description:	The electricity use of power plant supplied by the grid in year y
Source of data to be used:	Assumed as zero in the PDD. Measured by M1 actually
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:	Measured continuously and recorded on a monthly basis
QA/QC procedures to be applied:	The meter will be annually calibrated according to the relevant national electric industry standards and regulations; electricity use of power plant supplied by the grid will be double checked according to purchasing invoices.

Any comment:	Refer to B.7.2. Description of the monitoring plan

Data / Parameter:	$EG_{faacility,y}$
Data unit:	MWh
Description:	Net power supplied to the grid in year y
Source of data to be used:	Calculated
Value of data applied for the purpose of calculating expected emission reductions in section B.5	The electricity supplied to the grid is 312,700MWh which is figured out by the equation: $EG_{faacility,y} = EG_{s,y} - PR_{g,y}$
Description of measurement methods and procedures to be applied:	Calculated from the above measured parameters and recorded on a monthly basis.
QA/QC procedures to be applied:	This data is calculated, so does not need QA procedures.
Any comment:	/

B.7.2. Description of the monitoring plan:

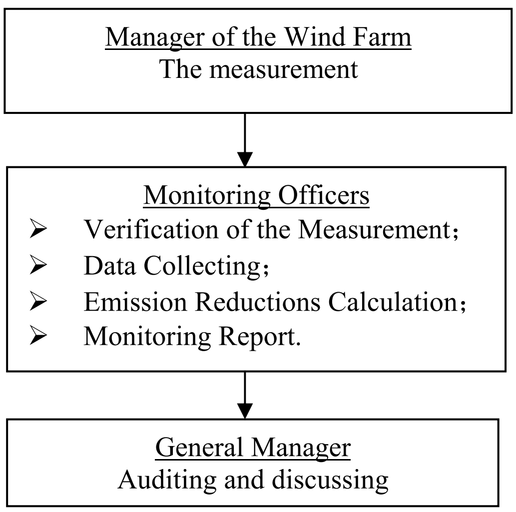
The objective of the monitoring plan is to insure the complete, consistent, clear, and accurate monitoring and calculation of the emissions reductions during the whole crediting period. The project owner is mainly responsible for the implementation of the monitoring plan, and the Grid Company should cooperate with the project owner.

1. Monitoring Data

The main date to be monitored are the power supplied to the grid ($EG_{s,y}$), the electricity use of power plant supplied by the grid ($PR_{g,y}$), and according to the two data, the net power supplied to the grid ($EG_{faacility,y}$) will be calculated ($EG_{faacility,y} = EG_{s,y} - PR_{g,y}$).

2. Monitoring Organization

A chief monitoring officer will be appointed by the project owner, who will supervise and verify metering and recording, collect data (meter's data reading, sales/purchasing invoices), calculate emission reductions and prepare monitoring reports.



3. Monitoring Equipment and program

According to the *Technical Administrative Code of Electric Energy Metering (DL/T448－2000)*, the electric energy metering equipment will be properly configured and the metering equipment will be checked before the project starts operation.

The power generated by the proposed project will be transmitted to on-site 220kV transformer substation of the project, and then be transmitted to the NCPG through the Yudaokou 220kV Switching Station. There are 2 meters (bi-directional, 0.2S) for this project, of which, M1 (main meter) and M2(backup meter) located at the output of the on-site 220 kV transformer substation measures power supplied to the grid and the electricity use of power plant supplied by the grid

When the main meter has any troubles, the data monitored by the backup meter should be employed.

The power connection diagram is as follows:

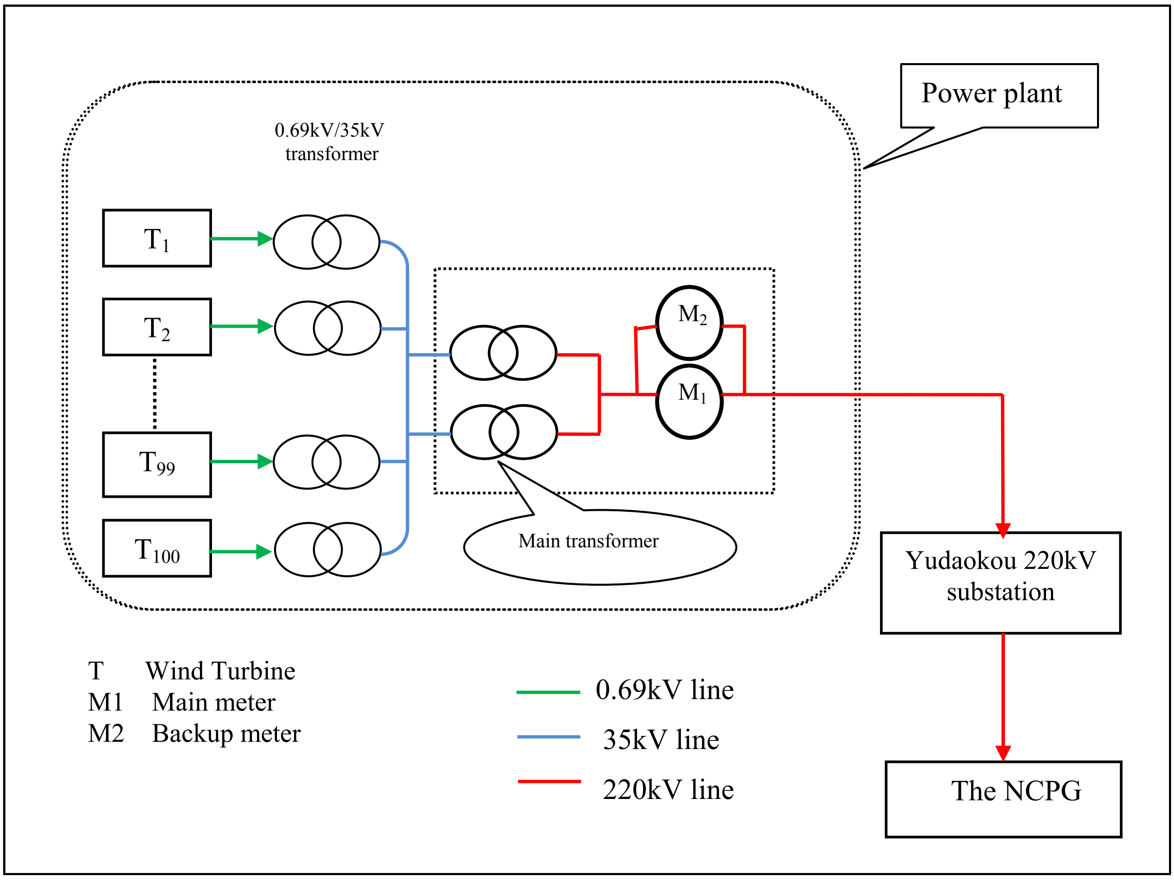


Fig. B.4 Power Connection Diagram

4. Data Collection:

The project owner is responsible for monitoring of the main meter, and guarantee the measuring equipments are in good operation and with complete seal.

The electricity recorded by the main meter alone will suffice for the purpose of invoices and emission reduction verification as long as the accuracy of the Main Meter is within the permissible tolerance. The main monitoring process is as follows:

i The project owner read and check the main meter， and records the data on an appointed day of every month;
ii The project owner supplies the electricity reading to the grid company on an appointed day of every month; and the grid company checks the data based on the Remote Data.
iii The project owner provides electricity sales invoices to the Grid Company. A copy of the invoices is stored by the project owner, together with a record of the payment by the grid company;
iv The Grid Company provides electricity sales invoices to the project owner based on the electricity supplied to the power plant by the grid company, and the invoices are stored by the project owner;
v The project owner keeps and safeguards the records of the main meter's data readings for verification by the DOE.

If inaccuracy of the reading data from the main meter exceeds the allowable tolerance or otherwise the meter mal functioned will operate in one month, the grid-connected electricity generated by the proposed project shall be followed by:

i Reading the backup meter to ensure electricity is supplied to the grid, unless a test by either party reveals it is inaccurate;
ii If the backup system is not within acceptable limits of accuracy or performed improperly, the proposed project owner and the Grid Company shall jointly prepare an new agreement of the correct readings;

The meter reading shall be readily accessible for the DOE. Calibration test records shall be maintained for verification.

5. Calibration

The check of electric meters should be annually carried out according to relevant national electric industry standards or regulations. After the check, all meters should be sealed. All meters shall be jointly inspected and sealed on behalf of the project owner and Grid Company and shall not be accessible by either party except in the presence of the other party or its accredited representatives,
All the meters installed shall be tested by the qualified metrical organization co-authorized by the project owner and the Grid Company if:

i The error of the meters exceeds the allowable error ;
ii The meter was repaired.

6. Data Management

Data will be archived at the end of each month using electronic spreadsheets. The electronic files will be stored on hard disk and CD-ROM. In addition, a hard copy printout will be archived. Physical documentation such as, paper-based maps, diagrams and environmental assessment, will be collected in a central place, together with the monitoring plan. In order to facilitate the auditor's reference, monitoring results will be indexed. All paper-based information will be stored by the project owner. All data records will be kept for a period of 2 years after the end of the crediting period.

7. Monitoring Report

The project owner will collect sales invoices for the power supplied to the grid as a cross-check, and purchasing invoices will be provided for the electricity use of power plant supplied by the grid as a cross-check. At the end of each crediting year, a monitoring report will be compiled detailing the metering results and evidence (i.e. sales invoices).

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: 08/02/2010
Name of persons determining the baseline and monitoring methodology:

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SECTION C. Duration of the project activity / Crediting period

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

01/04/2009 (Signature date of the Equipment Purchase Contract, which is the earliest starting date of the project activity and earlier than the CDM-PDD for GSP by the DOE)

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

The operational lifetime of the project activity is 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:

01/07/2010 (The crediting period will not commence prior to the date of registration)

C.2.1.2. Length of the first crediting period:

7 years 0 month

C.2.2. Fixed crediting period:

Not applicable

C.2.2.1. Starting date:

C.2.2.2. Length:

SECTION D. Environmental impacts

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

According to the relevant environmental law and regulations, an environmental impact assessment has been carried out, and the assessment report has been approved by the Hebei Environmental Bureau. The main assessment conclusions are as follows:

➢ **Noise Impact on the Environment**

Noise will be generated by machine equipment and vehicle during the construction period. Measures will be taken to reduce the environmental impacts of noise: choosing low-noise machines and technologies, strengthening the management and maintenance on equipment, allocate reasonable selection and layout on the plant construction site, and enhancing construction management etc. Low-noise turbine units will be employed and installed far away from the surrounding villages. Noise level will be controlled within the Class 1 requirement of Standard of Environmental Noise of Urban Area (GB 3096-93). In addition, during the operation period the nearest residential area is far away from the construction site, and there is no enterprises, schools or hospitals nearby. So, the neighbourhood residents will not be influenced by the noise.

➢ **Impact of solid waste on environment**

During the construction period, the discharged waste slag will be reduced by refilling the excavated earth as much as possible, and the wastes will be piled up in designated waste disposal sites.
During the operation period, the domestic waste produced by operational workers will be collected and discharged by existing garbage disposal facilities.

➢ **Impact on the water environment**

The main water pollution includes industrial wastewater and domestic wastewater.
During the construction period, the domestic wastewater will be discharged through local sewage treatment facilities. For the applied mechanical equipment is relative less, so the industrial wastewater will be also less, in addition, the industrial wastewater can be used to irrigate plant.
During the operation period, domestic wastewater will be treated by a septic tank, so the wastewater after treatment could well satisfy the requirement of Chinese Environmental Standard, which will be collected into a water collection basin for greening and so on. After those appropriate treatment measures has been taken, such wastewater will not cause negative impacts on the environment.

➢ **Impact on the Air quality**

The main air pollution sources during the construction period include excavation, blasting and transportation, and the main air pollutant is dust. Some measures will be taken to reduce impact of dust, such as watering, covering and the construction material will be pile up centralized. Therefore, the construction has little negative impact on the local air environment.

➢ **Impact on ecological environment**

The construction will cause some negative impacts on the ecological environment, such as vegetation trampled by workers and machine and covered by the dust, excavating. In order to reduce the negative impacts, the following measures will be taken: controlling construction activity within–occupied land to reduce negative impacts, and, carrying away all waste slag and cleaning up the construction site to recover the original vegetation when the construction is over.

There is no rare plant and wild animal living around the project site, nor the inhabitant of birds. Therefore, the proposed project activity has little negative influence on birds and ecological environment.

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 project participants and the host Party think that the project causes little negative impact on the environment.

SECTION E. Stakeholders' comments

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

Before the start of the construction of the proposed project, the project owner has given out questionnaires to local residents to ask their opinions. The aim of these questionnaires is to collect opinions concerning the influence the project would have on the local society, environment, economy, daily life etc.

A special stakeholder consultation meeting of the project was hold from 10:00 to 11:00 AM on November 2, 2008 at the meeting room of the project site, Chengde City. In order to make the potential stakeholders receive notification and information of the meeting, the project owner published a bulletin for the stakeholders meeting on the nearby residents' areas, from October 28, 2008. In the bulletin, the companies notified all the potential stakeholders that they could have detailed information on the proposed project. During the meeting, the project owner invited the participants to express their comments and concerns about the project and CDM.

Main questions of the meeting and questionnaires are as follows:

- What is the main fuel that local residents used for heating and cooking?
- Will the project have a negative impact on the local residents?
- Will the construction of the project cause any pollution? Do the residents think that the noise unendurable? Does the noise have any impact on the lives of the local residents?
- Will the project have any negative impact on the habitat of birds? Is the project site the main flight way of migratory birds?
- Will the project have any negative impact on local ecological environment?
- Will the construction improve the communicating condition?
- Will the project bring any benefit for the local residents?
- Do the local residents support CDM project?
- Do local residents agree with the construction of the project?

E.2. Summary of the comments received:

40 questionnaires were distributed, and all were recollected,, of which, 30% is from women, 40% is from people graduated from senior high school or lower school, 100% is from people elder than twenty years old, and the investigation results show the following:

- ➢ 60% of the investigated residents use firewood for heating and cooking, and the rest 40% use gas or coal for heating and cooking.
- ➢ 85% of investigated residents think the wind farm will bring benefit to their lives; other investigated residents think the wind farm will not influent their lives.
- ➢ 100% of the investigated residents think the construction of wind farm will not cause negative impact on their lives.
- ➢ 100% of investigated residents think the wind farm will not cause negative impact on the environment.
- ➢ 100% of investigated residents think the wind farm will not cause noise pollution.
- ➢ 100% of the investigated residents think the project site is not the main flight way of migratory birds.
- ➢ 100% of the investigated residents agree the proposed project to apply as CDM project.
- ➢ 100% of investigated residents agree with the construction of the project.

20 representatives（which is different from the people who give the questionnaires） of local residents, the representatives of local government and consultants attended this meeting, and the project owner has done the record of the meeting.

Through the investigation and stake-holder meeting, it was learned that all stakeholders, having considered that wind power is a renewable energy and will not cause negative impacts on the environment, agree to the construction of the wind farm. There are no residents living around the project, which is far away from the residential areas. Meanwhile the background noise is great, so the wind farm will not cause negative impacts on local residents. The wind farm site is located off the main flight path of migratory birds and only a few migratory birds stay around the wind farm, there will be no negative influence on birds. The project will provide sufficient electric power for social life and manufacture, increase the employment ratio and incomes of the local residents, improve life quality of local residents, and accelerate the development of social economy. Overall, the project will cause little negative impact on local residents and environment. All stakeholders support the construction of the project and the application as CDM project.

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

Given the generally positive (or neutral) nature of the comments received, no action has to be taken to address the comments received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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The Project participants

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding from Annex I parties used in the project activity.

Annex 3

BASELINE INFORMATION

Table1. the Ratio of Power Generated by Hydropower and Other Low Cost/compulsory Resources of Total Grid Generation, 2002-2006

	2002	2003	2004	2005	2006
Electricity Generation of Thermal power plant (MWh)	403,919,000	457,675,000	526,772,000	603,231,000	721,282,000
Total Electricity Generation of the NCPG (MWh)	407,545,000	461,653,000	530,804,000	607,782,000	728,853,000
the Ratio of Power Generated by Hydropower and Other Low Cost/compulsory Resources of Total Grid Generation	0.89%	0.86%	0.76 %	0.75%	1.04%

Data Source: China Electric Power Yearbook 2003-2007 and China Energy Statistical Yearbook 2007.

Table2. Thermal Power Supplied to the NCPG and Power Imported in 2004

Province	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong
Thermal power Generation (MWh)	18,579,000	33,952,000	124,970,000	104,926,000	80,427,000	163,918,000
Rate of Electricity Consumption of Power Plant (%)	7.94	6.35	6.50	7.70	7.17	7.32
Thermal power Supplied (MWh)	17,103,827	31,796,048	116,846,950	96,846,698	74,660,384	151,919,202
Total Thermal Power of the NCPG (MWh)	489,173,110					
Net import power from the Northeast Power Grid (MWh)	4,514,550					
The total Power for the NCPG (MWh)	493,687,660					

Data source: China Electric Power Yearbook. 2005

Table3. Thermal Power Supplied to the NCPG and Power Imported in 2005

Province	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong
Thermal power Generation (MWh)	20,880,000	36,993,000	134,348,000	128,785,000	92,345,000	189,880,000
Rate of Electricity Consumption of Power Plant (%)	7.73	6.63	6.57	7.42	7.01	7.14
Thermal power Supplied (MWh)	19,265,976	34,540,364	125,521,336	119,229,153	85,871,616	176,322,568
Total Thermal Power of the NCPG (MWh)	560,751,013					
Net import power from the Northeast Power Grid (MWh)	3,929,000					
The total Power for the NCPG (MWh)	564,680,013					

Data Source: China Electric Power Yearbook 2006; Abstract of Electric Power Industry Statistics 2005

Table4. Thermal Power Supplied to the NCPG and Power Imported in 2006

Province	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong
Thermal power Generation (MWh)	20,705,000	35,924,000	143,888,000	150,250,000	139,593,000	230,922,000
Rate of Electricity Consumption of Power Plant (%)	7.51	6.86	6.63	7.45	7.58	7.12
Thermal power Supplied (MWh)	19,150,055	33,459,614	134,348,226	139,056,375	129,011,851	214,480,354
Total Thermal Power of the NCPG (MWh)	669,506,473					
Net import power from the Northeast Power Grid (MWh)	2,618,060					
Net import power from the Central China Power Grid	497,060					
The total Power for the NCPG (MWh)	672,621,593					

Data Source: China Electric Power Yearbook 2007, China Energy Statistical Yearbook 2007and Abstract of Electric Power Industry Statistics 2005.

Table 5. Average Emission Factor of the Northeast China Power Grid in 2004 to 2006

Year	Total CO_2 emission of the Northeast Power Grid (tCO_2e)	The total power supplied to the Northeast Power Grid (MWh)	Average emission factor (tCO_2e/ MWh)
2004	199,708,287	170,132,885	1.17384
2005	207,254,040	179,031,569	1.15764
2006	229,226,818	196,444,400	1.16688

Table 6. Calculation of average emission factor for the Central China Power Grid in 2006

Year	Total CO_2 emission of the Central China Power Grid (tCO_2e)	The total power supplied to the Central China Power Grid (MWh)	Average emission factor (tCO_2e/ MWh)
2006	406,286,055	529,958,480	0.77134

Table 7. Energy Consumption Statistics of Power Generation of the NCPG in 2004

Fuel	Unit	Beijing A	Tianjin B	Hebei C	Shanxi D	Inner Mongolia E	Shandong F	the NCPG G=A+B+C+D+E+F
Raw coal	10^4 Tons	823.09	1,410.00	6,299.80	5,213.20	4,932.20	8,550.00	27,228.29
Clean coal	10^4 Tons	0.00	0.00	0.00	0.00	0.00	40.00	40.00
Other washed coal	10^4 Tons	6.48	0.00	101.04	354.17	0.00	284.22	745.91
Coke	10^4 Tons	0.00	0.00	0.00	0.00	0.22	0.00	0.22
Coke oven gas	10^8 m^3	0.55	0.00	0.54	5.32	0.40	8.73	15.54
Other gas	10^8 m^3	17.74	0.00	24.25	8.20	16.47	1.41	68.07
Crude oil	10^4 Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gasoline	10^4 Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Diesel oil	10^4 Tons	0.39	0.84	4.66	0.00	0.00	0.00	5.89
Fuel oil	10^4 Tons	14.66	0.00	0.16	0.00	0.00	0.00	14.82
LPG	10^4 Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Refinery gas	10^4 Tons	0.00	0.55	1.42	0.00	0.00	0.00	1.97
Natural gas	10^8 m^3	0.00	0.37	0.00	0.19	0.00	0.00	0.56
Other petroleum products	10^4 Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other coking products	10^4 Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Energy	10^4 Tons (coal)	9.41	0.00	34.64	109.73	4.48	0.00	158.26

Data Source: China Energy Statistical Yearbook 2005.

Table 8. The Operation Margin Emission Factor Calculation of the NCPG in 2004

Fuel	Unit	Fuel Consumption of the NCPG in 2004 G	Emission Factor H(tc/TJ)	Average NCV I (MJ/t,km^3)	CO_2 Emission(tCO_2e) K=G*H*I*44/12/100 (in quality unit) K=G*H*I*44/12/10 (in volume unit)
Raw coal	10^4 Tons	27,228.29	25.8	20,908	538,547,477
Clean coal	10^4 Tons	40.00	25.8	26,344	996,857
Other washed coal	10^4 Tons	745.91	25.8	8,363	5,901,191
Coke	10^4 Tons	0.22	29.2	28,435	6,698
Coke oven gas	10^8 m^3	15.54	12.1	16,726	1,153,187
Other gas	10^8 m^3	68.07	12.1	5,227	1,578,574
Crude oil	10^4 Tons	0.00	20.0	41,816	0
Gasoline	10^4 Tons	0.00	18.9	43,070	0
Diesel oil	10^4 Tons	5.89	20.2	42,652	186,070
Fuel oil	10^4 Tons	14.82	21.1	41,816	479,451
LPG	10^4 Tons	0.00	17.2	50,179	0
Refinery gas	10^4 Tons	1.97	15.7	46,055	52,229
Natural gas	10^8 m^3	0.56	15.3	38,931	122,306
Other petroleum products	10^4 Tons	0.00	20.0	38,369	0
Other coking products	10^4 Tons	0.00	25.8	28,435	0
Other Energy	10^4 Tons (coal)	158.26	0.0	0	0
CO_2 emission of net power import from the Northeast Power Grid		1.17384×4,514,550 =5,299,346tCO_2e			
Total Emission (Q)		554,323,387tCO_2e			
Thermal Power supplied to the NCPG (P)		493,687,660MWh			
OM Emission Factor in 2004 [＝Q/P]		1.12282tCO_2e/MWh			

Data sources: China Energy Statistical Yearbook 2007;2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy: p.21-22 in Chapter 1.

Table 9 Energy Consumption Statistics of Power Generation of the NCPG in 2005

Fuel	Unit	Beijing A	Tianjin B	Hebei C	Shanxi D	Inner Mongolia E	Shandong F	the NCPG G=A+B+C+D+E+F
Raw coal	10^4 Tons	897.75	1,675.20	6,726.50	6,176.45	6,277.23	10,405.40	32,158.53
Clean coal	10^4 Tons	0.00	0.00	0.00	0.00	0.00	42.18	42.18
Other washed coal	10^4 Tons	6.57	0.00	167.45	373.65	0.00	108.69	656.36
Coke	10^4 Tons	0.00	0.00	0.00	0.00	0.21	0.11	0.32
Coke oven gas	10^8 m^3	0.64	0.75	0.62	21.08	0.39	0.00	23.48
Other gas	10^8 m^3	16.09	7.86	38.83	9.88	18.37	0.00	91.03
Crude oil	10^4 Tons	0.00	0.00	0.00	0.00	0.73	0.00	0.73
Gasoline	10^4 Tons	0.00	0.00	0.01	0.00	0.00	0.00	0.01
Diesel oil	10^4 Tons	0.48	0.00	3.54	0.00	0.12	0.00	4.14
Fuel oil	10^4 Tons	12.25	0.00	0.23	0.00	0.06	0.00	12.54
LPG	10^4 Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Refinery gas	10^4 Tons	0.00	0.00	9.02	0.00	0.00	0.00	9.02
Natural gas	10^8 m^3	0.28	0.08	0.00	2.76	0.00	0.00	3.12
Other petroleum products	10^4 Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other coking products	10^4 Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Energy	10^4 Tons (coal)	8.58	0.00	32.35	69.31	7.27	118.90	236.41

Data sources: China Energy Statistical Yearbook 2006

Table 10. The Operation Margin Emission Factor Calculation of the NCPG in 2005

Fuel	Unit	Fuel Consumption of the NCPG in 2005 G	Emission Factor H(tc/TJ)	Average NCV I (MJ/t,km^3)	CO_2 Emission(tCO_2e) K=G*H*I*44/12/100 (in quality unit) K=G*H*I*44/12/10 (in volume unit)
Raw coal	10^4 Tons	32,158.53	25.8	20,908	636,062,536
Clean coal	10^4 Tons	42.18	25.8	26,344	1,051,186
Other washed coal	10^4 Tons	656.36	25.8	8,363	5,192,725
Coke	10^4 Tons	0.32	29.2	28,435	9,742
Coke oven gas	10^8 m^3	23.48	12.1	16,726	1,742,396
Other gas	10^8 m^3	91.03	12.1	5,227	2,111,027
Crude oil	10^4 Tons	0.73	20.0	41,816	22,385
Gasoline	10^4 Tons	0.01	18.9	43,070	298
Diesel oil	10^4 Tons	4.14	20.2	42,652	130,786
Fuel oil	10^4 Tons	12.54	21.1	41,816	405,690
LPG	10^4 Tons	0.00	17.2	50,179	0
Refinery gas	10^4 Tons	9.02	15.7	46,055	239,141
Natural gas	10^8 m^3	3.12	15.3	38,931	681,417
Other petroleum products	10^4 Tons	0.00	20.0	38,369	0
Other coking products	10^4 Tons	0.00	25.8	28,435	0
Other Energy	10^4 Tons (coal)	236.41	0.0	0	0
CO_2 emission of net power import from the Northeast Power Grid		1.15764×3,929,000 =4,548,366tCO_2e			
Total Emission (Q)		652,197,698tCO_2e			
Thermal Power supplied to the NCPG (P)		564,680,013MWh			
OM Emission Factor in 2005 [＝Q/P]		1.15499tCO_2e/MWh			

Data sources: China Energy Statistical Yearbook 2007; 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy: p.21-22 in Chapter 1.

Table 11. Energy Consumption Statistics of Power Generation of the NCPG in 2006

Fuel	Unit	Beijing A	Tianjin B	Hebei C	Shanxi D	Inner Mongolia E	Shandong F	the NCPG G=A+B+C+D+E+F
Raw coal	10^4 Tons	796.63	1,639.20	6,867.99	6,968.88	8,404.05	10,930.66	35607.41
Clean coal	10^4 Tons	0.00	0.00	0.00	0.00	0.00	39.77	39.77
Other washed coal	10^4 Tons	6.36	0.00	214.13	371.14	61.77	544.60	1198.00
Briquettes	10^4 Tons	7.97	0.00	0.00	0.00	0.00	27.77	35.74
Coke	10^4 Tons	0.00	0.00	0.00	0.00	0.00	3.23	3.23
Coke oven gas	10^8 m^3	0.38	0.63	5.80	22.32	0.64	5.79	35.56
Other gas	10^8 m^3	20.66	6.58	69.72	13.79	22.76	7.22	140.73
Crude oil	10^4 Tons	0.00	0.00	0.00	0.00	0.74	0.00	0.74
Gasoline	10^4 Tons	0.00	0.00	0.01	0.00	0.00	0.00	0.01
Diesel oil	10^4 Tons	0.21	0.00	3.01	0.00	0.07	6.32	9.61
Fuel oil	10^4 Tons	6.38	0.00	0.08	0.00	0.00	4.10	10.56
LPG	10^4 Tons	0.00	0.00	0.00	0.00	0.00	0.01	0.01
Refinery gas	10^4 Tons	0.00	0.00	2.43	0.00	0.00	2.32	4.75
Natural gas	10^8 m^3	3.41	0.73	0.00	0.53	0.00	0.00	4.67
Other petroleum products	10^4 Tons	0.00	0.00	0.00	0.00	0.00	0.28	0.28
Other coking products	10^4 Tons	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Energy	10^4 Tons (coal)	6.83	0.00	47.11	230.76	12.51	132.29	429.50

Data sources: China Energy Statistical Yearbook 2007

Table 12. The Operation Margin Emission Factor Calculation of the NCPG in 2006

Fuel	Unit	Fuel Consumption of the NCPG in 2006 G	Emission Factor H(tc/TJ)	Average NCV I (MJ/t,km^3)	CO_2 Emission(tCO_2e) K=G*H*I*44/12/100 (in quality unit) K=G*H*I*44/12/10 (in volume unit)
Raw coal	10^4 Tons	35607.41	25.8	20,908	704,277,823
Clean coal	10^4 Tons	39.77	25.8	26,344	991,125
Other washed coal	10^4 Tons	1198.00	25.8	8,363	9,477,855
Briquettes	10^4 Tons	35.74	26.6	20,908	728,820
Coke	10^4 Tons	3.23	29.2	28,435	98,335
Coke oven gas	10^8 m^3	35.56	12.1	16,726	2,638,825
Other gas	10^8 m^3	140.73	12.1	5,227	3,263,593
Crude oil	10^4 Tons	0.74	20.0	41,816	22,692
Gasoline	10^4 Tons	0.01	18.9	43,070	298
Diesel oil	10^4 Tons	9.61	20.2	42,652	303,589
Fuel oil	10^4 Tons	10.56	21.1	41,816	341,633
LPG	10^4 Tons	0.01	17.2	50,179	316
Refinery gas	10^4 Tons	4.75	15.7	46,055	125,934
Natural gas	10^8 m^3	4.67	15.3	38,931	1,019,942
Other petroleum products	10^4 Tons	0.28	20.0	38,369	7,878
Other coking products	10^4 Tons	0.00	25.8	28,435	0
Other Energy	10^4 Tons (coal)	429.50	0.0	0	0
CO_2 emission of net power import from the Northeast Power Grid		1.16688×2,618,060=3,054,959tCO_2e			
CO_2 emission of net power import from the Central China Power Grid		0.87599×497,060=435,420tCO_2e			
Total Emission (Q)		726,789,037tCO_2e			
Thermal Power supplied to the NCPG (P)		672,621,593MWh			
OM Emission Factor in 2006 [＝Q/P]		1.08053tCO_2e/MWh			

Data sources: China Energy Statistical Yearbook 2007; 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy: p.21-22 in Chapter 1.

Table 13. Full-weighted Ave. OM three years of the NCPG

Year	2004	2005	2006
Total CO_2 Emission (tCO_2e)	554,323,387	652,197,697	726,789,038
Thermal Power supplied to the NCPG (MWh)	493,687,660	564,680,013	672,621,593
Full-weighted average OM	= (554,323,387+652,197,697+726,789,038) / (493,687,660+564,680,013+672,621,593) =1.1169tCO_2e/MWh		

Table14. Proportion of CO_2 Emission by Solid, Liquid and Gas Fuel Power Generation in Total CO_2 Emission in 2006

Fuel	Unit	Beijing A	Tianjin B	Hebei C	Shanxi D	Inner Mongolia E	Shandong F	Total G=A+B+C +D+E+F	NCV kJ/kg kJ/m^3 H	Emission Factor I	CO_2 emission (tCO_2e)	λ_{Coal} λ_{Oil} λ_{Gas}
Raw coal	10^4 Tons	796.63	1,639.20	6,867.99	6,968.88	10,930.66	8,404.05	35607.41	25.8	20,908	704,277,823	-
Clean coal	10^4 Tons	0	0	0	0	39.77	0	39.77	25.8	26,344	991,125	-
Other washed coal	10^4 Tons	6.36	0	214.13	371.14	544.6	61.77	1198.00	25.8	8,363	9,477,855	-
Briquettes	10^4Tons	7.97	0	0	0	27.77	0	35.74	26.6	20,908	728,820	
Coke	10^4 Tons	0	0	0	0	3.23	0	3.23	29.2	28,435	98,335	
Coal Fuel Subtotal		-	-	-	-	-	-	-	-	-	715,573,958	98.93%
Crude oil	10^4 Tons	0	0	0	0	0	0.74	0.74	20.0	41,816	22,692	-
Gasoline	10^4 Tons	0	0	0.01	0	0	0	0.01	18.9	43,070	298	-
Kerosene	10^4 Tons	0	0	0	0	0	0	0.00	19.6	43,070	0	
Coal oil	10^4 Tons	0.21	0	3.01	0	6.32	0.07	9.61	20.2	42,652	303,589	-
Diesel oil	10^4 Tons	6.38	0	0.08	0	4.1	0	10.56	21.1	41,816	341,633	-
Fuel oil	10^4 Tons	0	0	0	0	0.28	0	0.28	20.0	38,369	7,878	-
Other petroleum products	10^4 Tons	0	0	0	0	0	0	0.00	25.8	28,435	0	
Oil Fuel Subtotal		-	-	-	-	-	-	-	-	-	676,091	0.09%
Natural gas	10^7 m^3	34.1	7.3	0	5.3	0	0	46.70	15.3	38,931	1,019,942	
Coke oven gas	10^7 m^3	3.8	6.3	58	223.2	57.9	6.4	355.60	12.1	16,726	2,638,825	
Other gas	10^7 m^3	206.6	65.8	697.2	137.9	72.2	227.6	1407.30	12.1	5,227	3,263,593	
LPG	10^4 Tons	0	0	0	0	0.01	0	0.01	17.2	50,179	316	
Refinery gas	10^4 Tons	0	0	2.43	0	2.32	0	4.75	15.7	46,055	125,934	
Gas Fuel Subtotal		-	-	-	-	-	-	-	-	-	7,048,610	0.98%
Total		-	-	-	-	-	-	-	-	-	723,298,659	100%

Calculated: λ_{Coal} =98.93%, λ_{Oil} =0.09%, λ_{Gas} =0.98%.

Table15. Calculating of Emission Factor for Various Power Plant

	Variable	Power Supply Efficiency L	Emission Factor for Fuels (tc/TJ) I	Emission Factor (tCO_2e/MWh) O=3.6/L/1000*I *44/12
Coal-fired Power Plant	$EF_{Coal,Adv}$	37.28%	25.80	0.9135
Gas-fired Power Plant	$EF_{Gas,Adv}$	48.81%	15.30	0.4138
Oil-fired Power Plant	$EF_{Oil,Adv}$	48.81%	21.10	0.5706

Therefore, the emission factor of thermal power is:

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} = 0.90833 tCO_2 eMWh$$

Table16 the Installed Capacity of the NCPG 2006

Installed Capacity	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Thermal Power	MW	3,984.0	6,512.0	26,087.0	26,661.0	28,899.0	49,395.0	141,538.0
Hydro Power	MW	1,053.0	5.0	785.0	790.0	818.0	553.0	4,004.0
Nuclear Power	MW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wind Power and others	MW	24.0	24.0	218.0	0.0	565.0	106.0	937.0
Total	MW	5,061.0	6,541.0	27,090.0	27,451.0	30,282.0	50,054.0	146,479.0

Data Source: China Energy Statistical Yearbook 2007.

Table17 the Installed Capacity of the NCPG 2005

Installed Capacity	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Thermal Power	MW	3,833.5	6,149.9	22,333.2	22,246.8	19,173.3	37,332	111,068.7
Hydro Power	MW	1,025.0	5.0	784.5	783.0	567.9	50.8	3,216.2
Nuclear Power	MW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wind Power and others	MW	24.0	24.0	48.0	0.0	208.9	30.6	335.5
Total	MW	4,882.5	6,178.9	23,165.7	23,029.8	19,950.2	37,413.4	114,620.5

Data Source: China Energy Statistical Yearbook 2006.

Table18 the Calculation of BM Emission Factor for the NCPG

	Installed Capacity in 2005	Installed Capacity in 2006	Capacity Addition Of 2005-2006	Ratio of Capacity Addition
Thermal Power(MW)	111,068.7	141,538.0	30,469.3	95.64%
Hydropower(MW)	3,216.2	4,004.0	787.8	2.47%
Nuclear Power(MW)	0.0	0.0	0.0	0.00%
Wind Power and Other(MW)	335.5	937.0	601.5	1.89%
Total(MW)	114,620.4	146,479.0	31,858.6	100.00%
Percent of Installed Capacity in 2006	78.25%	100%	-	-

Therefore, the BM was calculated as $EF_{grid,BM,y} = 0.9083 \times 95.64\% = 0.8687 tCO_2e / MWh$.

The baseline emission factor was calculated as the weighted average of the OM Emission Factor (1.1169tCO_2e/MWh) and the BM Emission Factor (0.8687tCO_2e/MWh). According to the "*Tool to calculate the emission factor for an electricity system*" *Version 2.0* the defaults weights of OM Emission Factor and the BM Emission Factor for the project are used as 0.75 and 0.25 respectively. So the Baseline Emissions Factor ($EF_{grid,CM,y}$ in tCO_2e/MWh) is 1.05485tCO2e/MWh.

Annex 4

MONITORING INFORMATION

The monitoring plan will monitor: the electricity supplied to the grid by the proposed project and the electricity use of power plant supplied by the grid, provided the relative information in section B.7.2, and the detailed plan is provided in special monitoring plan.