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:

>>
Huadian Kulun 201MW Wind Farm Project
Version: 03
Date: 03/02/2009

A.2. Description of the project activity:

>>
Huadian Kulun 201MW Wind Farm Project (hereafter refer as "the proposed project") will be developed by Inner Mongolia Huadian Huitengxile Wind Power Co., Ltd. The proposed project will be located in Kulun town, Wulan Chabu city, Inner Mongolia Autonomous Region in China and involves a installation of 134 turbines, each of which has a rated output of 1500kW, providing a total capacity of 201MW. The annual net output of the proposed project is estimated to be 496,530MWh. The electricity to be generated will be delivered to North China Power Grid through Inner Mongolia Power Grid.

The proposed project is a newly built project, which renewable energy, i.e. wind energy will, be used to generate electricity to alleviate electricity shortage in North China as well as reduce air pollution. The proposed project will contribute to the reduction of GHG emission by displacing part of the electricity from North China Power Grid, which is dominant of fossil fuel fired power plants. As for North China Power Grid will supply equal quantity of electricity before the proposed project complemented, it will be defined as baseline scenario. The proposed project is estimated to reduce 523,765 tonnes CO_2 emission per year in the first crediting period, which will contribute to the alleviation of climate change.

The contributions of the proposed project to sustainable development goal are summarized as follows:

(1) The proposed project will increase the tax income to promote local economic development and alleviate local poverty.

(2) The proposed project is located in poor area of Inner Mongolia Autonomous Region, which is a Minority Resident Area in North China. The proposed project is beneficial to economic promotion of minority resident area.

(3) The proposed project will provide high quality green electricity to North China Power Grid, which can improve the proportion of green electricity in the energy structure of the North China Power Grid, decrease the GHG emission and at the same time alleviate the environment pollution caused by the combustion of the fossil fuels.

(4) The proposed project activity can bring employment opportunities for local residents during the construction and operation of the proposed project, which will increase income of the local residents, and contribute to the local socio-economic development.

A.3. Project participants:

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Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity (ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant

		(Yes/No)
P.R.China (host)	Inner Mongolia Huadian Huitengxile Wind Power Co., Ltd	No
Sweden	Carbon Asset Management Sweden AB	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

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P.R.China

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

>>

Inner Mongolia Autonomous Region

A.4.1.3. City/Town/Community etc.:

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Kulun town, Wulan Chabu city

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

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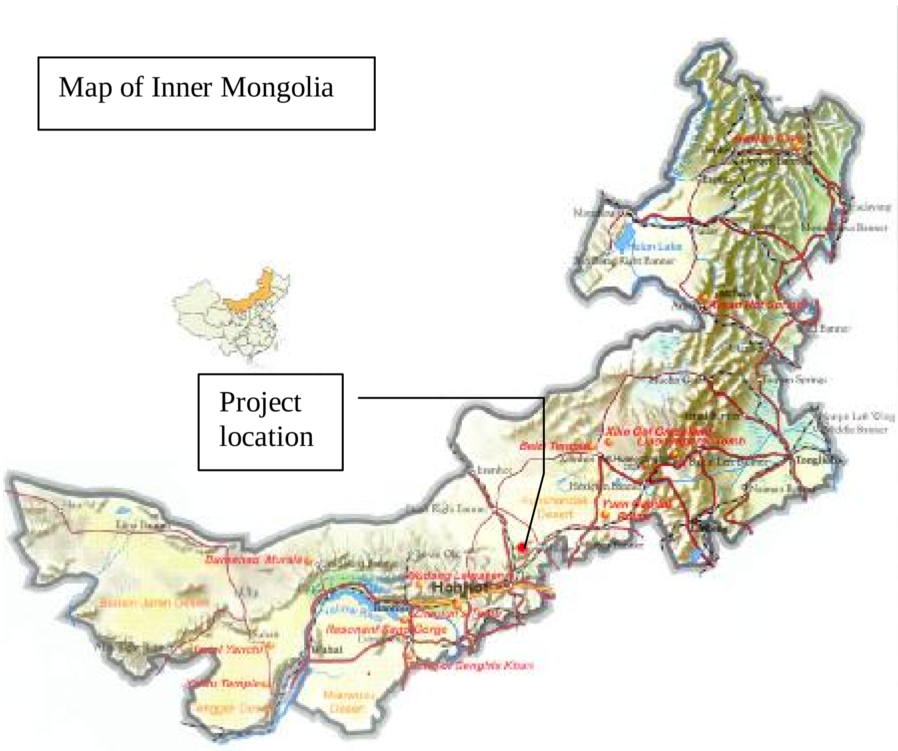
The proposed project located in Kulun Town, Wulan chabu city, Inner Mongolia Autonomous Region, in the north of China. The proposed project is 180km northeast to Hohhot, the capital of Inner Mongolia Autonomous Region, and 120km away from the government location of Wulan Chabu city. Center of the wind farm is longitude 112°36′ 7″ E and latitude 41°43′ 5′ N. The location of the proposed project will be shown in FigureA.1 and FigureA.2 as following.

FigureA.1 Map of Inner Mongolia in China



FigureA.2 Map of the site of proposed project

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

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The project falls into:
Sectoral scope 1: energy industries (renewable - / non-renewable sources)

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

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The proposed project is a newly-built wind farm project. 134 wind turbines will be employed, each of whose unit capacity is 1.5MW and the total installed capacity will be 201MW.
As for the project's location is covered by North China Power Grid, electricity which will be replaced by the proposed project should be supplied by North China Power Grid before the project implemented, while same as the baseline scenario. Without the proposed project, thermal power plants in North China Power Grid will keep on working to meet the power demand. Baseline scenario is defined as CO_2 emission from thermal power plants in North China Power Grid.

Main parameters of the wind turbine are shown below in table A-1.

Table A-1: Parameters of wind turbine

Parameter	Value	Unit
Rated power output	1500	KW
Turbine number	134	set
Total installed capacity	201	MW
Number of blades	3	Piece

One 35/220kV voltage-boosting station at a capacity is going to be built in the wind farm during the period of construction. The power generated by turbines will be boosted to 35kV to get through generatrix. After boosted to 220kV by main transformer, electricity will be lead to the 220kV suspension lines and connected to the 220kV substation of Hanhai transformer station.

There is no technology transfer involved in the proposed project.

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

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The renewable crediting period is chosen and the proposed project activity is expected to generate an estimated annual emission reduction of 523,765 tCO_2e during the first crediting period of the proposed project.

Table A.2 estimation of emission reductions

Operating Years	**CO_2 Emission Reductions (tonnes of CO_2)**
Jun. 1st, 2009 – Dec. 31st, 2009	305,530
2010	523,765
2011	523,765
2012	523,765
2013	523,765
2014	523,765
2015	523,765

Jan. 1st 2016 – May 31st, 2016	218,235
Total estimated reductions (tonnes of CO_2e)	3,666,355
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	523,765

A.4.5. Public funding of the project activity:

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

SECTION B. Application of a baseline and monitoring methodology

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

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Title of the approved baseline methodology: ACM0002-Consolidated baseline methodology for grid connected electricity generation from renewable sources (Version 07, EB36)

Title of the approved monitoring methodology: ACM0002-Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources (Version 07, EB36)

Reference: Tool for the demonstration and assessment of additionality (Version 05.2, EB39)

Tool to calculate the emission factor for an electricity system (Version 01.1, EB35)

Please click on following link for more information about the methodology and reference:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

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

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The proposed project is a grid-connected renewable power generation project activity, which meets the applicability criteria stated in methodology ACM0002 version 07:

1. The project is a newly-built wind-farm project that uses clean wind resources to generate electricity that is delivered to North China Power Grid.
2. The project does not involve switching from fossil fuels to renewable energy at the site of the project activity.
3. The geographic and system boundaries for North China Power Grid can be clearly identified and information on the characteristics of the grid is available.

Thus the baseline and monitoring methodology ACM0002 are applicable to the project.

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

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According to the methodology ACM0002, a project electricity system is defined as:

> The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to.

Electricity generated by proposed project will be supplied to North China Power Grid after operation, thus the North China Power Grid can be defined as project boundary for the proposed CDM project. It is within the boundary of the North China Power Grid[1], which geographical range includes the grids of: Beijing City, Tianjin City, Hebei Province, Shanxi Province, Shandong Province and Inner Mongolia Autonomous Region.

Emission sources included and excluded in the project boundary are listed below:

[1] Detailed information of the grid in China can be obtained from the China Electric Power Yearbook, the China Energy Statistical Yearbook and the Notification on Determining Baseline Emission Factor of China's Grid made publicly available on the website of China's DNA (http://cdm.ccchina.gov.cn)on July 18th, 2008.

Table B.1. Emission sources included in the proposed project boundary

	Source	Gas	Included ?	Justification / Explanation
Baseline	Electricity generation, grid or captive source	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
Project Activity	Proposed Project	CO_2	Excluded	According to ACM0002, the project emission of wind power project is not considered.
		CH_4	Excluded	According to ACM0002, the project emission of wind power project is not considered.
		N_2O	Excluded	According to ACM0002, the project emission of wind power project is not considered.

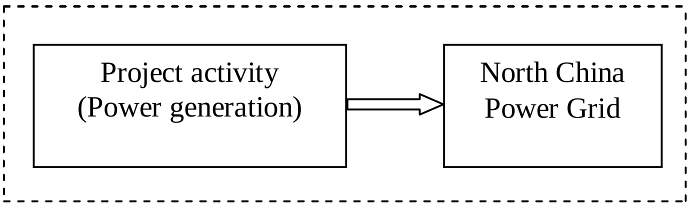

Figure B.1: Project boundary of the proposed project

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

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

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

Due to the proposed project is a newly built wind farm project connected with North China Power Grid, the North China Power Grid is considered as the "connected electricity system". Therefore, the baseline scenario of the proposed project can be identified as the North China Power Grid.
According to ACM0002, baseline emissions are equal to the power generated by the project that is delivered to the Northwest China Power Grid, multiplied by the baseline emission factor.

The analysis and description in B.5 and B.6 will support the baseline scenario shown above.

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

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Timeline of the proposed project

In China, it's a common practice to compare the internal return rate (IRR) with benchmark IRR when doing the investment analysis in Feasibility Study Report (FSR) of a wind farm project. According to the regulation published by government, the financial benchmark internal rate of return (after tax) of total investment for Chinese power industry is 8%[2]. If IRR is lower than the benchmark, the project is considered to be financially unfeasible.
When Feasibility Study Report of the proposed project was implemented by Inner Mongolia Power Exploration and Design Institute in August 2007, IRR was much lower than the benchmark. Low internal rate of return brought great difficulty on financing and investment decision to the project owner. If no other solution can be found to improve the financial attractive, investment of the project may be failed.

According to the proposal that to apply for CDM to support made by the design institute, in October 2007 the project owner held a board meeting to decide to invest on the proposed project activity after considering the CDM revenues, although the proposed project activity is economically unattractive. The project was approved by National Development and Reform Commission (NDRC) on Dec. 14th 2007, in which the government suggested project owner to apply CDM to overcome financial problem. On Dec. 25th 2007 the project owner signed the first equipment contract with provider, which is regarded as the start date of the proposed project as it is the earliest date according to CDM glossary term. At the same time, the project owner was looking for CERs buyer. After comparing and negotiating with some CERs buyers, in January 2008 the project owner signed the letter of intention with CAM. At the same time, project owner started to sign contracts of other equipments for the project. After the Chinese Spring Festival, the project owner prepared and started construction in April 2008. On May 19th the ERPA was signed. From the above statement, we can conclude that CDM is seriously taken into account before the start of the proposed project activity and CDM is essential for the project owner to go ahead with the implementation of the project activity.

Turbine purchase contract was signed in Dec. 25th 2007 while civil construction started in April 2008.

Below is the time table of this project.

Events	Timeline
Environmental Impact Assessment (EIA)	Feb. 5th, 2007
EIA approval	Mar. 2nd, 2007
Feasibility Study Report (FSR)	August 2007
Board meeting	October 17th, 2007
Approved by NDRC	Dec. 14th, 2007
Turbine purchase contract	Dec. 25th, 2007
Letter of Intent	Jan. 20th, 2008
Contract of transformer (1)[3] 33 sets	Jan. 3rd 2008
Contract of pylon (1) 17 sets	Sep. 5th, 2008
Contract of pylon (2) 18 sets	Oct 30th. 2008
Contract of pylon (3) 34 sets	Oct 22nd. 2008

[2] "Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects", page 2, item 1.11: The social discount rate and the IRR benchmark of power industry are very important parameters for Financial Evaluation and National Economic Evaluation. The social discount rate is determined and issued by the national government as 12%; the benchmark of power industry is issued to be 8% of the total investment IRR and 10% of the capital IRR. The project is considered to be financially feasible when the FIRR and EIRR of the project are higher or equal than the relevant financial benchmark or social discount rate.

[3] Until now, only one transformer contract was signed.

Contract of pylon (4) 30 sets	Oct 6th. 2008
Contract of pylon (5) 17 sets	Mar 5th. 2008
Contract of pylon (6) 18 sets	Oct 7th. 2008
Construction	Feb. 2nd, 2008
ERPA signed	May 19th, 2008
Financing	Aug. 25th, 2008

The proposed project uses the *Tool for the Demonstration and Assessment of Additionality* (version 5.2), which was revised in the EB 39, to demonstrate its additionality. The tool includes the following steps:

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

The objective of this step is to identify realistic and credible alternatives to the project that can be the baseline scenario through the following sub-steps:

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

Realistic and credible alternatives available to the proposed project that provides outputs or services comparable with the proposed CDM project activity include:
Alternative 1: The proposed project activity not undertaken as CDM project activity
Alternative 2: Construct a fossil fuel-fired power plant with equivalent annual power supply
Alternative 3: Construct a power plant using other renewable energy with equivalent annual power supply
Alternative 4: Equivalent annual electricity supplied by North China Power Grid

In the North China Power Grid, other renewable energies including hydropower, solar PV, biomass and geothermal are the possible grid-connected technologies However, the proposed project is located in a semiarid region of Inner Mongolia, where is a continental arid climate and lack of hydro resources at the proposed project site[4] that it is impossible for the project owner to build a hydro power projects in project site. Besides, nowadays in China, solar PV, biomass and geothermal generation technology is still lack of economic attraction to investor due to high investment and low repay, which is difficult to be operated without policies& financial support[5]. Moreover, as a power company specialized in developing wind power project, the project owner has no experience and ability to develop other renewable energy power plants. Hence, the alternative 3 is unrealistic.

Outcome of Step 1a:

Four realistic and credible alternatives to the proposed project activity are selected and one is excluded. Alternative 3 is unrealistic.

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

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

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

[4] "A description about on-site water resource". Evidence will be supplied to DOE for validation.

[5] http://www.chinaenergy.gov.cn/news.php?id=15688

Alternative 2: Construct a fossil fuel-fired power plant with equivalent annual power supply
Generally speaking, the average annual utilization hours of the fossil fuel plants are larger than the average annual utilization of the proposed project. As for average utilization hours of thermal power station is 5,316h[6] per year, to supply same output as the proposed project, the total installation of a coal-fried power station will be lower than 100MW[7]. However, according to the current laws and regulations in China, the thermal power plants with installed capacity of 135 MW or below are prohibited for construction in the areas covered by large power grids[8]. Besides, construction of thermal power generation unit with an installed capacity lower than 100MW is strictly restricted[9]. Therefore, the alternative 2 is not a possible baseline scenario.

Alternative 4: Equivalent annual electricity supplied by North China Power Grid
Alternative 4 is in compliance with legal and regulatory requirements. Thus the scenario 4 can be a baseline scenario.

Outcome of Step 1b:

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

Step 2. Investment Analysis

The purpose of investment analysis is to determine whether the proposed project activity is economically or financially less attractive than other alternatives without the revenue from the sale of certified emission reductions (CERs). To conduct the investment analysis, use the following sub-steps:

Sub-step 2a. Determine appropriate analysis method
According to "Tool for the demonstration and assessment of additionality", there are three analysis methods recommended, including simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III).

For the proposed project, the simple cost analysis method (Option I) is not applicable because the project activity will produce economic benefit (from electricity sale) other than CDM related income. The investment comparison analysis method (Option II) is also not applicable because the baseline scenario is the North China Power Grid rather than a new investment project.

To conclude, benchmark analysis method (Option III) based on project IRR will be applied to proposed project to identify whether the financial indicators is better than relevant benchmark value.

Sub-step 2b. Option III. Apply benchmark Analysis
According to ***Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects,***

[6] http://www.chinapower.com.cn/article/1120/art1120273.asp

[7] (2470 * 201) / 5316 = 93.4MW

[8] General Office of the State Council [Decree No. 2002-6]: <Notice on Strictly Prohibiting the Construction of Thermal Power Plants with Installed Capacity of 135 MW or Below>

[9] "Temporary provisions on construction of small thermal power generation unit", published on Aug. 17th, 1997.

issued by former State Power Corporation of China, the financial internal rate of return of total investment (after tax) as benchmark in China's power generation industry is 8% considering economic assessments of hydropower projects, fossil fuel fired projects, transmission and substation projects, especially the interest rate of commercial loans over five years[10]. Nowadays this is widely used in China.

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

1) Parameters needed for calculation of key financial indicators

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

Table B.2 Basic Parameters for Financial Analysis

Items	Unit	Data Value	Data Source
Installed capacity	MW	201	FSR
Annual net electricity	MWh	496,530	FSR
Static total investment	10^4 RMB	178,661	FSR
Expected tariff	RMB/kwh (Inc.VAT)	0.47	FSR
Value-added tax rate	%	8.5%	FSR
Income tax rate	%	25%	FSR

When doing the investment analysis in FSR, the design institute and the project investors adopted fixed tariff as 0.47RMB/kWh to do financial analysis because they must abide by relevant regulations and codes on investment analysis issued by NDRC: "*Proposed Regulation on Electricity Tariff for Renewable Energy Power Projects and Share of Proceeds*". It was stated in chapter 2, item 6 as "The electricity tariff for wind power project shall be subject to government guiding price. The guiding price standard shall be determined by responsible department in the State Council through competitive price method." This FSR is made under the finical and tax mechanism and investment environment at that time which is a good guidance of investment decision for project owner. The tariff adopted in the FSR referred to the latest concession projects, which were the most up-to-date tariff available at that time. Thus adoption of the tariff in FSR is appropriate.

This project was approved by NDRC on Dec. 14th 2007 and tariff mechanism was defined in the Approval. Before the operating hour reach 30,000 hours[11], tariff should be in line with latest approved tariff of concession projects. When operating hour reach 30,000 hours, tariff of the electricity generated afterwards shall be in line with average tariff of wind farm projects in local area at that time. In this CDM-PDD, we adopted the tariff 0.47RMB/kWh in line with FSR through operation life time with a conservative manner:

According to the timeline of project activity, the approved tariff of 4th concession projects (approved in Sep. 2006)[12] in Inner Mongolia shall be adopted because it's the latest tariff available when making investment decision. The highest tariff was 0.4656 RMB/kWh while the lowest was 0.4200 RMB/kWh near the project site. W adopted 0.47 RMB/kWh as the tariff before operating hour reach 30,000 hours in the project design document which is higher than the highest tariff to make sure it's conservative. Additionally, project owner sent a Letter of Inquiry to local Grid Company who knew all tariff level of local area for the expect tariff of proposed project. Grid Company responded that the tariff may not higher

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

[11] The project is designed in FSR to be operating 2470 hours per year. Operation for 12.15 years can fulfil 30,000 hours.

[12] http://www.nwtc.cn/Article/ShowArticle.asp?ArticleID=991

than 0.47RMB/kWh according to the analysis of operated concession wind projects in local area. So investment analysis in this PDD with the tariff of 0.47 RMB/kWh before 30,000 hours is conservative.

For tariff after the operating hour reach 30,000 hours, tariff of the electricity generated afterwards shall be in line with **average tariff of wind farm projects** in local area at that time. But according to the tariff of projects in western Inner Mongolia approved by NDRC from Jan. 2007 to Jul. 2008[13][14][15], "when operating hour reach 30,000 hours, tariff of the electricity generated afterwards shall be in line with **average tariff** in local area at that time", tariff of the proposed project shall also follow the **average tariff** just as the above projects. North China Power Grid, in which the proposed project is located and connected, is dominated by thermal power plants[16]. Average tariff is dominated by thermal power plants, a little higher but very close to tariff of thermal power plants. Based on the latest Notice on tariff of thermal power plants published by local DRC (NeiFaGaiJiaZi[2006]1328), tariff of newly commissioned desulfurization coal-fired units, who are the most advanced commercialized coal-fired power plants, is 0.2659 RMB/kWh. This tariff is much lower than 0.47 RMB/kWh that we adopted in FSR after 30,000 hours. Thus, it's conservative that we still adopt 0.47 RMB/kWh in the PDD after operating hour reach 30,000 hours.

Thus, adoption of the tariff from FSR is conservative and consistent with requirement of Validation and Verification Manual.

2) Comparison of IRR for the proposed project and the financial benchmark
In accordance with benchmark analysis (Option III), if the financial indicators of the proposed project, such as the proposed project IRR, are lower than the benchmark, the proposed project is not considered to be financially attractive.
Without the sales of CERs, the proposed project IRR is 5.53% which is lower than the financial benchmark. Thus the proposed project is not considered to be financially attractive.
In case the project owner can get the income from CDM, the project IRR with CDM is 11.77%, which is higher than the benchmark, thus the financial problem will be solved. CDM revenues can help the proposed project to overcome the investment barrier and demonstrate the additionality of the proposed project.

Sub-step 2d. Sensitivity analysis
The sensitivity analysis shall show whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions. For the proposed project, four parameters were selected as sensitive factors to check out the financial attractiveness:
1) Total investment
2) Electricity Tariff
3) Annual O&M cost
4) Electricity amount
The results of sensitive analysis are shown in Table B.3 and Figure B.2 below.

Table B.3 Sensibility analysis of the proposed project (without CDM)

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[13] Neifagaijiazi[2007]47, approved on Jan 11th, 2007.

[14] http://jgs.ndrc.gov.cn/zcfg/t20080218_193011.htm (FaGaiJiaGe[2007]3303, approved on Dec. 3rd, 2007)

[15] http://zfxxgk.ndrc.gov.cn/PublicItemView.aspx?ItemID=%7B3e2df87d-6532-4952-a109-d5a7de41daa1%7D (FaGaiJiaGe[2008]1876, approved on Jul. 23rd, 2008)

[16] China Electric Power Yearbook (2007) page 637. Total installed capacity of NCPG in 2006 is 116197.9 MW while for thermal power plants is 112639.3MW. Thermal power plants take up 96.9% of NCPG.

Sensitivity analysis	-10%	-5%	0	5%	10%
Tariff [17]	5.01%	5.28%	5.53%	5.78%	6.02%
Total investment	6.81%	6.14%	5.53%	4.97%	4.44%
annual operation cost	5.83%	5.68%	5.53%	5.38%	5.23%
Electricity amount	4.36%	4.95%	5.53%	6.09%	6.63%

IRR of the proposed project varies to different degrees in accordance with the fluctuation of three parameters within the range of negative 10 percent to positive 10 percent. It could be seen that the proposed project IRR is always below the benchmark IRR even when the total investment drops by 10 percent or the electricity price/supply increase 10 percent. In addition, when the operation cost drops by 10 percent, the proposed project IRR cannot reach the benchmark IRR.

A further analysis was done to find the parameter variation when benchmark IRR is achieved.
When total investment decrease 18%, IRR can exceed 8%.
When electricity amounts increase 23%, IRR can exceed 8%.
When annual O&M cost decrease 85%, IRR can exceed 8%.
When electricity tariff (after 30,000 hours) increase 60%, IRR can exceed 8%.

	Fluctuate range	IRR
Total Investment	- 18%	8.01%
	0	5.53%
Tariff	0	5.53%
	+ 60%	8.01
Annual operation cost	-85%	8.02%
	0%	5.53%
Electricity generation	+ 23%	8.01%
	0%	5.53%

[17] Tariff before 30,000 hours is fixed according to approval. The sensitivity analysis is based on the tariff after 30,000 hours.

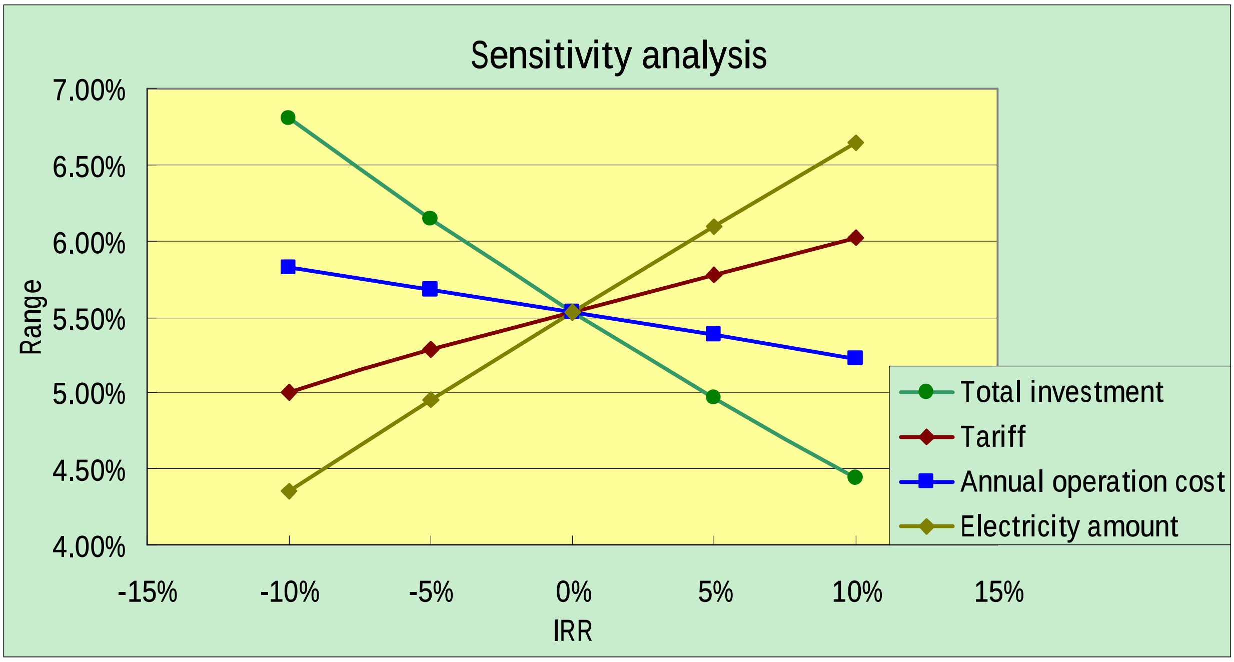

Figure B.2 Sensibility analysis of the proposed project

In 2006, approval of *Renewable Energy Law of the People's Republic of China* by Chinese government boosted the development of wind power in China and the total installed capacity of wind farm increased sharply since then[18]. The increase of wind farm construction caused the shortage of wind turbine and price increase occurred when wind turbine can't meet the need of the market[19]. Besides, according to the *Statistical Bulletin* published by National Bureau of Statistics of China, Consumer Price Index (CPI) increased by 3.3% from 2004 to 2006 in China. Investment budget for project owner of wind farms has increased by 5% compared to 2005 due to the increase of price of equipment and raw materials. Price of turbine has increased by 8% while the price of steel increased by 9% compared to year 2005[20]. Thus it's not possible to decrease total investment by 18% to exceed the benchmark IRR.
To reach the benchmark IRR, O&M cost shall decrease 85%. According to sensitivity analysis, IRR of the project can reach benchmark only when the O&M cost decreased to 85%. Based on the statistic data published by National Bureau of Statistics of China, producer price index (PPI) of industrial products in Inner Mongolia never dropped so much since 1987[21]. According to the statistic data published by National Bureau of Statistics of China, total income of Chinese residents has dramatically increased from 568.9×10^8 to 23265.9×10^8 from year 1978 to year 2006[22]. Thus it's impossible for the O&M cost to decrease 85% to reach benchmark IRR

As for the electricity tariff, we adopted fixed tariff from FSR. According to the Approval by NDRC, tariff mechanism was defined as: before the operating hour reach 30,000 hours, tariff should be in line with latest approved tariff of concession projects; when operating hour reach 30,000 hours, tariff of the

[18] http://www.sdpc.gov.cn/zjgx/t20070105_109006.htm
[19] http://www.cs.com.cn/jrbznew/html/2008-07/17/content_16499157.htm
20 Data was sited from Feasibility Study Report, page 14-4.
[21] Evidence from web site of National Bureau of Statistics of China has been supplied to DOE.
[22]Evidence from web site of National Bureau of Statistics of China has been supplied to DOE.

electricity generated afterwards shall be in line with average tariff of wind farm projects in local area at that time. Tariff before 30,000 hours is fixed according to FSR approval, which is explained clearly before. We will do the sensitivity analysis on the tariff after 30,000 hours. To overcome the benchmark of 8%, electricity tariff after 30,000 hours, i.e., 12 years later, shall exceed 0.75 RMB/kWh. But it's impossible for the average tariff to increase by 60% from 0.47 to 0.75 during the future 12 years. According to the statistics result published by National Bureau of Statistics of China, average tariff never change that much. Besides, "China's wind power tariff will remain stable for a period of time" said by officer from NDRC. On 19 May 2007，Li Junfeng, deputy director of Energy Research Institute of China's National Development and Reform Commission participated in the "International Summits for Alternative Energy and the Power"[23]. Thus we can conclude that it would be impossible for the proposed project to increase tariff to reach the benchmark.

As for electricity amount, according to FSR, quality of wind source of the project has been expounded. Data was mainly based on the record of Chayouzhongqi Weather Station, the nearest weather station to project site from 1967 to 2006. Wind speed from 1967 to 2006 is 4.0m/s and speed from 1987 to 2006 is 3.4m/s. Wind speed has decreased to 3.3m/s from 1997 to 2006 which shows a decrease trend of wind quality during the recent 40 years. Thus the annual power generation is impossible to increase much during the whole operation life time. Thus it is reasonable and conservative for the project owner to adopt fixed tariff in the FSR.

According to the explanations above, without CDM revenues, the proposed project has obvious investment barrier and fulfils the requirement of additionality.

Outcome of Step 2:
The sensitivity analysis shows that without CER revenue, IRR of The proposed project is difficult to reach the benchmark, which supports the conclusion, that the proposed project is unlikely to be financially attractive. Hence, alternative 1 the proposed project activity not undertaken as CDM project activity is excluded.

Step 3 Barrier Analysis
This step is not used for this project activity.

Step 4 Common practice analyses

Sub-step 4a. Analyze other activities similar to the proposed project activity:
According to the guidance of "Tool for the demonstration and assessment of additionality", the other activities similar to the proposed project activity are defined as wind projects in the same region (Inner Mongolia), rely on a broadly similar technology (wind projects), are of a similar scale (larger than 15MW), and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing.

China is a big country, the policies and regulations in Chinese provinces are different. Common practice analysis is limited to the provincial level due to different investment environment for each province differs. For example, the electricity tariff for different province is much different under the control of National Development and Reform Commission[24] and price index of industrial products is very different[25].

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[23] http://politics.people.com.cn/GB/5752740.html

[24] http://www.sdpc.gov.cn/zfdj/jggg/dian/t20080813_230724.htm

Also the wind resources of the different provinces are different and Inner Mongolia is relatively large[26], hence the selected geographical area for the project is Inner Mongolia.

There was a significant reform in 2002 on the electric power sector approved by the State Council[27]. After 2002 the power generation enterprises and power grid companies are separated and private capital providers were allowed to invest in power plants. The investment climate was different compared to the situation before the reform. So wind power projects commissioned after 2002 are chosen to do common practice analysis.

The proposed project activity is 201MW wind project, which is a large project, so the similar scale is defined as the operational wind project with the capacity larger than 15MW.

According to the reason above, we select the projects constructed after 2002 with an installed capacity higher than 15MW in Inner Mongolia Area to do common practice analysis.

According to *China's wind farm installed capacity statistics* 2003-2007, in the Inner Mongolia Autonomous Region, the wind power projects that have been running with the similar investment environment are shown in table B.4:

Table B.4 The Wind-power projects in Inner Mongolia for common practice analysis[28],[29][30]

The title of project	Operation time	Installed capacity	Wind turbine Producer &Model	Notes
Dali Phase III	2004	31.2	Goldwind /NEG-Micon	Demonstration Project Supported by national debt fund[31]
Huitengxile 25.8 MW	2004.05(10.8MW) 2004.11(15MW)	25.8	NEG Micon and GE	Registered CDM Project
Huitengxile (Jingneng) 100MW	2006.12(59MW) 2007.05(41MW)	100	Goldwind	Registered CDM Project

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

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

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

[28] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1837.doc

[29] http://cdm.unfccc.int/Projects/registered.html

[30] Source: Shi Pengfei, Statistics of Chinese Wind Energy Installed Capacity in 2003-2007, China Wind Energy, No.1 2006

[31] http://www.kskt.gov.cn:8080/old/news/2004-11-22-01.htm

Dali Phase IV	2007.12	40.5	Sinovel	Registered CDM Project
West Saihanba	2005.1	30.6	Vestas	Registered CDM Project
East Saihanba	2006.12	90.1	Vestas	Registered CDM Project
North Saihanba	2007.7	45.05	Vestas	
Xishan(Datang)	2007.12	30.6	Vestas	Applying for CDM
Sunjiaying	2006.1	100.5	Goldwind	Registered CDM Project
Wudaogou	2007.1	49.5	Goldwind	Applying for CDM
Zhuozi I	2006.12(12.5MW) 2007.08(27.5MW)	40	Suzlon	Registered CDM Project
Huitengliang(North Inner Mongolia)	2007.6	49.5	Sinovel	Applying for CDM
Huitengliang（Guohua）	2007.09(49.5MW) 2007.10(50MW)	99.5	GE/Suzlon	Registered CDM Project
Huitengliang（Datang）	2007.11	57	DEC	Registered CDM Project
Yihewusu	2007.12	32.25	Goldwind	Applying for CDM
Bayinhanggai（Luneng）	2007.12	43.5	Windey	Applying for CDM
Chuanjing（Longyuan）	2007.12	49.5	Goldwind	Applying for CDM
	2007.12	49.3	Gamesa	
Turiguge	2007.12	49.5	Goldwind	Applying for CDM
Dadonggou(Huadian)	2006.12	19.5	Sinovel	Applying for CDM
	2007.8	25.5	Sinovel	Applying for CDM
	2007.11	76.5	Gamesa	Applying for CDM
Caoduozi	2007.8	40.5	Sinovel	Applying for CDM
Dongshan	2006.12	49.3	Vestas	Registered CDM Project
	2007.6	49.3	Vestas	Applying for CDM
Alatanemole (Guohua)	2006.11	4.5	DEC	Registered CDM Project
	2007.4	45	DEC	

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

Due to the high investment and low benefit, most of the project owners face the financial problems in the beginning of the project construction. Even through many wind farms are under construction in Inner Mongolia, most of them are registered as a CDM project or applying for CDM registration as shown in the table above, except for Dali III phase wind farm project. But Dali phase III wind project is Demonstration Project supported by national debt fund. Therefore, there are essential distinctions between proposed project and these two projects in both investment source and the operation environment.

However, the other operated projects shown in Table B.4 have the same conditions as the proposed project, i.e., facing financial obstacles and lack of financial support. All the projects have overcome such obstacles through the CDM financial support. So, the operated projects listed in the table B.5 will not result in the additionality changes of the proposed project. Thus, the project is not a common practice.

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

Thus, the proposed project is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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In this part, the emission production of the proposed will be calculated according to the methodology and tools chosen.

As raised in B.4, baseline of the proposed project is “Electricity supplied by the operation of grid-connected power plants and by the addition of new generation sources within the North China Power Grid”. Thus the baseline emission of proposed project in year y is defined as:

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

Where:

BE_y: Baseline emissions in year y (tCO_2/yr).

EG_y: Electricity supplied by the project activity to the North China Power Grid (MWh).

$EG_{baseline}$: Baseline electricity supplied to the North China Power Grid in the case of modified or retrofit facilities (MWh). For new power plants this value is taken as zero. For the proposed project is a new power plant, $EG_{baseline}$ is zero.

$EF_{grid,CM,y}$: Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system”.

Calculation of $EF_{Grid,CM,y}$

According to “Tool to calculate the emission factor for an electricity system” version 01, the baseline emission factor (EF_y) is calculated as a combined margin (CM) of $EF_{OM,y}$ and $EF_{BM,y}$, based on the following six steps:

Step 1: Identify the relevant electric power system

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

According to instructions of Chinese DNA, the relevant electric power system is the North China Power Grid which consists of Beijing City, Tianjin City, Hebei Province, Shanxi Province, Shandong Province and Inner Mongolia Autonomous Region.

Step 2: Select an operating margin (OM) method

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

1. Simple OM;
2. Simple adjusted OM;
3. Dispatch data analysis OM;
4. Average OM.

In this case, the simple OM is used.

The simple OM method can only be used where low-cost/must run resources constitute less than 50% of total grid generation in: (1) average of the five most recent years, or (2) based on long-term normal for hydroelectricity production. Low operating cost and must run resources typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. If coal is obviously used as must-run, it should also be included in this list, i.e. excluded from the set of plants. From 2002 to 2006, the low cost/must run resources constitute less than 50% of total amount grid generation output. (Table B.5). Therefore, method (1) is applicable for the project.

The Simple OM can be calculated using either of the two following data vintages for year y;

- ♦ (ex-ante) the full generation-weighted average for the most recent 3 years for which data are available at the time of PDD submission, if or,
- ♦ The year in which project generation occurs, if $EF_{OM,y}$ is updated based on ex-post monitoring. Here ex-ante vintage is chosen, and $EF_{OM,y}$ is fixed during the first crediting period.

Based on the most recent statistics available of the project activity at the time of PDD submission, the first data vintages (ex-ante) for the calculation of the OM emission factor was chosen for this project.

Table B.5 Constitution of low-cost/must run resources in NCPG during year 2002～2006[32]

Year	2002	2003	2004	2005	2006
Percentage (%)	0.89	0.86	0.76	0.75	0.74

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

According to the "Tool to calculate the emission factor for an electricity system", the Simple OM emission factor ($EF_{OM\ ,\ simple\ ,\ y}$) 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-operating cost and must-run power plants/units, It may be calculated:

- Option A: Based on data on fuel consumption and net electricity generation of each power plant/unit, or
- Option B: Based on data on net electricity generation, the average efficiency of each power unit and the fuel type used in each power unit, or

[32] *China Electric Power Yearbook 2003～2007*

- Option C: Based on data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

Option A should be preferred and must be used if fuel consumption data is available for each power plant/unit. In other cases, option B or option C can be used. For the purpose of calculating the simple OM, Option C should only be used if the necessary data for option A and option B is not available and can only be used if only nuclear and renewable power generation are considered as low-cost/must-run power sources and if the quantity of electricity supplied to the grid by these sources is known. So in the proposed project activity, Option C is used and the simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost/must-run power plants/units, and based on the fuel types and total fuel consumption of the project electricity system, as follows:

$$EF_{OM,simple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_y} \qquad (2)$$

Where:

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

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

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

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

EG_y: is the 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: is all fossil fuel types combusted in power sources in the project electricity system in year y

y: is either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex-ante option) or the applicable year during monitoring (ex post option), following the guidance on data vintage in step 2. As for the proposed project, data of the three most recent years is available and then will be used.

For this approach (simple OM) to calculate the operating margin, the subscript m refers to the power plants/units delivering electricity to the grid, not including low-cost/must-run power plants/units, and including electricity imports to the grid. Electricity imports should be treated as one power plant m.

In the project activity, the data of net calorific values of the fuels is from the China Energy Statistical Yearbook and the data of emission factors of the fuels are from IPCC 2006 default.

The Simple OM Emission Factor (EF_{OM}, *simple,y*) of the project activity is calculated ex ant on the basis of the fuel consumption data from North China Power Grid, excluding those of low operating cost and must-run power plants, such as wind power, hydropower and nuclear etc. These data are obtained from the *China Electric Power Yearbook* (2003~2007, published annually) and *China Energy Statistical Yearbook* (2003~2007). Based on these data, the Simple OM Emission Factor ($EF_{OM, simple,y}$) of the North China Power Grid is calculated as 1.1169 tCO_2e/MWh (see Annex 3 for details).

Step4: Identify the cohort of power units to be included in the build margin

According to "Tool to calculate the emission factor for an electricity system", the sample group of power units m used to calculate the build margin consists of either:

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

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

Due to data availability, the latest clarification from CDM EB is applied. And option (b) is used to calculate build margin.

In terms of vintage of data, there are also two options:

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 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.

And option 1 is used for the proposed project.

Step5: Calculation the Build Margin emission factor (**$EF_{BM,y}$)***

According to "Tool to calculate the emission factor for an electricity system", $EF_{BM,y}$ is determined by the formula as follow:

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

Where:

$EF_{grid,BM,y}$: is build margin CO_2 emission factor in year y (tCO_2/MWh)
$EG_{m,y}$: is net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$: is CO_2 emission factor of power unit m in year y (tCO_2/MWh)
m: is power units included in the build margin
y: is most recent historical year for which power generation data is available

According to the EB' guidance on DNV deviation request "Request for clarification on use of approved methodology AM0005 for several projects in China", the EB accepted the following deviation[33]:

1) Use of capacity additions during the last 1-3years for estimating the build margin emission factor for gird electricity;

[33] http://cdm.unfccc.int/Project/Deviation

2) Use of weights estimated using installed capacity in place of annual electricity generation.
3) Use the efficiency level of the best technology commercially available in the provincial/regional or national grid, as a conservative proxy, for each fuel type in estimating the fuel consumption to estimate the build margin (BM).

The calculation of the Build Margin for the proposed project makes use of aggregated data to identify the 20% most recent capacity additions (sample group). This is identified by direct comparison of the total installed capacity on North China Power Grid in the most recent years for which data is available, in this case 2005, with historical data from preceding years until the 20% addition is reached. BM is determined by selecting the year since which the new capacity additions are equal to or greater than 20%.

The percentage is calculated as follows:

$$[(C_{2006} - C_n)/C_{2006}]*100\% \qquad (4)$$

Where:
C_{2006}: is the capacity in 2006 (most recent year for which published data are available)
C_n: is the capacity in the preceding year n

Statistical data available in China shows installed capacities of thermal, hydro and other plant. No subdivision of capacity by fuel type, such as coal, oil and gas, is available. However, coal-fired plants dominate North China Power Grid with other fuels mostly used for start-ups only. The BM, therefore, is calculated from the capacity of thermal power plant and the CO_2 emission factor of the best commercially available coal-fired thermal power plant ($EF_{Thermal}$) in China.

$$EF_{BM} = [C_{Thermal}/(C_{2005} - C_n)] * EF_{Thermal} \qquad (5)$$

Where:

$C_{Thermal}$: is the thermal power plant capacity amongst the sample group with the capacity (C_{2006}-C_n)
$EF_{Thermal}$: is the CO_2 emissions factors of the thermal power plant with the best available technology, discounted for the share of non-coal fuels among thermal plant.

Based on the method issued by China's DNA on 18/07/2008, the $EF_{Thermal}$ is calculated as following:
Step a: Calculation of weights of CO_2 emissions of coal, oil and gas fuel in total emission for power generation based on the Energy Balance Table of the most recent years,

$$l_{Coal} = \frac{\sum_{i=COAL,j} F_{i,j,y} * COEF_{i,j}}{\sum_{i,j} F_{i,j,y} * COEF_{i,j}} \qquad (6)$$

$$l_{Oil} = \frac{\sum_{i=OIL,j} F_{i,j,y} * COEF_{i,j}}{\sum_{i,j} F_{i,j,y} * COEF_{i,j}} \qquad (7)$$

$$l_{Gas} = \frac{\sum_{i=GAS,j} F_{i,j,y} * COEF_{i,j}}{\sum_{i,j} F_{i,j,y} * COEF_{i,j}} \quad (8)$$

Where:

$F_{i,j,y}$: is the total amount of fuel I (in a mass or volume unit) consumed by Province j in North China Power Grid for power generation in year y;

$COEF_{i,j,y}$: is the total amount of the CO_2 emission coefficient of fuel I (tCO_2/mass or volume unit of the fuel),taking into account the carbon content of the fuels used by relevant power source j and the oxidation rate of the fuel in year y.

Step b: the EF $_{thermal\ power}$ is calculated as a weighted emission factor as the following formula:

$$EF_{Thermal} = l_{Coal} * EF_{Coal,Adv} + l_{Oil} * EF_{Oil,Adv} + l_{Gas} * EF_{Gas,Adv} \quad (9)$$

Where:

$EF_{coal,\ adv}$, $EF_{oil,adv}$, and EF $_{gas,\ adv}$ are the emission factors of the best technology for coal, oil, gas fired power plants commercially available in China, which are calculated based on the efficiency level of the best technology for each fuel type commercially available in China (see details in Annex 3)

Step c: Calculation of BM of the grid based on the result of Step b and the share of thermal power of recent 20% capacity additions.

$$EF_{BM} \ \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \quad (10)$$

Where:

$CAP_{Thermal}$: is capacity additions of thermal power;

CAP_{Total}: is total capacity additions.

A coal-fired power plant with a total installed capacity of 600MW built in 2006 is assumed to be the commercially available best practice technology in terms of efficiency. The estimated coal consumption of such a National Sub-critical Power Station with a capacity of 600MW is 329.94gce/kWh, which corresponds to an efficiency of 37.28% for electricity generation.

For gas and oil power plants a 200MW 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.

Based on the steps above, the BM emission factor of North China Power Grid for the proposed project in the crediting period is calculated as: EF_{BM} = 0.8687 tCO_2/MWh.

The details of EF_{BM} calculation are given in Annex 3.

Step6. Calculate the combined margin emissions factor

Based on ACM0002, the baseline emission factor $EF_{Grid,CM,y}$ should be calculated as the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor($EF_{BM,y}$), where the weights w_{OM} is 0.75 and w_{BM} is 0.25 by default, and ($EF_{OM,y}$) and ($EF_{BM,y}$) are calculated as described

in Step 1 and 2.

$$EF_{Grid,CM,y} = w_{OM} \times EF_{OM,y} + w_{BM} \times EF_{BM,y}$$
$$= 0.75 \times 1.1169 + 0.25 \times 0.8687$$
$$= 1.05485 \ tCO_2e/MWh$$

Leakage

According to baseline methodology ACM0002, there is no need for the project to consider leakage (L_y). Thus, $L_y = 0$

Project emission

According to ACM0002, project emission of the proposed emission is 0.

Emission Reductions

The annual emission reduction (ER_y) of the project is the difference between baseline emission and project activity emission. The final GHG emission reduction is calculated as follows:

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

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

Data / Parameter:	NCV_i
Data unit:	kJ/kg or kJ/m^3
Description:	The net calorific value (energy content) per mass or volume unit of fuel i
Source of data used:	*China Energy Statistical Yearbook 2007.*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	Official data, used for OM and BM calculation.

Data / Parameter:	$OXID_i$
Data unit:	/
Description:	Oxidation factor of the fuel i
Source of data used:	Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	100%
Justification of the choice of data or description of measurement methods and procedures actually applied :	No specific local value available, adopt the IPCC default value.
Any comment:	Official data, used for OM and BM calculation.

Data / Parameter:	Fi, j, y

Data unit:	10^4 t, 10^8 m^3
Description:	The quantity of fuel i (in a mass or volume unit) consumed for power generation by the relevant provinces j in year(s) y
Source of data used:	*China Energy Statistical Yearbook 2005-2007*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	Official data, used for OM and BM calculation.

Data / Parameter:	*Electricity generation of power plants in North China Power Grid*
Data unit:	*MWh*
Description:	Electricity generated by province *j* in North China Power Grid in year *y*.
Source of data used:	*China Electric Power Yearbook 2005-2007*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	Official data, used for OM and BM calculation.

Data / Parameter:	*Internal use rate of power plant*
Data unit:	*%*
Description:	The internal power consumption rate of power plants in province j in North China Power Grid in year y.
Source of data used:	*China Energy Statistical Yearbook 2005-2007*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	Official data, used for OM and BM calculation.

Data / Parameter:	$EF_{CO2,i}$
Data unit:	tCO_2/TJ
Description:	The CO_2 emission factor per unit of fuel i
Source of data used:	*Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	See Annex 3 for details.
Justification of the choice of data or	No specific local value available, adopt the IPCC default value.

description of measurement methods and procedures actually applied :	
Any comment:	Official data, used for OM and BM calculation.

Data / Parameter:	$CAP_{i, j, y}$
Data unit:	MW
Description:	Installed capacities of power plant category *i* of province *j* in years *y*.
Source of data used:	*China Electric Power Yearbook 2003-2007*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	Official data, used for OM and BM calculation.

Data / Parameter:	$GENE_{best,coal,}$
Data unit:	/
Description:	The power supply efficiency of most advanced commercialized coal-fired power plants
Source of data used:	Chinese DNA's Guideline of emission factors of Chinese grids
Value applied:	37.28%
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	Official data, used for OM and BM calculation.

Data / Parameter:	$GENE_{best,oil/gas}$
Data unit:	/
Description:	The power supply efficiency of most advanced commercialized oil-fired power plants and gas-fired power plants
Source of data used:	Chinese DNA's Guideline of emission factors of Chinese grids
Value applied:	48.81%
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	Official data, used for OM and BM calculation.

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

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Estimated project emission

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

Estimated baseline emissions

As defined in B.4, baseline of the proposed project is "Electricity supplied by the operation of grid-connected power plants and by the addition of new generation sources within the North China Power Grid". Thus the baseline emission of proposed project in year y is:

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

= 496,530×1.05485

= 523,765 tCO_2e

Leakage

According to ACM0002, the proposed project needn't consider leakages, i.e. L_y = 0 tCO_2e

Calculation of emission reduction

The project activity will generate GHG emission reductions by avoiding CO_2 emissions from electricity generation by fossil fuel power plants. The emission reduction is:

$$ER_y = BE_y - PE_y - L_y$$

= 523,765– 0 – 0

= 523,765 tCO_2e

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

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The result of ex-ante calculation of emission reduction in the first crediting period (Jun. 1st, 2009 – May. 31st, 2016) is shown below:

Years	Estimation of project activity emissions （tCO_2e）	Estimation of baseline emissions (tCO_2e)	Estimation of leakage (tCO_2e)	Estimation of emission reductions （tCO_2e）
Jun. 1st, 2009 – Dec. 31st, 2009	0	305,530	0	305,530
2010	0	523,765	0	523,765
2011	0	523,765	0	523,765
2012	0	523,765	0	523,765
2013	0	523,765	0	523,765
2014	0	523,765	0	523,765
2015	0	523,765	0	523,765
Jan. 1st 2016 – May 31st, 2016	0	218,235	0	218,235
Total（tCO_2e）	0	3,666,355	0	3,666,355

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

>>

B.7.1 Data and parameters monitored:

>>

Data / Parameter:	$EG_{export,y}$
Data unit:	MWh
Description:	Generated electricity exported to North China Power Grid by the project in year *y*.
Source of data to be used:	Monitored by the electricity meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	/
Description of measurement methods and procedures to be applied:	The data is measured hourly and recorded monthly. The data will be kept during the crediting period and two years after.
QA/QC procedures to be applied:	Electricity export record will be used for double check to ensure the consistency. The accuracy of the meter will be 0.5s or higher. The meter will be calibrated periodically according to national rules by a qualified organization to ensure accuracy.
Any comment:	

Data / Parameter:	$EG_{import,y}$
Data unit:	MWh
Description:	Generated electricity imported from North China Power Grid by the project in year *y*.
Source of data to be used:	Monitored by the electricity meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	/
Description of measurement methods and procedures to be applied:	The data is measured hourly and recorded monthly. The data will be kept during the crediting period and two years after.
QA/QC procedures to be applied:	Electricity export record will be used for double check to ensure the consistency. The accuracy of the meter will be 0.5s or higher. The meter will be calibrated periodically according to national rules by a qualified organization to ensure accuracy.
Any comment:	

Data / Parameter:	EG_y

Data unit:	MWh
Description:	Net power supply to North China Power Grid by the project 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	496,530MWh
Description of measurement methods and procedures to be applied:	Difference of the electricity import from the Grid and export to the Grid.
QA/QC procedures to be applied:	This value can be calculated using electricity generated minus electricity consumed.
Any comment:	

B.7.2. Description of the monitoring plan:

>>

1. Subject of monitoring plan

In order to make sure the completed, consistent and precise monitoring result can be achieved during the crediting period, the project owner made a complete monitoring plan and compiled a monitoring plan.

2. Implementation of monitoring plan

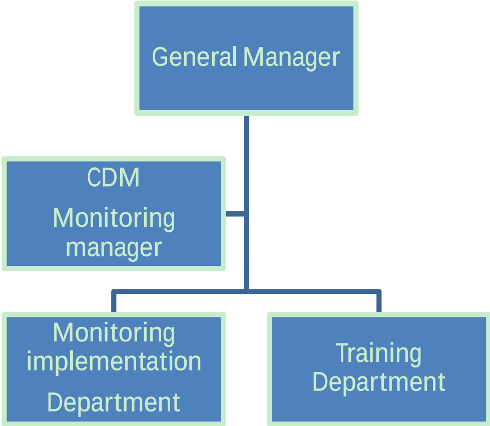
To insure the monitoring plan to be implemented according to EB's requirements, project owner will set up special monitoring organization with well trained staff for data recording, collection and preservation. All monitoring issues shall be implemented by the designated monitoring team.

The general manager will take the responsibility of management and coordination. CDM monitoring manager will take charge of all issues about monitoring plan implementation. He or she will responsible for the check of monitoring and recording tasks (such as meter reading, sales receipts), emission reductions calculation and monitoring reports preparation etc. All monitoring issue related shall be reported to CDM monitoring manager.

2 departments will be set up to fulfill the duty of CDM monitoring job. Training department will take the charge of staff training on CDM and monitoring plan implementation before operation. All staff who will take the duty of monitoring job should be well trained by training department. A periodic training will be taken place if needed. Staff in training department can be employee of the project owner or project or CDM expert from other corporation. Staff in monitoring implementation department will take all responsibility of monitoring work.

Staff will be appointed by CDM manager or general manager before monitoring team is set up.

Structure of monitoring team is shown below.



3. Installation of monitoring equipment and metering

According to the national regulations, the electric energy metering equipment will be properly configured, and the metering equipment will be checked by both the project owner and the grid company before the project is in operation. The meters shall have sufficient accuracy according to national rules.

A bi-directional meter maintained by the Grid Company will be employed to monitor the $EG_{exprot,y}$ and $EG_{import,y}$ in order to calculate the net power supply to Grid every year. It will be installed at the high voltage side of substation. A bi-directional meter will be installed at each transformer. It will be maintained and monitored by the project owner as a backup meter for cross check. When main meter is in trouble, records on backup meters will be employed to as a reference for the calculation of power supply to Grid under the discussion result between project owner and Grid Company

In case other wind projects would be constructed in the future in the wind farm beside the proposed project, the electricity supply by the proposed project activity will be calculated in the light of the rules agreed by both Grid Company and project owner.

4. Calibration

Calibration should be implemented by qualified agency accept by both project owner and grid company. The metering equipment will be properly configured and calibrated annually according to the national regulations by qualified entity. Project owner will take charge of backup meter while the Grid Company shall calibrate the main meter in line with national regulation. Monitoring team staff will preserve the original version of Calibration certification for backup meter and the copy for main meter.
In case emergency occurred, calibration should be taken place as soon as possible. When metering equipment does not work, new metering equipment should be replaced as soon as possible.
Meters shall be jointly inspected and sealed on behalf of the parties concerned and shall not be interfered with by either party except in the presence of the other party or its accredited representatives.

5. Data monitoring and Erroneous measurement

In order to calculate the net power supply to grid, amount of electricity imported from grid and exported to grid shall be monitored continually. Readings of backup meter will be hourly and recorded monthly. The difference of exported and imported data is the net power generation of the project. Net power supply can be getting by net power generation minus line lost. The Grid Company will provide the project owner with the net electricity generation data and/or electricity import record. The project owner will provide the Grid Company receipts and keep the copies for cross check.

When main meter is in trouble or damaged, readings on backup meter will be employed or according to the agreement signed by project owner and Grid Company.
When the main meter and back-up meter are both not work, project owner and Grid Company should calculate the conservative net power supply. Method for net power supply calculation and net power supply should be agreed by both sides with a conservative manner.
In case DCS system is in trouble and can't connect the wind turbine with control center, periodically record will be made by on-duty staff in wind farm until the DCS system is successfully connected again.

6. Data management
All monitoring data and records will be archived in electronic document or paper documents. The project owners will also keep copies of sales receipts. All the electronic and paper documents shall be archived during the crediting period or the last issuance of CERs and two years after.

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

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

>>

Date of completing draft of the baseline and monitoring section:
The current version of baseline and monitoring study was completed on Feb. 3rd, 2009.

The name of the responsible person/ entity:
Carbon Asset Management Sweden AB.
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Tel: +86-10-6598 1589
Fax: +86-10-6598 1579
E-mail: hedy.sun@trocorona.se

Carbon Asset Management Sweden AB is a project participant.

SECTION C. Duration of the project activity / crediting period

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

>>
25/12/2007
Equipment purchase agreement was signed on 25 December 2007 while construction started in April 2008 and Financing was finished in August 2008. According to the clarification in EB41 report, starting date of the project is defined the time that equipment purchase agreement was signed.

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

>>
20 years

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

C.2.1. Renewable crediting period:

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

>>
01/06/2009 or date of registration whichever is later.

C.2.1.2. Length of the first crediting period:

>>
7 years

C.2.2. Fixed crediting period:

>>
N/A

C.2.2.1. Starting date:

>>
N/A

C.2.2.2. Length:

>>
N/A

SECTION D. Environmental impacts

>>

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

>>

Environmental Impact Assessment (EIA) of the proposed project was compiled by Inner Mongolia Power Exploration and Design Institute and approved by Environment Protection Bureau of Inner Mongolia Autonomous Region on March 12th, 2007. The environmental impacts are summarized as follows:

A summary of the impacts is presented below. The environmental impacts are not deemed to be significant.

Atmospheric environmental impact analysis

Dust is the greatest impact during the period of the project construction for the atmospheric environment. Dust is mainly from the construction waste during excavation. The proposed is located in semi-desert grassland, almost no residents are living in the wind farm area. Thus the atmospheric will not be a serious problem to local residents.

After the completion of the project, it will provide the power grid large amount of green power annually, reduce the GHG to the atmosphere, and play a positive role in improving the atmosphere environment. Vegetation will be recovered by project owner. And no dust will be produced any more.

Noise environmental impact analysis

Noise during construction period is mainly caused by equipment installation and operation. It will be well controlled by project owner by operating equipments in daily time. Besides, good management will be applied to reduce the noise during construction period.

During operation period, sound insulation type wind turbine will be employed. Also, other solutions will be applied as well to reduce noise produced by the wind turbine to an acceptable noise level. Consider that there is no other noise source in the villages nearby, the background noise level is relative low. It will not cause negative impact to local inhabitants.

Solid waste

Main solid waste will come from the excavation. After construction, backfilling will be done to reduce solid waste. Another main resource of solid waste will be waste produced by workers. Good management rules will be set up to well control the solid waste disposal.

The main solid waste after the site put into operation is household garbage. The household garbage will be collected in an appointed place and dispose together. Solutions like this will guarantee that not influence the local ecological environment.

Conclusion Wind Farm building can alleviate the pollution of the surrounding environment from the construction of coal-fired power plant, have the role of use of renewable energy, conservation of fossil energy, reducing pollution, protecting the ecological environment. Therefore, from the view of environmental protection, the project is practicable.

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

>>

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

SECTION E. Stakeholders' comments

>>

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

>>

To investigate the impacts on local ecological environment and social environment, a survey was made among the potential stakeholders in January 2007, mostly including residents and government of Kulun town. Posters were pasted on the wall of Kulun town to inform stakeholders who are interested in this project to attend the stakeholder query. The survey was arranged through a one-page questionnaire, which was designed to be easily filled in with the following sections:

1) Do you know this project?
2) Do you think this project will accelerate the local development?
3) Do you think this project will bring negative impact on local ecological system?
4) Do you think the construction will seriously impact your life?
5) Do you think the construction of the project will affect the migrant of birds?
6) Do you think the project will be a tourist attraction when construction complete?
7) Will there be any negative impacts on local residents?
8) Do you think the construction of the project will increase the employment rate in local area?
9) Do you think the construction of the project will improve infrastructure development?
10) Do you think the construction of the project will increase the income of local residents?
11) Do you have any other suggestions and comments on this project?
12) Please indication the issue you care about.
13) Do you agree the construction of the project?

E.2. Summary of the comments received:

>>

30 questionnaires were spread out and 100% responses were collected. Below is a summary of the key findings:

- Education level of the participants: 10 people is lower than middle school (33.3%), 5 people is middle school and high school (16.7%), 15 people is higher than high school (50%)
- Status of participants: 14 are local residents (46.7%), 10 are from local government (33.3%), 6 are from the project company (20%).
- Age of participants: 26 are from 20 to 40 years old, 4 are over 40 years old.
- 100% of the participants have some knowledge and understandings about wind farm projects.
- 100% of the participants support the implement of the proposed project.

Results of the survey

100% participants knew this project and all of them supported the construction of this project. Over 76% participants believe the construction of this project will bring more job opportunities to local people, which can increase the income of local residents. 100% participants believed the local ecological environment will not be impacted. Over 93% participants believed this project will accelerate local development. 100% participants believed this wind farm will be a tourist attraction when construction complete.

Question 11 and Question 12 are subjective questions. Comments and suggestions from stakeholders are well concerned by project owner. 40% participants suggested the project owner to consider about vegetation protection. They suggested the project owner to minimize the impact on the grassland during construction by well organize the construction work. Project owner will pay attention on the management of construction according to these suggestions. Besides, recovery work will be taken place after construction finished.

As for 33% participants cared about the compensation problem, project owner will sign the compensation contract with stakeholders who will be impacted by the construction. 53% people care about whether transportation can be improved by construction of the project. Project owner believes the road paved during construction period can be used by stakeholders and bring much convenient to them.
Over 83% participants believed the proposed project will not bring negative impact to their life while the rest were not clear about the impact.

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

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

>>

No negative comments have been received on the proposed project. Therefore, there is no need to modify the Project due to the comments received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public fundings for the proposed project.

Annex 3

BASELINE INFORMATION

The following tables summarize the results from the formulas listed in the ACM0002 Baseline methodology for grid-connected electricity generation from renewable sources. The information provided by the table includes data, data sources and the underlying computations.

1. Value of key parameters

Table 1: Low calorific values, CO_2 emission factors and oxidation factors of fuels

Fuel	Low Calorific Value (KJ/Kg or m^3)	Emission Factor (tc/TJ)	Oxidation Factor
Raw coal	20908	25.80	1
Clean coal	26344	25.80	1
Other washed coal	8363	25.80	1
moulded coal	20908	26.60	1
Coke	28435	29.20	1
Crude oil	41816	20.00	1
gasoline	43070	18.90	1
kerosene	43070	19.60	1
Diesel oil	42652	20.20	1
Fuel oil	41816	21.10	1
Others	38369	20.00	1
Other coking products	28435	25.80	1
Natural gas	38931	15.30	1
Coke oven gas	16726	12.10	1
Other coal gas	5227	12.10	1
LPG	50179	17.20	1
Refinery dry gas	46055	15.70	1

Data Source:
The net calorific values are quoted from <China Energy Statistical Yearbook 2007>, Page 287.
Potential emission factor: 1) Table 1.3 &1.4, P1.21-1.24, Chapter 1, Volume 2 Energy, 2006 IPCC Guidelines for National Greenhouse Gas Inventories

The following tables summarize the numerical results from the equations listed in the “Tool to calculate the emission factor for an electricity system”. The information listed in the tables includes data, data sources and the underlying computations.

BM calculation

The most advanced commercialized technologies for coal-fired power plants in China are domestic 600 MW sub-critical generators, with the standard coal consumption of power supply of 329.94 gce/kWh. For gas-fired and oil-fired power plants in China, the most advanced commercialized technologies are 200MW combined cycle generators. The standard coal consumption (equivalent) for power supply of oil-fired and gas-fired ower plants are 252 gce/kWh.

Table 2: Emission factor of thermal plant based on the best technology commercially available in the regional grid of China

	Parameter	Efficiency of electricity supply	Emission factor (tc/TJ)	Oxidation Factor	Emission factor (tCO_2/MWh)
		A	B	C	D=3.6/A/1000*B*C*44/12
Coal-fired plant	$EF_{Coal,Adv}$	37.28%	25.8	1	0.9135
Gas-fired plant	$EF_{Gas,Adv}$	48.81%	15.3	1	0.4138
Oil-fired plant	$EF_{Oil,Adv}$	48.81%	21.1	1	0.5706

Explain of calculating the BM emission factor of the North China Power Grid

Step 1: **Calculating of percentages of CO_2 emissions from the coal-fired, gas-fired and oil-fired power plants in total fuel-fired CO_2 emissions**

Table3: Calculating the percentage between CO_2 emission by burning coal, fuel, gas, separately and the total emission.

Fuel type	Unit	Beijing A	Tianjin B	Hebei C	Shanxi D	Shandong E	Inner Mongolia F	Total G=A+…+F	NCV H	Emission factor (tc/TJ) I	Oxidation factor J	Emission K=G*H*I*J*44/12/100
Raw coal	10^4 ton	796.63	1639.20	6867.99	6968.88	10930.66	8404.05	**35607.41**	**20908.00**	25.80	1.00	704,277,822.95
Clean coal	10^4 ton					39.77		**39.77**	**26344.00**	25.80	1.00	991,125.03
Other washed coal	10^4 ton	6.36		214.13	371.14	544.60	61.77	**1198.00**	**8363.00**	25.80	1.00	9,477,854.80
moulded coal	10^4 ton	7.97				27.77		**35.74**	**20908.00**	26.60	1.00	728,819.71
coke	10^4 ton					3.23		**3.23**	**28435.00**	29.20	1.00	98,335.43
Subtotal												715,573,957.93
Crude oil	10^4 ton						0.74	**0.74**	**41816.00**	20.00	1.00	22,692.15
Gasoline	10^4 ton			0.01				**0.01**	**43070.00**	18.90	1.00	298.48
Coal oil	10^4 ton							**0.00**	**43070.00**	19.60	1.00	0.00
Diesel	10^4 ton	0.21		3.01		6.32	0.07	**9.61**	**42652.00**	20.20	1.00	303,588.69
Fuel oil	10^4 ton	6.38		0.08		4.10		**10.56**	**41816.00**	21.10	1.00	341,633.37
Other oil product	10^4 ton					0.28		**0.28**	**38369.00**	20.00	1.00	7,878.43
Crude oil	10^4 ton							**0.00**	**28435.00**	25.80	1.00	0.00
Sub total												676,091.12
Natural gas	10^8 m^3	34.10	7.30		5.30			**46.70**	**38931.00**	15.30	1.00	1,019,941.59
Coke oven gas	10^8 m^3	3.80	6.30	58.00	223.20	57.90	6.40	**355.60**	**16726.00**	12.10	1.00	2,638,825.34
Other coal gas	10^8 m^3	206.60	65.80	697.20	137.90	72.20	227.60	**1407.30**	**5227.00**	12.10	1.00	3,263,592.97

Liquefied petroleum gas	10^4 ton		0.01	**0.01**	**50179.00**	17.20	1.00	316.46
Refinery gas	10^4 ton	2.43	2.32	**4.75**	**46055.00**	15.70	1.00	125,933.56
Subtotal								7,048,609.92
Total								723,298,658.97

Data source: China Energy Statistical Yearbook 2007

According to the formulas (6), (7) and (8):

λ_{Coal}=98.93%， λ_{Oil}=0.09%， λ_{Gas}=0.97%

Step 2: Calculating the emission factor of thermal plant.

$$EF_{Thermal} = l_{Coal} \times EF_{Coal,Adv} + l_{Oil} \times EF_{Oil,Adv} + l_{Gas} \times EF_{Gas,Adv} = 0.9083(tCO2e/MWh)$$

Step 3: Calculating the BM emission factor of power grid.

Table 4: The installed capacity of North China Power Gird in 2006

Installed capacity	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Thermal	MW	3984	6512	26087	26661	28899	49395	141538
Hydro	MW	1053	5	785	790	818	553	4004
Nuclear	MW	0	0	0	0	0	0	0
Wind and other	MW	24	24	218	0	565	106	937
Total	MW	5061	6541	27090	27451	30282	50054	146479

Data source: China Electric Power Yearbook（2007）

Table 5: The installed capacity of North China Power Gird in 2005

Installed capacity	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Thermal	MW	3833.5	6149.9	22333.2	22246.8	19173.3	37332	111068.7
Hydro	MW	1025	5	784.5	783	567.9	50.8	3216.2
Nuclear	MW	0	0	0	0	0	0	0
Wind and other	MW	24	24	48	0	208.9	30.6	335.5
Total	MW	4882.5	6178.9	23165.7	23029.8	19950.2	37413.4	114620.4

Data source: China Electric Power Yearbook（2006）

Table 6: The installed capacity of North China Power Gird in 2004

Installed capacity	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Thermal	MW	3458.5	6008.5	19932.7	17693.3	13641.5	32860.4	93594.9
Hydro	MW	1055.9	5	783.8	787.3	567.9	50.8	3250.7
Nuclear	MW	0	0	0	0	0	0	0
Wind and other	MW	0	0	13.5	0	111.7	12.3	137.5
Total	MW	4514.4	6013.5	20730	18480.6	14321.2	32923.5	96983.1

Data source: China Electric Power Yearbook（2005）

Table 7: BM emission factor of North China Power Grid

	Installed capacity in 2004	Installed capacity in 2005	Installed capacity in 2006	Newly installed capacity addition during 2005-2006	Percentage to newly-added capacity
	A	B	C	D=C-B	E
Thermal	93594.9	111068.7	141538	30469.3	95.64%

（MW）					
Hydro（MW）	3250.7	3216.2	4004	787.8	2.47%
Nuclear（MW）	0	0	0	0	0.00%
Wind（MW）	137.5	335.5	937	601.5	1.89%
Total（MW）	96983.1	114620.4	146479	31858.6	100.00%
Percentage of newly installed capacity to 2006	66.21%	78.25%	100.00%		

$$EF_{BM,y}=0.9083\times 95.64\%=0.8687\ tCO_2/MWh$$

3. OM calculation

Table 8: Fuel consumption and emission of North China Power Grid in 2004

Fuel type	unit	Beijing **A**	Tianjin **B**	Hebei **C**	Shanxi **D**	Inner Mongolia **E**	Shan dong **F**	Subtotal **G=A+B+C+D+E+F**	EF (tc/TJ) **H**	average low Caloric value (MJ/t,km^3,tce) **I**	CO_2 emission (tCO_2e) K=G*H*I*J*44/12/10000 (for mass unit) K=G*H*I*J*44/12/1000 (for volume unit
Raw coal	10^4tonne	823.09	1410	6299.8	5213.2	4932.2	8550	**27228.29**	25.8	20908	538547476.6
Clean coal	10^4tonne						40	**40**	25.8	26344	996856.96
Other washed coal	10^4tonne	6.48		101.04	354.17		284.22	**745.91**	25.8	8363	5901190.882
Coke	10^4tonne					0.22		**0.22**	29.2	28435	6689
Coke oven gas	10^8m^3	0.55		0.54	5.32	0.4	8.73	**15.54**	12.1	16726	1153187.451
Other coal gas	10^8m^3	17.74		24.25	8.2	16.47	1.41	**68.07**	12.1	5227	1578574.385
Crude oil	10^4tonne							**0**	20	41816	0
gasoline	10^4tonne								18.9	43070	0
Diesel oil	10^4tonne	0.39	0.84	4.66				**5.89**	20.2	42652	186070.4874
Fuel oil	10^4tonne	14.66		0.16				**14.82**	21.1	41816	479451.3838
LPG	10^4tonne							**0**	17.2	50179	0
Refinery gas	10^8m^3		0.55	1.42				**1.97**	15.7	46055	52229.2868
Natural gas	10^4tonne		0.37		0.19			**0.56**	15.3	38931	122305.6296
Other petroleum product	10^4tonne							**0**	20	38369	0
Other coke product	10^4tonne CO_2e							**0**	25.8	28435	0
Other energy	10^4tonne	9.41		34.64	109.73	4.48		**158.26**	0	0	0
total											549024040.8

Data source: China Energy Statistic Yearbook 2005

Table 9: The fossil-fired electricity generation of North China Power Grid in 2004

Province	**Electricity Generation**	**Auxiliary Power Ratio**	**Supplied Electricity**

	$(10^8$KWh)	(%)	(MWh)
Beijing	185.79	7.94	17,103,827
Tianjin	339.52	6.35	31,796,048
Hebei	1249.7	6.5	116,846,950
Shanxi	1049.26	7.7	96,846,698
Inner Mongolia	804.27	7.17	74,660,384
Shandong	1639.18	7.32	151,919,202
Total			489,173,110

Data source: China Electric Power Yearbook 2005

Total emission (tCO_2e): 554,332,3400
Total electricity supply (MWh): 493,687,660
$EF_{(OM, simple, 2004)}$: 1.12282 tCO_2e/ MWh

Table 10: Fuel consumption and emission of North China Power Grid in 2005

Fuel type	unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Fuel Consumption	Carbon Possession （tc/TJ）	average low Caloric value （MJ/t,km^3,tce）	CO_2 emission （tCO_2e） L=H*I* K*44/12/10^4 (quality unit)
		A	**B**	**C**	**D**	**E**	**F**	**G=A+B+C+D+E+F**	**H**	**I**	**J=G*H*I* 44/12/1000 (Volumn Unit)**
Raw coal	10^4tonne	897.75	1675.2	6726.5	6176.5	6277.23	10405.4	**32158.53**	25.8	20908	636,062,536
Clean coal	10^4tonne						42.18	**42.18**	25.8	26344	1,051,186
Other washed coal	10^4tonne	6.57		167.45	373.65		108.69	**656.36**	25.8	8363	5,192,725
Coke	10^4tonne					0.21	0.11	**0.32**	29.2	28435	89,742
Coke oven gas	10^8m^3	0.64	0.75	0.62	21.08	0.39		**23.48**	12.1	16726	1,742,396
Other coal gas	10^8m^3	16.09	7.86	38.83	9.88	18.37		**91.03**	12.1	5227	2,111,027
Crude oil	10^4tonne					0.73		**0.73**	20	41816	22,385
gasoline	10^4tonne			0.01				**0.01**	18.9	43070	298
Diesel oil	10^4tonne	0.48		3.54		0.12		**4.14**	20.2	42652	130,786
Fuel oil	10^4tonne	12.25		0.23		0.06		**12.54**	21.1	41816	405,690
LPG	10^4tonne							**0**	17.2	50179	0
Refinery gas	10^8m^3			9.02				**9.02**	15.7	46055	239,141
Natural gas	10^4tonne	0.28	0.08		2.76			**3.12**	15.3	38931	681,417
Other petroleum product	10^4tonne							**0**	20	38369	0
Other coke product	10^4tonne CO_2e							**0**	25.8	28435	0
Other energy	10^4tonne	8.58		32.35	69.31	7.27	118.9	**236.41**	0	0	0
total											647,649,331

Data source: China Electric Power Yearbook 2006

Table 11: The fossil-fired electricity generation of North China Power Grid in 2005

Province	**Electricity Generation**	**Auxiliary Power Ratio**	**Supplied Electricity**
	(10^8KWh)	**(%)**	**(MWh)**
Beijing	208.8	7.73	19,265,976
Tianjin	369.93	6.63	34,540,364

Hebei	1343.48	6.57	125,521,336
Shanxi	1287.85	7.42	119,229,153
Inner Mongolia	923.45	7.01	85,871,616
Shandong	1898.8	7.14	176,322,568
Total			560,751,013

Data source: China Electric Power Yearbook 2006

Total emission (tCO_2e): 652,197,698
Total electricity supply (MWh): 564,680,013
$EF_{(OM, simple, 2005)}$: 1.15499 tCO_2e/ MWh

Table 12: Fuel consumption and emission of North China Power Grid in 2006

Fuel type	unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Fuel Consumption	Carbon Possession （tc/TJ）	average low Caloric value （MJ/t,km^3,tce）	CO_2 emission （tCO_2e） L=H*I* K*44/12/10^4 (quality unit) **J=G*H*I* 44/12/1000 (Volumn Unit)**
		A	**B**	**C**	**D**	**E**	**F**	**G=A+B+C+D+E+F**	**H**	**I**	
Raw coal	10^4tonne	796.63	1639.2	6867.99	6968.88	8404.05	10930.66	**35607.41**	25.8	20908	704,277,823
Clean coal	10^4tonne						39.77	**39.77**	25.8	26344	991,125
Other washed coal	10^4tonne	6.36		214.13	371.14	61.77	544.6	**1198**	25.8	8363	9,477,855
moulded coal	10^4tonne	7.97					27.77	**35.74**	26.6	20908	728,820
Coke	10^4tonne						3.23	**3.23**	29.2	28435	98,335
Coke oven gas	10^8m^3	0.38	0.63	5.8	22.32	0.64	5.79	**35.56**	12.1	16726	2,638,825
Other coal gas	10^8m^3	20.66	6.58	69.72	13.79	22.76	7.22	**140.73**	12.1	5227	3,263,593
Crude oil	10^4tonne					0.74		**0.74**	20	41816	22,692
gasoline	10^4tonne			0.01				**0.01**	18.9	43070	298
Diesel oil	10^4tonne	0.21		3.01		0.07	6.32	**9.61**	20.2	42652	303,589
Fuel oil	10^4tonne	6.38		0.08			4.1	**10.56**	21.1	41816	341,633
LPG	10^4tonne						0.01	**0.01**	17.2	50179	316
Refinery gas	10^8m^3			2.43			2.32	**4.75**	15.7	46055	125,934
Natural gas	10^4tonne	3.41	0.73		0.53			**4.67**	15,3	38931	1,019,942
Other petroleum product	10^4tonne						0.28	**0.28**	20	38369	7,878
Other coke product	10^4tonne CO_2e							**0**	25.8	28435	0
Other energy	10^4tonne	6.83		47.11	230.76	12.51	132.29	**429.5**	0	0	0
total											723,298,659

Data source: China Electric Power Yearbook 2007

Table 13: The fossil-fired electricity generation of North China Power Grid in 2006

Province	Electricity Generation (10^8KWh)	Auxiliary Power Ratio (%)	Supplied Electricity (MWh)
Beijing	207.05	7.51	19,150,055
Tianjin	359.24	6.86	33,459,614
Hebei	1438.88	6.63	134,348,226
Shanxi	1502.5	7.45	139,056,375
Inner Mongolia	1395.93	7.58	129,011,851
Shandong	2309.22	7.12	214,480,354
Sum			669,506,473

Data source: China Electric Power Yearbook 2007

Total emission (tCO_2e): 726,789,040 tCO_2
Total electricity supply (MWh): 672,621,593
$EF_{(OM, simple, 2006)}$: 1.08053 tCO_2e/ MWh

The Simple OM emission factor ($EF_{OM,y}$): 1.1169 tCO_2e/ MWh

Annex 4

MONITORING INFORMATION

More detail information will be described in CDM Management Manual.