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:

Inner Mongolia Bayannaoer Chuanjingsumu Wind Power Project

Version: 4.0

Date: August 7, 2008

A.2. Description of the project activity:

Inner Mongolia Bayannaoer Chuanjingsumu Wind Power Project (hereafter referred as the proposed project) is a grid connected renewable energy project developed by Longyuan (Bayannaoer) Wind Power Co., Ltd. The proposed project is to be located in Bayannaoer League, Inner Mongolia Autonomous Region, China. The proposed project installs totally 58 wind turbines, each of which has the capacity of 850 kW, for a total installed capacity of 49.3 MW. The purpose of the proposed project is to generate electricity using wind power resources in the project region and to sell into North China Power Grid. It is estimated that the annual generated output will be 119,120 MWh. As a result, 128,117 tonnes of CO2 emission reductions will be generated annually.

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

- Being located in a power grid dominated by fossil fuel fired power plants, development of the proposed project will not only reduce GHG emissions but also mitigate local environmental pollution caused by air emissions from fossil fuel fired power plants;
- New 20 jobs will be generated during the operation period;
- Development of the proposed project could contribute to meet local electricity demand and increase employment opportunities; therefore boost the economy in the local region.

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	**Private and/or public entity(ies) project participants (*) (as applicable)**	**Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)**
China (host)	Longyuan (Bayannaoer) Wind Power Co., Ltd.	No
France	EDF Trading Limited	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

China

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

Inner Mongolia Autonomous Region

A.4.1.3. City/Town/Community etc:

Wulatezhongqi, Bayannaoer League

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

The proposed project is located in the northeast of Chuanjingsumu, Wulatezhongqi, Bayannaoer League, Inner Mongolia Autonomous Region, China. The central geographical co-ordinates of the proposed project are east longitude 118°17'6" and northern latitude 41°58'42", and elevation is 1350 meters, the proposed project covers an area of approximately 12 km^2. The specific location is shown in Figure 1.

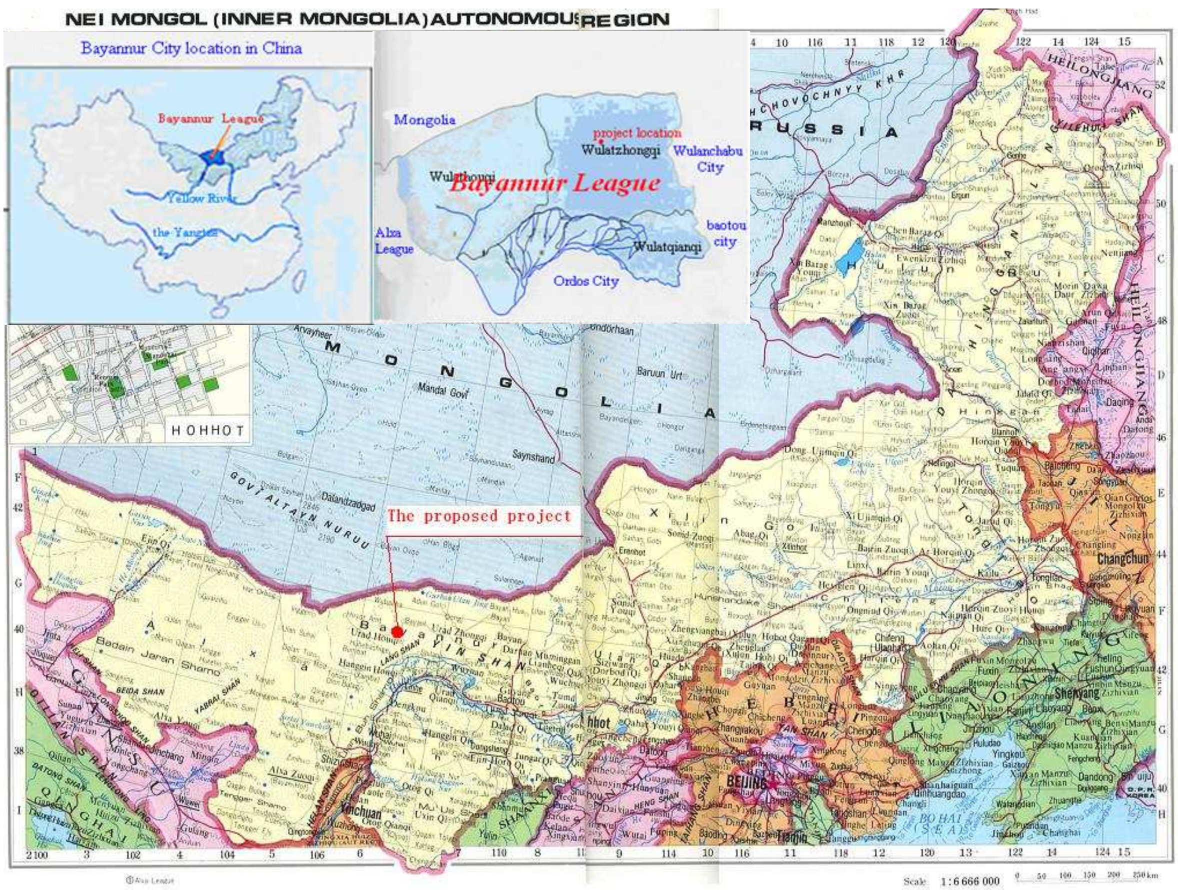

Figure 1: Location of the proposed project

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

The project activity falls under the following scope and category.

Sectoral Scope: 1.Energy Industries

Category: Grid-connected electricity generation from renewable energy sources

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

The proposed project is to install and operate totally 58 wind turbines (G52-850kW of Gamesa) with a unit capacity of 850kW, the total capacity is 49.3MW. As stipulated in the Equipment Purchase Agreement (EPA), the manufacturer provides the technical training and maintenance for the project[1]. Table 1 provides main technical specifications of wind turbines adopted by the proposed project. The proposed project will adopt a unit connection mode of one-turbine-one-transformer. Each turbine will have a 690V-to-35kV transformer, through two 35kV joint lines the electricity will be delivered to Chuanjing 35kV-to-220kV switch station, then through a 220kV line, the electricity will be delivered to Inner Mongolia Power Grid which is an integral part of North China Power Grid.

Table 1 Technical Characteristics of Wind Turbines for the proposed project

Rotor 850 kW	
Type	3-bladed, horizontal axis, upwind
Diameter	52m
Area Swept	2124m^2
rotate speed	14.6~30.8r/min
Operational data	
Cut-in wind speed	4m/s
Cut-out wind speed	25m/s
Generator	
Type	Double-fed Asynchronous Generator
Nominal Power	850kW
Operational data	50Hz/690V
Towers	
Height of hub centre	64.5m

The auxiliary electric system of the proposed project includes on-site control, protection, measure, signalling and surveillance in central control room at the site. The targets to be controlled and monitored include 58 wind turbines and transformers. The wind farm will be dispatched by regional dispatch centre and wind turbines could be measured and signalled remotely by Internet.

Based on the long-term wind data (1976-2005) at the local meteorological station, the average wind

[1] EPA

speed over the last 30 and 20 years is 3.0 m / s and 2.9 m / s respectively, and it can conclude that there has been a stable wind condition over the last 20 years and it is suitable to develop wind power project in the region[2].

The development of the project will contribute to promote the transfer of wind power technology, and to boost the manufacture technology of wind turbine.

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

A renewable crediting period (7 years×3) is adopted for the proposed project activity. The total estimation of emission reductions in the first crediting period is 896,819 tCO_2e, as shown in the table below.

Years	Annual estimation of emission reductions(in tons of CO_2e)
2009	128,117
2010	128,117
2011	128,117
2012	128,117
2013	128,117
2014	128,117
2015	128,117
Total estimated reductions(tons of CO_2e)	896,819
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tons of CO_2e)	128,117

A.4.5. Public funding of the project activity:

No public funding from countries in Annex I is involved in the proposed 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:

The latest version (06) of “Consolidated baseline methodology for grid-connected electricity generation from renewable sources”- ACM 0002 Version 06

[2] Wind Resource Evaluation in the FSR of the project (The evidence is available for DOE validation)

The latest version (06) of "Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources" - ACM 0002 Version 06

The latest Version (04) of the "Tool for demonstration and assessment of additionality"

For more information regarding the methodologies and tools please refer to http://cdm.unfccc.int/methodologies/approved.

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

The proposed project can meet the applicability criteria of the baseline methodology (ACM0002), therefore, the methodology is applicable to the proposed project.

- The proposed project is a new grid-connected zero-emission renewable power generation activity from wind source;
- The proposed project is not an activity that involves switching from fossil fuels to renewable energy at the site of the project activity;
- The geographic and system boundaries for the North China Power Grid which the proposed project is to be connected to can be clearly identified and information on the characteristics of the grid is publicly available.

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

The spatial extent of the project boundary includes Inner Mongolia Bayannaoer Chuanjingsumu Wind Power Project and all power plants connected to the North China Power Grid. Using the boundary definitions of the Chinese DNA[3], North China Power Grid is defined as the project electricity system, which consists of independent province-level electricity systems including Beijing, Tianjin, Hebei, Shanxi, Inner Mongolia and Shandong province that exchange power significantly within the region depending on the demand and can be dispatched without significant transmission constraints. The connected electricity system is Northeast Power Grid. North China Power Grid has the net power imports from Northeast Power Grid[4].

The greenhouse gases and emission sources included in or excluded from the project boundary are shown in the following table:

	Source	Gas	Included?	Justification / Explanation
Baseline	Power plants	CO_2	Yes	Major emission sources

[3] http://cdm.ccchina.gov.cn/web/index.asp.

[4] http://cdm.ccchina.gov.cn/web/index.asp.

	connected to the North China Power Grid	CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
Project Activity	the project is a zero-emissions renewable power source	CO_2	No	According to ACM0002, the project emission of renewable energy project activity is not considered.
		CH_4	No	According to ACM0002, the project emission of renewable energy project activity is not considered.
		N_2O	No	According to ACM0002, the project emission of renewable energy project activity is not considered.

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

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

"Electricity delivered to the grid by the project 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 below."

The proposed project is a new grid-connected project. North China Power Grid is considered as the "project electricity system", therefore, the baseline scenario of the proposed project can be identified as the following:

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

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):

Chronology of the implementation of the project, including the CDM consideration:

No	Date	Description
1	Sep, 2006	FSR finished.
2	10/10/2006	EIA submitted to Inner Mongolia Environmental Protection Bureau
3	24/10/2006	EIA approval by Inner Mongolia Environmental Protection Bureau

4	27/02/2007	Propositional tariff letter issued by local NDRC
5	12/03/2007	A meeting of the Board of Directors held, at which a resolution on the CDM development for the project was passed[5] (Due to the lower expected tariff than that applied in the FSR, the project owner decided to develop the proposed project as a CDM project to ensure the successful implementation of the proposed project.)
6	11/04/2007	FSR Approval by Inner Mongolia Development & Reform Commission (Inner Mongolia DRC).
7	08/06/2007	Construction start permission[6] (the earliest date considered as the starting date of the project)
8	15/07/2007	Equipment Purchase Agreement (EPA) signed[7]
9	16/07/2007	Consultant Contract for CDM development signed
10	Aug, 2007	Apply for the CDM LoA at the host Country
11	Oct, 2007	Submitted to DOE for validation
12	01/01/2009	The project is expected to be registered as a CDM project

The additionality of the proposed project is demonstrated and assessed by using the *Tool for the Demonstration and Assessment of Additionality (version 4)* approved by Executive Board. It includes the following steps:

Step1. Identification of alternatives to the 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 (part of) the baseline scenario through the following sub-steps:

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

To provide the same output or services comparable with the proposed CDM project activity, these alternatives are to include:

a) The proposed project not undertaken as a CDM project activity but as a commercial project;
b) The thermal power plant with the same annual electricity output as the proposed project;
c) Other renewable energy project with the same annual electricity output as the proposed project;
d) To provide the same electricity output by North China Power Grid.

For the alternative c), besides wind energy, other kinds of energy like solar PV, geothermal, biomass and hydro are the possible grid-connected renewable energy technologies that could be applied in China. Due to the technology development status and the high cost for power generation, solar PV, geothermal and

[5] The resolution on the CDM development for the project passed in the meeting of the Board of Directors. (Relevant evidences are available for DOE validation)

[6] Construction start permission letter (The documentary evidence is available for DOE validation)

[7] EPA of the project

biomass with the same annual electricity output as the proposed project are alternatives far from being attractive investment in the grid in China. First, because of the higher cost of generation[8], there are none of commercial solar PV or geothermal power projects in China today; Second, due to the unavailability of the biomass resources in Inner Mongolia region where is a grassland with land sandy desertification[9], and the financial unattractiveness of the biomass power projects[10], biomass power project is not able to provide a comparable output or the same services, moreover, nearly all the biomass power projects under construction in China recently have been applying the CDM support to overcome the economical barriers. Third, Inner Mongolia region is an area with serious water shortage[11]. From the year 2003 to 2005, the installed hydropower capacities in Inner Mongolia region are 544.7 MW, 567.9 MW and 596.8 MW respectively[12], it's obvious that there are little additional exploitable hydro power resources in Inner Mongolia, and hydropower is not able to provide a comparable output or the same services as the proposed project as well. Therefore, though the alternative c) is in compliance with all mandatory laws and regulations, is not a realistic alternative.

Sub-step1b. Consistency of mandatory laws and regulations

The mandatory laws and regulations for the proposed project include laws, central government regulations, local regulations, departmental rules and disciplines related to electricity and environment protection.

According to Notice on Strictly Prohibiting the Installation of coal-fired Generation with the Capacity of 135MW or below issued by the General Office of the State Council, decree no. 2002-6, the coal-fired power plant with the Capacity of 135MW or below is strictly prohibited for construction[13].

The alternative b) should be eliminated from the following consideration because it does not comply with the national regulation for controlling small scale fuel-fired power plant. The average generation hours for fuel-fired power plants are 5633 hours[14] in China in 2006 while the effective generation hours for proposed project are 2416 hours[15], to provide the same output as the proposed project, the alternative baseline scenario for the proposed project should be a grid-connected fuel-fired power plant with installed

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[8] Report by Li Junfeng from Energy Research Institute of NDRC (The relevant evidence is available for DOE validation)

[9] 《China desert》(The relevant evidence is available for DOE validation)

[10] Survey Report (Financial unattractiveness of the biomass power project)

[11] http://www.ces.cn/html/2005-6/200567953231.shtml

[12] China Electric Yearbook 2004-2006

[13] Notice on Strictly Prohibiting the Installation of coal-fired Generation with the Capacity of 135MW or below issued by the General Office of the State Council, decree no. 2002-6

[14] China Electric Power Yearbook 2007, P20

[15] FSR of the proposed project

capacity of about 21.1 MW. However, according to Chinese regulations, coal-fired power plants of less than 135 MW are prohibited for construction within the grid connected area[16]. Meanwhile, National Development and Reform Committee (NDRC) requests to execute strictly the policy to close fossil fuel fired power plants with low capacity[17]. Consequently, the scenario b) is not a feasible alternative.

The alternative a) and d) are in compliance with all applicable laws and regulations.
To summarize, the potential realistic and creditable alternatives that can provide the same output or services as the proposed project are a) and d). The investment analysis in Step 2 will show the proposed project not undertaken as a CDM project and without CERs income (alternative a) is lack of the attraction for the potential investors.

Step2. Investment analysis

This step will determine whether the project is the economically or financially less attractive than other alternatives without the revenue from the sale of CERs. The investment analysis is conducted in the following steps:

Sub-step 2a. Determine appropriate analysis method

Tool for the Demonstration and Assessment of Additionality (version 04) provides three analysis methods to apply for the investment analysis: the simple cost analysis, the investment comparison analysis and the benchmark analysis.
For the proposed project, the simple cost analysis method is not applicable because the project activity will produce economic benefit (from electricity sale) other than CDM related income.
The investment comparison analysis method is also not applicable because the baseline scenario, as identified in step1, providing the same electricity output by the North China Power Grid, is not a new investment project.
To conclude, the proposed project will use the benchmark analysis method based on total investment IRR to identify whether the financial indicators of the proposed project is better than relevant benchmark value.

Sub-step 2b. Apply benchmark analysis

According to the *Economical assessment and parameters for construction project, 3th edition*, a project will be financially acceptable when the Internal Return Rate (IRR) is better than the benchmark IRR. The

[16] Notice on Strictly Prohibiting the Installation of coal-fired Generation with the Capacity of 135MW or below issued by the General Office of the State Council, decree no. 2002-6

[17] Notice on strictly close fossil fuel fired power plants with low capacity, State Council (2007) No.2

financial benchmark Internal Return Rate (after tax) on total investment of Chinese power industry is 8%[18], which has been used widely for Feasibility Studies of the power project investments.

Based on the above-mentioned benchmark, the calculation and comparative analysis of financial indicators for the proposed project are carried out in sub-step 2c.

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

(1) Basic parameters for calculation of financial indicators

According to the feasibility study report of the proposed project, the parameters for calculation of financial indicators are shown in Table 2.

Table 2 Main parameters for the calculation of financial indicators

Items	Unit	Amount	Comment
Capacity	MW	49.3	FSR, P90
Static Total Investment	Million Yuan	404.17	FSR, P90
Annually output	MWh/year	119,120	FSR, P90
Cumulative O & M costs	Million Yuan	269.48	Calculation
Electricity Tariff (Excluding VAT)	Yuan/kWh	0.4977	Propositional tariff
Value Added Tax (VAT)	%	8.5	FSR, P92
Income tax	%	33	FSR, P92
Expected CERs Price	EUR/tCO_2	10.3	Agreement
Project life time	Year	21	FSR, P90
CERs crediting time	Year	7×3	

(Note: For details, please kindly refer to the IRR calculation spreadsheet.)

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

In according with the benchmark analysis, if the financial indicator of the project, such as IRR is lower than the benchmark IRR, the project is not considered as financially attractive.

Table 3 shows the IRR of the proposed project with and without CERs revenues. Without CERs the IRR of the project is 7.67%, lower than the benchmark rate 8%. Thus the project is not considered as financially attractive. However, taking into account the CERs revenues, the IRR on the total investment is 10.95%, which is significantly improved and higher than the financial benchmark rate. Therefore the CDM revenues enable the project to overcome the investment barrier and demonstrate the additionality of the project.

Table 3 Comparison of financial indicators with and without CERs revenues

[18] Annex for DOE validation: Interim Rules on Economic Assessment of Electric Engineering Retrofit Projects

Scenario	IRR (Benchmark 8%)
Project without CERs revenues	7.67%
Project with CERs revenues	10.95%

Sub-step 2d. Sensitivity analysis

The objective of this sub step is to show the conclusion regarding the financial attractiveness is robust to reasonable variations of the critical assumptions.

Four factors are considered in following sensitivity analysis:

1) Static total investment.
2) Annual O & M costs
3) Tariff (excluding VAT)
4) Operating hours

What the project IRR (without income from selling CERs) varies with fluctuation of above factors is shown in below.

The impact of the total investment on IRR

Variation (%)	-10	-7.5	-5	-2.5	-2.28	0	+2.5	+5	+7.5	+10
IRR(%)	9.22	8.81	8.41	8.03	8.00	7.67	7.32	6.99	6.67	6.36

The impact of the annual O & M costs on IRR

Variation (%)	-10.4	-10	-7.5	-5	-2.5	0	+2.5	+5	+7.5	+10
IRR(%)	8.00	7.98	7.91	7.83	7.75	7.67	7.59	7.51	7.43	7.35

The impact of the tariff (excluding VAT) on IRR

Variation (%)	-10	-7.5	-5	-2.5	0	+2.20	+2.5	+5	+7.5	+10
IRR(%)	6.14	6.53	6.91	7.29	7.67	8.00	8.05	8.42	8.79	9.15

The impact of operating hours on IRR

Variation (%)	-10	-7.5	-5	-2.5	0	+2.20	+2.5	+5	+7.5	+10
IRR(%)	6.14	6.53	6.91	7.29	7.67	8.00	8.05	8.42	8.79	9.15

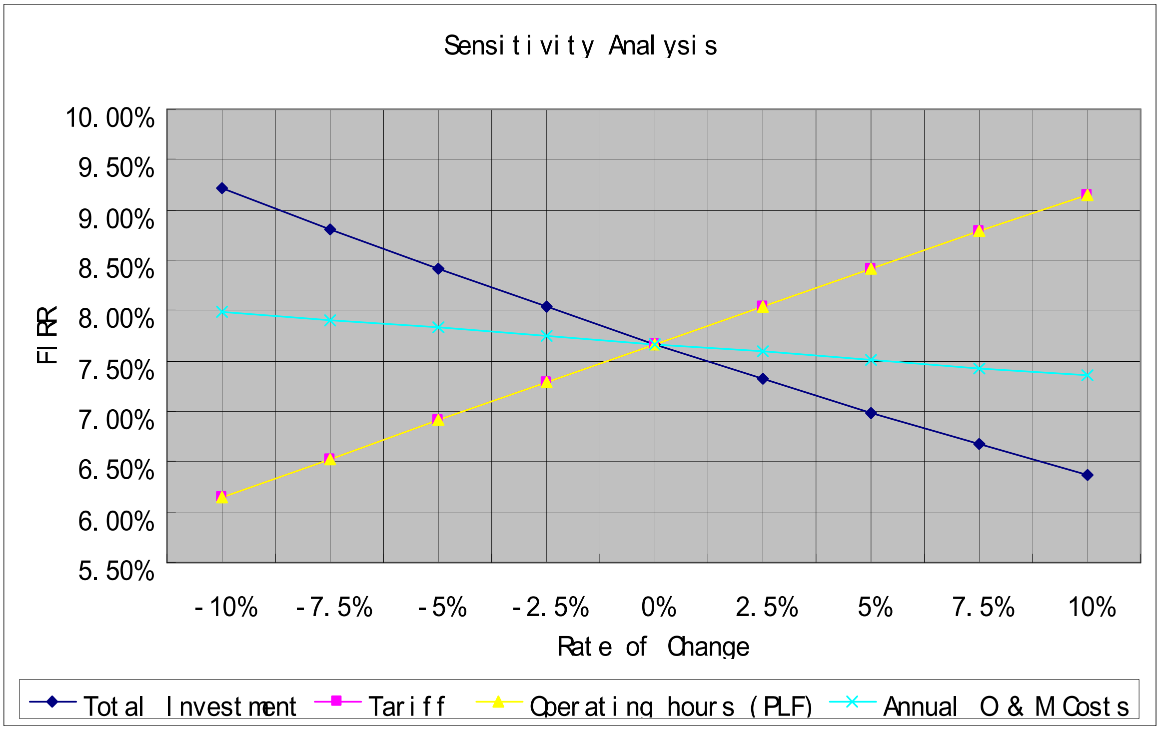

Figure 3: Sensitivity analysis of the proposed project

Above tables and figure show that:

The impact of the static total investment on the project IRR is significant. In the case that the static total investment decreases by 2.28%, the IRR of the proposed project reaches the 8% benchmark. For a wind power project, the majority of the static total investment is due to wind turbines, whose price has been determined with the equipment purchase agreement (EPA has been signed). The rest investment is for installation of the wind turbines and the construction of the wind foundation and some buildings, due to the increasing trend of construction material costs[19], is also unrealistic to be lowered down[20] [21].

The impact of tariff on the project IRR is the most significant. When the tariff increases by about 2.20%, the project IRR exceeds the benchmark. But according to China's Management Rules on Tariff issued by NDRC[22] dated on Jan 04, 2006, the tariff of the un-tendering wind power projects should adopt the government-guiding tariff which is determined by the government with reference to the tariff of tendering wind power projects, and the un-tendering wind power projects within the same grid should enjoy the same tariff to reflect the principle of fair competition in the market. The proposed project,

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[19] http://finance.jrj.com.cn/news/2008-03-28/000003465715.html

[20] http://www.86wind.com/info/detail/4-5335.html

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

[22] Interim Regulation for Tariff of Renewable Energy Power Generation and Appointment of Expenses FAGAIJIAGE(2006) No.7

being an un-tendering project, should implement this government-guiding tariff, which is no more than 0.54 Yuan/ kWh(including VAT), i.e. 0.4977 Yuan/kWh excluding VAT in Inner Mongolia region as stated by the local Development and Reform Commission[23], as compared to the applicable tariff of 0.5528 Yuan/ kWh (including VAT) to reach 8% benchmark as shown in the FSR of the project, it is obvious that the project is financial unattractive, for the actual tariff for the project could only be the government-guiding tariff. In addition, it is very unlikely for the tariff to have an increase in the future, given the fact that China has been taking measures to reduce tariff of wind power projects, through adopting domestic wind turbines and using the scheme of tendering for wind power projects, just as on September 4, 2007, in a press conference held by the State Council Information Office, Chen Deming, vice minister of NDRC, stated that China would continue to use the scheme of tendering for the wind power projects, because "in this way can the tariff of wind power generation projects gradually lower down"[24]. Furthermore, the tariff is strictly regulated by the government, once the tariff of a wind power project is set, neither the project owner nor the grid company can change it, it will basically remain unchanged throughout the operation period. Given the above, it is very unlikely to hope the tariff of the project have an increase, even if an increase of 2.20%, thus unquestionable that the proposed project is financial unattractive.

The sensitivity around operating hours is similar to the sensitivity around the tariff (both impact the turnover the same way). The needed operating hours to reach the 8% benchmark is 2.20% increase, but the value of the operating hours is sourced from FSR, it is a representative value (the relevant evidence is available for DOE validation[25]), which is figured out by experienced analysts using a professional software WAsP based on 1-year wind data of on-site measurement and long team wind data from a nearby meteorological station. It is unreasonable to have an increase of 2.20% on this representative value.

The annual O & M costs will affect the project IRR, but the needed annual O & M costs to reach 8% benchmark is 10.4% less than basic assumption. On the one hand, the basic annual O & M costs assumption is from the FSR, which was approved by Inner Mongolia Development & Reform Commission; on the other hand, along with a rapid economic development, China has been experiencing rising labour and material costs[26]. As a result, a reduction of 10.4% in O & M costs is not realistic and obviously the project IRR is not likely to reach the 8% benchmark.

To conclude, under the reasonable variations in the critical assumptions, the conclusion regarding the financial additionality is robust and supported by sensitivity analysis.

Step 3. Barrier analysis

Not applicable.

Step 4. Common practice analysis

[23] Propositional tariff letter issued by the local DRC (available for DOE validation)

[24] http://finance.sina.com.cn/china/hgjj/20070905/11043948808.shtml

[25] Wind resource evaluation of the project in FSR

[26] http://finance.jrj.com.cn/news/2008-03-28/000003465715.html

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

In 2005, wind power accounted for only 0.083% of the total installed capacity of the North China Power Grid[27], it is clear that wind power is not a common practice generally. Please find below the grid-connected wind farms similar to the proposed project with the capacity range of 25-75MW (50%-150%) in Inner Mongolia Power Grid since the year 2000 (Table 4).

Table 4 Grid-connected wind farms similar to the project in Inner Mongolia

Project Title	Capacity (MW)	Remarks
Inner Mongolia Bayinaobao wind power projects (1)	49.5	Approved by Chinese DNA
Inner Mongolia mangniuhai wind farm project	49.3	Approved by Chinese DNA
Inner Mongolia Northern Longyuan Huitengxile Wind Farm Project	40	Approved by Chinese DNA
Inner Mongolia LONG northern Gray Teng Liang wind farm project	49.5	Approved by Chinese DNA
Inner Mongolia Cailiang wind farm project	49.5	Approved by Chinese DNA
Inner Mongolia Bayannaoer Chuanjingsumu 49.3MW Wind Power Project	49.3	Approved by Chinese DNA
Inner Mongolia Bayin Hanggai 49.5MW wind farm project	49.5	Approved by Chinese DNA
Inner Mongolia Huitengxile Jingneng 49.5MW Wind Power Project	49.5	Approved by Chinese DNA
Inner Mongolia Hangjin Yihewusu Wind Power Project	49.5	Approved by Chinese DNA
Inner Mongolia Wulate 45MW Wind Power Project	45	Approved by Chinese DNA
Saihanba East 45.05 MW Windfarm Project	45.05	Registered on 15 DEC, 2006 (project 0561)
Saihanba North 45.05 MW Windfarm Project	45.05	Registered on 15 DEC, 2006 (project 0576)
Inner Mongolia Chifeng Saihanba West 30.6 MW Wind Farm Project	30.6	Registered on 27 May, 2007 (project 0994)
Inner Mongolia Chifeng Dongshan 49.3 MW Wind Power Project	49.3	Registered on 31 Dec, 2006 (project 0689)
Guohua Hulunbeier Xinbaerhu Youqi 49.5MW Wind Farm Project	49.5	Registered on 03 Jun, 2007 (project 0981)
Guohua Inner Mongolia Huitengliang Wind Farm Project	48.75	Registered on 18 Oct, 2007 (project 1261)
Inner Mongolia Huitengliang Wind Farm project	49.5	Registered on 22 Jan, 2007 (project 0589)
Inner Mongolia Zhuozi wind farm project	40	Registered on 14 Jan, 2008 (project 1327)

Data source: 1. Shi Pengfei (Deputy Director, Chinese Wind Energy Association), Statistics on China Wind Farm Cumulative Installed Capacity in 2005, 2006 and 2007;
2. http://cdm.ccchina.gov.cn/web/index.asp;
3. http://cdm.unfccc.int/Projects/projsearch.html

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

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According to the Statistic in the above table, all of the grid-connected wind farms similar to the proposed project in Inner Mongolia Autonomous Region have been applying for CDM support. Therefore, the existence of these projects does not contradict the claim that the proposed project activity is financially unattractive.

In conclusion, the proposed project activity passed all criteria of "Tool for the demonstration and assessment of additionality". The proposed project is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Baseline emissions are estimated using the formulae provided by the methodology ACM0002 (06) considering IPCC default values and as well as local values. Formula used to estimate emission reductions is provided in this Section and estimated quantity of emission reductions are furnished in Section B.6.4 and the detail calculation is in annex 3.

The boundary includes the physical boundary and geographical boundary of the proposed project and all plants in the North China Power Grid. North China Power Grid consists of independent province-level electricity systems including Beijing, Tianjin, Hebei, Shanxi, Inner Mongolia and Shandong province that exchange power significantly within the region depending on the demand. The connected electricity system is Northeast Power Grid. The power inflows from and outflows would constitute imports and exports.

To determine baseline scenario emissions, firstly emission factors of Operating Margin ($EF_{OM,y}$) and Build Margin ($EF_{BM,y}$) were calculated based on the history data of the North China Power Grid, which include the installed capacity, electricity generation and different types of fuel consumptions of all the power plants connected into the North China Power Grid. Secondly, the baseline emission factor (EF_y) was calculated as a combined margin(CM) of the Operating Margin (OM) and Build Margin (BM) emission factors as described in following three steps. All the calculations are in compliance with requirement of the baseline methodology (ACM0002), and the details is listed in the following steps.

Step 1: Calculation the Operating Margin emission factor ($EF_{OM,y}$)

Calculation of OM emission factor should be based on one of the four following methods:

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

The justifications of the choice of methodology to calculate OM emission factor are as follows:

Method (a): Simple OM

Method (a) 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. The project delivers it's generation to the North China Power Grid directly. From 2001 to 2005, the low-cost/ must run resources constitute 0.81% , 0.89% , 0.86% , 0.76% and 0.67% of total generation of North China Power Grid, respectively. (China Electric Power Yearbooks 2002-2006). Then hydroelectricity and other renewable resources generating electricity much lower than the proportion of 50%. Therefore, method (a) is applicable for the proposed project.

Method (b): Simple adjusted OM

Method (b) requires the annual load duration curve of the power grid and the load data of every hour data during the whole year on the basis of the time order. As mentioned above, the dispatch data and detailed load curve data were not available publicly. Therefore, method (b) is not applicable for the project as well.

Method (c): Dispatch Data Analysis OM

If the dispatch data is available, method (c) should be the first methodological choice. This method requires the dispatch order of each power plant and the dispatched electricity generation of all the power plants in the power grid during every operation hour period. Since the dispatch data, power plants operation data are considered as confidential materials and only for internal usage not available publicly. Thus, method (c) is not applicable for the project.

Method (d): Average OM

Method (d) will only be used when (1) low-cost/must run resources constitute more than 50% of total grid generation and detailed data to apply option (b) is not available, and (2) where detailed data to apply option (c) above is unavailable. From 2001 to 2005, the low-cost/ must run resources constitute 0.81% , 0.89% , 0.86% , 0.76% and 0.67% of total generation of North China Power Grid, respectively. (China Electric Power Yearbooks 2002-2006). Then hydroelectricity and other resources generating electricity much lower than the proportion of 50%. Hence method (d) is not applicable for the project.

In conclusion, method (a) is the only reasonable and feasible method among the four methods for calculating the Operating Margin emission factor ($EF_{OM,y}$) of the North China Power Grid.

According to the ACM0002, the Simple OM emission factor ($EF_{OM,simple,y}$) is calculated as the generation-weighted average emissions per electricity unit (tCO_2/MW•h) of all generating sources

serving the system, not including low-operating cost and must-run power plants, the detailed formulas are as following:

$$EF_{OM,simple,y} = \frac{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{j} GEN_{j,y}} \quad (1)$$

Where:

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

j refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports to the grid[28],

$COEF_{i,j,y}$ is the CO_2 emission coefficient of fuel i (tCO_2/ mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources j and the percent oxidation of the fuel in year(s) y, and

$GEN_{j,y}$ is the electricity (MW·h) delivered to the grid by sources j.

The CO_2 emission coefficient $COEF_i$ is obtained as

$$COEF_i = NCV_i \times EF_{CO_2,i} \times OXID_i \quad (2)$$

Where:

NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel i, (TJ/ mass or volume unit) ,

$OXID_i$ is the oxidation factor of the fuel i (IPCC default values),

$EF_{CO_2,i}$ is the CO_2 emission factor per unit of energy of the fuel i (tCO_2e/TJ).

Regarding parameter selection, local values of NCV_i and $EF_{CO_2,i}$ should be used where available. If no such values are available, country-specific values are preferable to IPCC worldwide default values. The Net Calorific Value (NCV_i) of each type of fossil fuel used in the calculation comes from China Energy Statistic Yearbooks. Emission factors ($EF_{CO_2,i}$) of each type of fossil fuel come from 2006 IPCC default values, For the value of $OXID_i$, it is from 2006IPCC default values too.

The simple OM emission factor can be calculated using either of the two following data vintages for years(s) y: (1) A 3-year average based on the most recent statistics available at the time of PDD submission, or (2) The year in which project generation occurs, if $EF_{OM,y}$ is updated based on ex post monitoring.

In the PDD, the simple OM emission factor was calculated using *ex-ante* vintage that (*ex-ante*) the full generation-weighted average for the most recent 3 years from 2003 to 2005 for which data are available at the time of PDD submission. The data of installed capacity, electricity generation and fuel

[28] As described above, an import from a connected electricity system should be considered as one power source j.

consumptions are all from China Energy Statistical Yearbooks 2004-2006 and China Electric Power Yearbooks 2004-2006. The net imports from Northeast Power Grid for the recent years were shown in annex 3 requested by the baseline methodology (ACM0002).

Based on the calculation results, the Operation Margin emission factor ($EF_{OM,y}$) of North China Power Grid i**s 1.1208 tCO_2/MWh.** The detailed data and calculation are listed in annex 3.

Step2: Calculation the Build Margin emission factor ($EF_{BM,y}$)

According to the ACM0002, the baseline Build Margin emission factor was calculated using the following formula (3).

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \times COEF_{i,m,y}}{\sum_{m} GEN_{m,y}} \qquad (3)$$

where:

$F_{i,m,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by *m* power plants in year(s) *y*,

$COEF_{i,m,y}$ is the CO_2 emission coefficient of fuel *i* (tCO_2/ mass or volume unit of the fuel), taking into account the carbon content of the fuels used by *m* power plants and the percent oxidation of the fuel in year(s) *y*,

$GEN_{m,y}$ is the electricity (MW•h) delivered to the grid by *m* power plants.

According to the baseline methodology (ACM0002), one of the following two options shall be selected to identify sample group for calculating Build Margin emission factor.

Option 1: Calculate the Build Margin emission factor $EF_{BM,y}$ *ex ante* based on the most recent information available on plants already built for sample *m* at the time of PDD submission. The sample group *m* consists of either

- The five power plants that have been built most recently, or
- The power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

Project participants should use from these two options that sample group that comprise the larger annual generation.

Option 2: For the first crediting period, the Build Margin emission factor $EF_{BM,y}$ must be updated annually *ex post* for the year in which actual project generation and associated emission reductions occur.

For subsequent crediting periods, $EF_{BM,y}$ should be calculated *ex-ante*, as described in option 1 above. The sample group *m* consisted of either

- The five power plants that have been built most recently, or
- The power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

Project participants should use from these two options that sample group that comprises the larger annual generation.

Power plant capacity additions registered as CDM project activities should be excluded from the sample group m.

For the proposed project, Option 1 was adopted for calculating the Build Margin emission factor.

However, no matter which options mentioned above was adopted for the proposed project; the same issue on data availability must be addressed. Currently, it is very difficulty to get the capacity margin data of power plants in China, since these data as well as generation and fuel consumption data of each power plant are regarded as commercial secrets or only for internal usage. According to the guidance from the CDM Executive Board for a deviation of the baseline methodology of AM0005, which had combined into the baseline methodology of ACM0002, the following deviation was adopted to calculate the Build Margin emission factor (http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_QEJWJEF3CFBP1OZAK6V5YXPQKK7WYJ):

1）Use of capacity additions for estimating the build margin emission factor for grid electricity.
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 of China, as a conservative proxy, for each fuel type in estimating the fuel consumption to estimate the build margin (BM).

The following steps were adopted to calculate the Build Margin emission factor:

1. The breakdown data by power plants are not available while the aggregate data by different types of fuels are available, therefore, the *m* sample group will consist of capacity addition by power sources with same fuel instead of by power plants. For the proposed project the *m* sample group will consist of fossil fuel fired capacity addition, hydropower capacity addition and other capacity addition;

2. Assuming that all the power plants with same fuel type have equal annual operation hours, the starting year t_0 could be identified which fulfil the following constraint:

$$\sum_i CAP_{i,t-t_0} \geq 20\% \times \sum_i CAP_{i,t} \quad (4)$$

Where,

t is the recent year of which the latest data is available;

$CAP_{i,t-t0}$ is the capacity addition of type *i* from year t_0 to year *t*;

$CAP_{i,t}$is the installed capacity of type *i* in year *t*;

The capacity addition belonging to *m* sample group thus could be identified. For the proposed project, the most recent year of which data is available is 2005, while t_0=2003, the total capacity addition during 2003to 2005 consisting of 27062.1MW of fossil fuel fired capacity, -49.8MW of hydropower capacity and 245.4MW of other capacity, which accounts for 23.78% of total installed capacity in 2005 (See Annex 3 for detailed calculation).

3. To be conservative, zero emission factors were selected for hydropower capacity and other capacity. Moreover, since specific data on coal fired capacity, oil fired capacity, and gas fired capacity could not be separated from current statistical data on fossil fuel fired capacity, the following approach was adopted for calculating the emission factor of fossil fuel fired capacity addition:

Step 2a: calculating the respective percentages of CO_2 emissions from coal fired power generation, oil fired power generation, and gas fired power generation against total CO_2 emissions from fossil fuel fired power generation

With the energy balance sheet in China Energy Statistical Yearbook for the most recent year, calculating the respective percentages of CO_2 emissions from coal fired power generation, oil fired power generation, and gas fired power generation against total CO_2 emissions from fossil fuel fired power generation:

$$\lambda_{Coal} = \frac{\sum_{i \in COAL, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (5)$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (6)$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (7)$$

where:

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

$COEF_{i,j,y}$ is the CO_2 emission coefficient of fuel *i* (tCO_2/ mass or volume unit of the fuel), taking into account the carbon content of the fuels consumed by province *j* and the percent oxidation of the fuel in year(s) *y*,

COAL, OIL, and GAS are the aggregation of various kinds of coal, oil, and gas as fossil fuels.

Step 2b: calculating the corresponding emission factor for fossil fuel fired power generation

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

where:

$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ are the emission factors for the best commercially available technology of coal fired power generation, oil fired power generation, and gas fired power generation, respectively (See Annex 3 for detailed calculation).

Step 2c: Calculating the $EF_{BM,y}$ of local grid

Using the share of different type of capacity in total capacity addition as weight, the weighted average of emission factors of different type capacity is calculated as the Build Margin emission factor $EF_{BM,y}$ of North China Power Grid (See Annex 3 for detailed calculation):

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \qquad (9)$$

where:

CAP_{Total} is the total capacity addition,

$CAP_{Thermal}$ is the fossil fuel fired capacity addition.

Following the three steps above, the Build Margin emission factor $EF_{BM,y}$ of the North China Power Grid is calculated to be: **0.9397 tCO2/MW•h.** The detailed calculation and data were listed in the annex 3**.**

Data sources for $EF_{OM,y}$ and $EF_{BM,y}$ calculation: Data on installed capacity, power generation, and self-usage rate of power plants are from China Electric Power Yearbooks 2004-2006. The consumption data of various types of fuels and their net caloric values are from China Energy Statistical Yearbooks 2004-2006. The CO_2 emission factors per unit of energy and the oxidation factors are from Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Step3: Calculation the baseline emission factor (EF_y)

According to the baseline methodology (ACM0002), the baseline emission factor EF_y is calculated as the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$):

$$EF_y = \omega_{OM} \times EF_{OM,y} + \omega_{BM} \times EF_{BM,y} \qquad (10)$$

Where: the weights ω_{OM} and ω_{BM} are 75% and 25% respectively by the default, and $EF_{OM,y}$ and $EF_{BM,y}$ are calculated as described in Steps 1 and 2 above.

Baseline Emission factor (EF_y) of the North China Power Grid		
Operating Margin emission factor ($EF_{OM,y}$)	(tCO_2/MW•h)	: 1.1208
Build Margin emission factor ($EF_{BM,y}$)	(tCO_2/MW•h)	: 0.9397
Baseline Emission factor (EF_y)	(tCO_2/MW•h)	: 1.0755

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

Data / Parameter:	$F_{i,j,y}$
Data unit:	t/m^3
Description:	Amount of fuel i (in a mass or volume unit) consumed by relevant power sources j in year(s) y
Source of data used:	China Energy Statistical Yearbook
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Since the detailed fuel consumption data by power plants are not publicly available, therefore the aggregated data by fuel types are used instead
Any comment:	

Data / Parameter:	$GEN_{j,y}$
Data unit:	MW·h
Description:	Electricity (MW·h) delivered to the grid excluding low operating cost/must run power plants in year y
Source of data used:	China Power Yearbook
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Since the detailed generation data by power plants are not publicly available, therefore the aggregated data by fuel types are used instead.
Any comment:	

Data / Parameter:	NCV_i
Data unit:	TJ/t(m^3)
Description:	Net calorific value (energy content) per mass or volume unit of fuel *i*
Source of data used:	China Energy Statistical Yearbook
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to ACM0002, the national specific value shall be used preferentially
Any comment:	

Data / Parameter:	$OXID_i$
Data unit:	%
Description:	Oxidation factor of the fuel *i*
Source of data used:	IPCC default value
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The country specific values of oxidation factors in China are not available. As such IPCC default values are used instead.
Any comment:	

Data / Parameter:	$EF_{CO_2,i}$
Data unit:	tCO_2/TJ
Description:	CO_2 emission factor per unit of energy of the fuel *i*
Source of data used:	IPCC default value
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually	The country specific values of fuel CO_2 emission factor in China are not available. As such IPCC default values are used instead.

applied :	
Any comment:	

Data / Parameter:	CAP_y
Data unit:	MW
Description:	The installed capacity in the project electricity system in year y
Source of data used:	China Electric Power Yearbook 2004-2006
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Use of capacity additions for estimating the build margin emission factor for grid electricity under the guidance of EB.
Any comment:	

Data / Parameter:	$EG_{imports,y}$
Data unit:	MWh
Description:	Electricity imports form the connected electricity system to the project electricity system in year y
Source of data used:	China Electric Power Yearbook 2004-2006
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	An import from a connected electricity system should be considered as one power source.
Any comment:	

Data / Parameter:	Coal fired power supply efficiency
Data unit:	%
Description:	the best commercially available technology of coal fired power generation
Source of data used:	http://cdm.ccchina.gov.cn/web/index.asp
Value applied:	35.82
Justification of the choice of data or	According to EB guidance

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

Data / Parameter:	Oil and gas fired power supply efficiency
Data unit:	%
Description:	the best commercially available technology of oil and gas fired power generation
Source of data used:	http://cdm.ccchina.gov.cn/web/index.asp
Value applied:	47.67
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to EB guidance
Any comment:	

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

According to the baseline methodology ACM0002, the GHG emission of the proposed project within the project boundary is zero, i.e. $PE_y = 0$

According to the baseline methodology ACM0002, the leakage of the proposed project is not considered, i.e. L_y =0.

Therefore, the proposed project activity emissions are zero, i.e. E.1+E.2= $PE_y + L_y$ =0.

According to the descriptions and formulas in section B.6.1, the combined baseline emission factor of the North China Power Grid is:

EF_y **=1.0755tCO2/MWh.**

According to the Feasibility Study Report of the proposed project, the estimated annual electricity generation delivered to the power grid, taking into account the imports from the grid with the back up line (as described in B.7.2) , will be:

$EG_y = EG_{evacuation\ system} - EG_{backupline}$ =119,120MWh

The annual emission of baseline scenario is:

$BE_y = EG_y \times EF_y$ =119120*1.0755=128,117tCO$_2$.

The annual emission reductions of the proposed project will be:

$ER_y = BE_y - PE_y - L_y$ =128,117tCO2.

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

Year	Estimation of baseline emissions (tons of CO2e)	Estimation of project activity emissions(tons of CO2e)	Estimation of leakage (tons of CO2e)	Estimation of overall emission reductions (tons of CO2e)
2009	128,117	0	0	128,117
2010	128,117	0	0	128,117
2011	128,117	0	0	128,117
2012	128,117	0	0	128,117
2013	128,117	0	0	128,117
2014	128,117	0	0	128,117
2015	128,117	0	0	128,117
Total(tons of CO2e)	896,819	0	0	896,819

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

B.7.1. Data and parameters monitored:

Data / Parameter:	EG_y
Data unit:	MWh
Description:	Net electricity supplied by the project activity to the grid during the year *y*
Source of data to be used:	On-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	119,120
Description of measurement methods and procedures to be	As described in the monitoring plan for the project, EG_y should be obtained through the total exported generation subtract the total

applied:	imported generation, i.e. $EG_y = EG_{evacuation\ system} - EG_{backupline}$, and $EG_{evacuation\ system}$ and $EG_{backupline}$ should be monitored as the requirements below.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$EG_{evacuation\ system}$
Data unit:	MWh
Description:	Electricity supplied by the project activity to the grid through the power evacuation system during the year *y*
Source of data to be used:	On-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	119,120
Description of measurement methods and procedures to be applied:	Hourly measurement and monthly recording using calibrated meters. The meters are the multifunctional electricity meters (accuracy degree is 0.2S, bidirectional).
QA/QC procedures to be applied:	The Meters used for reading will be calibrated as per industry standards of host country (DL/T448-2000). Double check by receipt of sales.
Any comment:	

Data / Parameter:	$EG_{backupline}$
Data unit:	MWh
Description:	Electricity import from the grid with the back up line
Source of data to be used:	On-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	Hourly measurement and monthly recording using the calibrated meter. The meter is installed at the project site. The meter's accuracy degree is 1.5S.
QA/QC procedures to be applied:	The Meter used for reading will be calibrated as per industry standards of host country (DL/T448-2000). Double check by receipt of sales.
Any comment:	

B.7.2. Description of the monitoring plan:

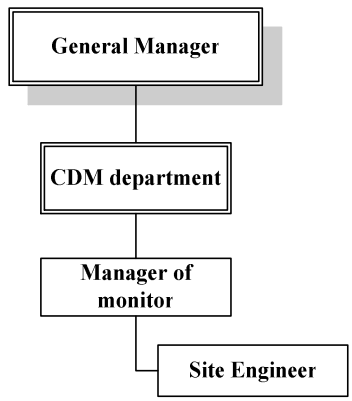
Monitoring tasks must be implemented according to the monitoring plan in order to ensure that the real, measurable and long-term greenhouse gas (GHG) emission reduction for the proposed project is

monitored and reported.

This monitoring plan is designed for Inner Mongolia Bayannaoer Chuanjingsumu Wind Power Project implemented by Longyuan (Bayannaoer) Wind Power Co., Ltd (the project owner).

1. Management Structure

The management structure is as follows:



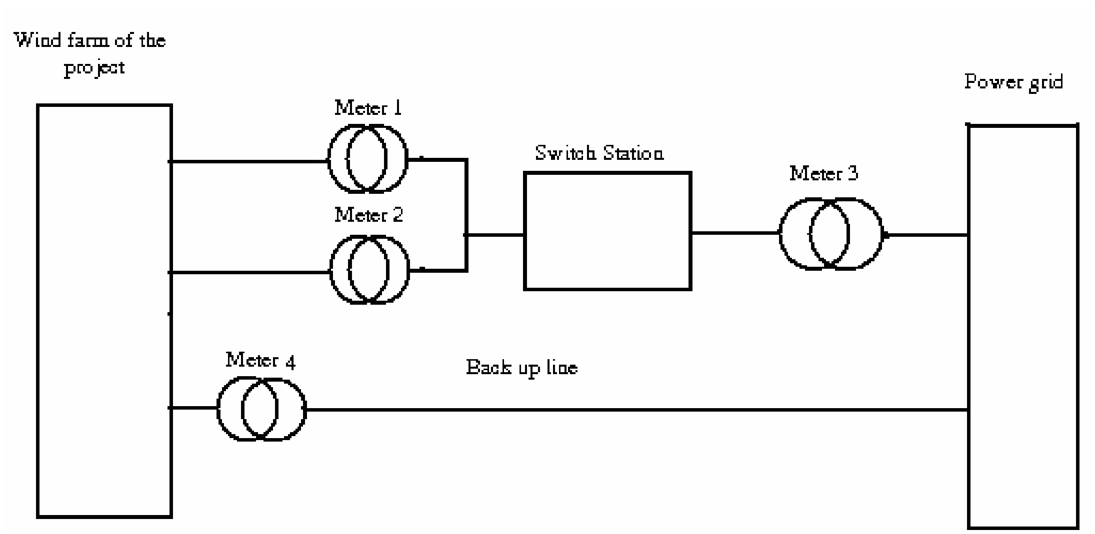
The general manager makes the overall policy decision while the CDM department is responsible for the concrete implementation of the Monitoring Plan. The monitor manager is responsible for supervising and checking the whole date record process and the calibration of meters. Another main task of the monitor manager is facilitating the verification through providing the DOE with all required necessary information. The site engineer will collect monitoring data (e.g. electric meter data), keep receipt of sales, calculate emission reduction and prepare the monitor report. Before the start of the monitor, all members in the CDM department should have received well training on CDM issues.

2. Calibration and Arrangement of Meters

◆ An agreement should be signed between the project owner and Power Grid Company that define the metering arrangements and the required quality control procedures to ensure accuracy.

◆ The first and second metering equipments (each of which has 1 +1 configuration, one for metering, and the other for backup usage) is installed at the entrance to the switch station (35kV/220kV) of the project. The third metering equipment (1 +1 configuration, one for metering, and the other for backup usage) is installed at the outlet of the 220 kV switch station. The meters are the multifunctional electricity meters (accuracy degree is 0.2S, bidirectional) capable of recording import and export of electricity and providing output in the form of electricity supplied to the grid. The fourth metering equipment is installed with a back up line at the project site when the project power evacuation system is out of order. The third metering equipment will be the key measurement equipment owned by the grid; the first and second metering equipment are owned by the proposed project, the sum of the electricity metering of the first and second can be used to check with the third metering by taking into account the transmission loses. By monitoring these three metering equipments the electricity from and to the grid through the power evacuation system can be clearly determined. As a little amount of electricity might be import from the grid through the back up line in case of disorder of the power evacuation system, so the

fourth metering equipment is necessary. So the net electricity supplied to the grid by the project should be obtained through the total exported generation subtract the total imported generation, as will be in line with the requirements of the PPA which is to be signed and where the relevant provisions will be clearly defined. The diagram of the electrical grid connection, including the metering equipment arrangement, is shown below:



◆ The metering equipments for electricity will be properly configured and calibrated annually under the requirements of Technical Administrative Code of electric energy metering (DL/T448 - 2000).. The metering equipments will be checked by the project owner and Power Grid Company before operation.

◆ The verification of electric metering equipments should be periodically carried out according to relevant national electric industry standards or regulations. After verification, meters should be sealed. All meters shall be jointly inspected and sealed on behalf of the parties concerned and shall not be accessible by either party except in the presence of the other party or its accredited representatives.

◆ All meters installed shall be tested by the qualified metrical agency co-authorized by the project owner and Power Grid Company, after:

1) The detection of a difference larger than the allowable error in the reading of meters, when considering the reactive loss of electrical wire;
2) The need for repair or replacement due to the damage of the meters in whole or in parts in accordance with the specifications.

◆ The project owner and Power Grid Company should have a remedial measure for the estimation of the correct reading according to agreed procedures under the signed agreement (PPA is to be signed).

3. Monitoring Parameters

All relevant parameters listed in Section B 7.1 will be monitored according to the methodology requirements and description of measurement methods and procedures to be applied. The electricity supplied to and imported from the grid should be measured continuously and recorded monthly as required by the methodology applied. The data and meter reading will be well documented and be readily accessible for DOE.

4. Data Recording

The project owner is responsible for the operation of the first, second and fourth metering equipments, and Power Grid Company responsible for the operation of the third metering equipment, to ensure that all meters are in good conditions and the net electricity supplied to the grid will be valid and be able to achieve emission reduction calculation. Under such circumstances, the specific steps for data collection and reporting are listed below:

1) Power Grid Company read the third meter, and the project owner read the first, second and fourth meters respectively and record readings, on a fixed day of every month;
2) Power Grid Company supplies readings to the project owner and provides relevant documents.
3) Project owner records the data of net electricity delivered to the grid, and supplies the invoice to Power Grid Company and receive and keep the receipt from the grid (i.e. the confirmed electricity quantity sheet);
4) Project owner provides the meter's readings and receipt from the grid to DOE for verification.

Should any previous months reading of the meter be inaccurate by more than the allowable error, or otherwise functioned improperly, the electricity generation supplied to the grid by the proposed project shall be determined by:

1) The project owner and Power Grid Company shall jointly prepare an estimate of the correct reading; and, provide ample evidence to DOE that the method is reasonable;
2) The backup meter reading shall be for backup usage;
3) If the project owner and Power Grid Company fail to agree the estimate of the correct reading, then the matter will be referred for arbitration according to agreed procedures.

5. Quality Assurance and Quality Control

The project activities will use high-precision monitoring equipment to monitor the electricity from and to the grid. Necessary backup meters will be installed, to operate for backup usage when the relevant meter is out of order. All meters will be calibrated and sealed as per the industry practices at regular intervals. Hence, high quality is ensured. Electricity sale invoices will be used to test the consistency of the recorded data.

6. Data Management System

All parameters monitored under the monitoring plan will be archived electronically and be kept at least for 2 years after the end of last crediting period. The monitored data will be presented to the verification agency or DOE to whom verification of emission reductions is assigned.

The documents in paper format, such as maps, tables, and the EIA report, will be used in conjunction with the monitoring plan to check the authenticity of the information, and be kept at least one copy by the project owner.

7. Verification

The main objective of the verification is to independently verify that the project has achieved the emission reductions as reported.

The responsibilities for verification of the project are as follows:

- Sign a service agreement about verification with specific DOE and agree to a time framework for carrying out verification activities. The project owner will make the arrangements for the verification and will prepare for the audit and verification process to the best of its abilities.

- The project owner will facilitate the verification through providing the DOE with all required necessary information, before, during and, in the event of queries, after the verification.

- The project owner will fully cooperate with the DOE for interviews and respond honestly to all questions from the DOE.

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

Date of completion of baseline study: July 25, 2008

Names of person/entity determining the baseline are listed as follows:

Yufeng, Hao,

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Telephone: +8610-66091379
Email: sunsunng1019@sina.com

(Not the project participants listed in Annex 1)

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:

08/06/2007 (Construction Start Permission Date)

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

20 years

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

Renewable crediting period is chosen

C.2.1. Renewable crediting period

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

01/01/2009

C.2.1.2. Length of the first crediting period:

7 years

C.2.2. Fixed crediting period:

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:

In accordance with relevant environmental law and regulations, the Environmental Impact Assessment Report (EIA) of the project has been approved by the Environmental Protection Administration of Inner Mongolia Autonomous Region, referred to "Inner Mongolia Autonomous Region Environment (Table) [2006] No.89". A summary of the report is illustrated as follows:

- **Main Potential Environmental Impacts Associated with the project**

– Impacts from the construction of the wind farm include construction noise, dust as well as water and soil loss etc;
– Impacts on native vegetation and environment as a result of construction activities for windmill towers, transformers and access roads;
– Impacts on socio-economy from the construction and operation of the project.

Impacts on Air Environment

The major air pollution sources in construction phase are dust generated from constructing building foundations, tower foundations, exhaust gas from vehicles and other emissions from ordinary workers' activities. Although the construction area is dispersed, the pollution sources are intermittent, mobile and small in intensity, several measures will still be taken in order to control and reduce the air pollution. Water should be sprinkled on the mounds of soil exposed in the air to prevent the dust blowing. The soil dug from groundwork should be transported without delay. No overloading of the vehicles should be permitted to avoid any material falling down along the way.
There are no air pollution sources in operation phase for the proposed project.

Impacts on Noise Environment

The noise of the project in construction phase is from vehicles and machines on-site. According to the monitoring data from the construction site, the noise is at a level between 80-110 dB. Based on the formula of declining of sound emitted from a non-directional source, it is estimated that the maximum noise effective distance of the project is 50m in daytime and 300m at night. Moreover, the magnitude of the impacts during the construction period will only exist temporarily, and disappear with the completing

of the construction period. However, operational noise from the rotating blades is expected to be minimal due to the higher background noise caused by strong winds. The closest residential area to the site of the project is over 500m away. Therefore, the noise of the project will not have impact on nearby residents.

Impacts on Water and Solid Waste

The wind-farm does not consume any water, nor does it generate any wastewater in the operation phase. The possible negative impacts are the household wastewater and solid waste produced by builders and staff, and the waste earth from digging of the foundation in the construction phase. Under normal conditions with highly automated monitoring and control system, the household wastewater will be first treated in a septic tank, and then be disinfected to discharge for circumjacent virescence. Moreover, the amount of household solid waste will be very little, which will not have impact on the environment. Besides, the solid waste will be collected and moved to the appointed landfill site. Following the suggestion, the water and solid waste should have no significant impact on the environment.

Impacts on Ecosystem Environment

A serious potential concern for wind farms is their impact on vegetation, animals and migrating birds. The land occupied by the project activity is unfertile. Therefore the water and soil loss does not happen during the construction of the project. Moreover, the installed height of turbines is lower than the winged height of the birds. So there are no significant impacts on migratory birds / endangered species in the region of the project activity. Therefore, the activities to be carried out will not generate any negative impact on the ecological environment.

Socio-Economic Impacts

The project is estimated to supply annually 119.12GW•h of power to the Inner Mongolia Power Grid and to save about 41500 tce. So the project generates eco-friendly, GHG free power that contributes to sustainable development of the region. Moreover, the locals have benefited economically through land sales and revenues. The project activity not only helps the uplift of skilled and unskilled manpower in the region, but also improves employment rate and livelihood of local populace in the vicinity of the project.

Conclusion

In conclusion, being as a typical type of clean renewable energy, the proposed project has no significant impacts on local environment and will greatly contribute to achievement of sustainable development objective and promote local environmental protection.

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

The construction and operation of the proposed project have no significant environmental impacts, and the proposed project is definitely an environmentally more friendly way of providing power than other power plants.

SECTION E. Stakeholders' comments

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

According to the requirement by the *Measures for Operation and Management of Clean Development Mechanism Projects in China* and PDD, the staff of Longyuan (Bayannaoer) Wind Power Co., Ltd held an open public survey and stakeholders' conference on the local villagers and residents. In the public survey and conference, the stakeholder representatives are respectively from the local Environmental Protection Bureau, Local Development and Reform Commission, local Electricity Supply Company and local villagers and residents where the project is located. The project participants informed them about the project and asked for their comments.

- Public survey: during July 2007-Aug 2007, one-page questionnaire was used to carry out a survey on the local stakeholders.
- Stakeholder conference: the meeting was held in Aug 2007 in Bayannaoer League to explain CDM, better understand the stakeholders' interests and obtain their comments.

E.2. Summary of the comments received:

The summary of the comments (33 questionnaires) received is listed in the following sections:

- Education level of the respondents: middle level (75.76%), higher level (24.24%) and 54.5% of males and 45.5% of females.
- Most respondents (93.94%) are satisfied with their living conditions and surrounding environment.
- 19 (57.58%) persons of the respondents know well about wind power, and 14 (42.42%) persons know a little.
- All the persons of the respondents support the local constructed wind farm.
- The respondents consider construction and operation of the proposed project may improve living level (84.85%), increase employment opportunities (93.94%) and income (84.85%), mitigate air pollution (90.91%).

- Among the negative impacts mentioned, the main concerns were the increasing amount of Ecological Environment, solid waste, wastewater and noise discharge in construction phase of the proposed project (75.76%, 15.15%, 12.12% and18.18%).
- 100% of the respondents deemed that the construction of the proposed project will have overall positive impacts on their livelihoods.
  All the persons of the respondents support the construction of the proposed project.

The survey shows that the proposed project receives very strong support from local people who believe the project will have positive impacts in many aspects.

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

The residents and local government are all very supportive of the proposed project therefore there has been no need to modify the project due to the comments received. Moreover, the local stakeholders have strong positive comments on the effects that the proposed project will bring the local economy and society. However, to control and avoid negative impacts on the local environment produced from the construction of the proposed project, the project owner should adopt relative measures as follow:

1) The project owner should guarantee and suitably add the investment of environmental protection.
2) The construction processes should be strictly implemented according to the national environment criterions.
3) The measures of environmental protection should been carried out to mitigate the environmental impacts according to the EIA report.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

The Project Owner:

Organization:	Longyuan (Bayannaoer) Wind Power Co., Ltd.
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State/Region:	Inner Mongolia
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URL:	
Represented by:	Qi Laisheng
Title:	General Manager
Salutation:	
Last Name:	Qi
Middle Name:	
First Name:	Laisheng
Department:	
Mobile:	
Direct FAX:	0471-6201717
Direct tel:	0471-6201717
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CERs Buyer:

Organization:	EDF Trading Limited
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City:	London
State/Region:	
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Country:	United Kingdom
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E-Mail:	franck.bernard@edftrading.com
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Represented by:	Franck Bernard
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding from Annex I countries is involved in the proposed project.

Annex 3

BASELINE INFORMATION

The Annex 3 provides the basic data and results of the baseline emission factor in the North China Power Grid.

The key parameters for the emission factors calculation

The key parameters in OM and BM calculation include the net caloric values (NCVs), oxidation factors (OXIDs), and CO_2 emission factor per unit of energy (EF_{co2}s) of various types of fuels, and power supply efficiency of various power generation technologies.

Table A-1 NCVs, OXIDs, and $EFco_2$s of various types of fuels

Fuel	NCV	EF_{co2} (tc/TJ)	OXID
Coal	20908 kJ/kg	25.80	1
Washed coal	26344 kJ/kg	25.80	1
Other Washed Coal[29]	8363 kJ/kg	25.80	1
Coke	28435 kJ/kg	29.20	1
Crude oil	41816 kJ/kg	20.00	1
Gasoline	43070 kJ/kg	18.90	1
Kerosene	43070 kJ/kg	19.60	1
Diesel	42652 kJ/kg	20.20	1
Fuel oil	41816 kJ/kg	21.10	1
Other petroleum products[30]	38369 kJ/kg	20.00	1
Natural gas	38931 kJ/m^3	15.30	1
Coke oven gas[31]	16726 kJ/m^3	12.10	1
Other gas[32]	5227 kJ/m^3	12.10	1
LPG	50179 kJ/kg	17.20	1
Refinery gas	46055 kJ/kg	15.70	1

Data sources:

NCVs are from China Energy Statistical Yearbook 2006, P287.

[29] Other washed coal includes middlings and slimes. The NCV value of middlings is adopted here, which is conservative because the NCV value of slimes is higher than that of middlings.

[30] The NCV value of other petroleum products are not provided in China Energy Statistical Yearbooks. This Annex calculates it as 38369 kJ/kg, i.e., 1.3108 tce/t, on the basis of Energy Balance Sheets (physical quantity) and conversion factor against SCE

[31] The NCV value here adopts the lower limit of the NCV value range, i.e., 16726-17981 kJ/m^3, for coke oven gas provided in China Energy Statistical Yearbook 2005, P 365.

[32] The NCV value here adopts the lowest NCV value among those for gas by furnace, gas by heavy oil catalytic cracking, gas by heavy oil catalytic thermal cracking, gas by pressure gasification, and water coal gas, which are provided in China Energy Statistical Yearbook 2005, P 365.

EF_{co2} are from 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Chapter 1, table 1-3.
OXID are from 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Chapter 1, table 1-4.

Table A-2 Calculation of emission factor of advanced electricity generation technology

	Variable	Efficiency of electricity transmission A	Emission factor of fuel B	Carbon oxidation rate C	Emission factor of power plant D=3.6/A/1000*B*44/12
Coal-fired power plant	$EF_{Coal,Adv}$	35.82%	25.8	1	0.9508
Gas-fired power plant	$EF_{Gas,Adv}$	47.67%	15.3	1	0.4237
Oil-fired power plant	$EF_{Oil,Adv}$	47.67%	21.1	1	0.5843

Step1 .Calculation of the Operating Margin Emission Factor ($EF_{OM,y}$)

According to the ACM0002 methodology, the Simple method OM was used to calculate the OM emission factors of the years 2003, 2004 and 2005, and then weighted average emission coefficient was calculated and selected as the $EF_{OM,y}$ for primary fuel input for thermal power supply to the North China grid.
The power data and processes for the calculation of the EF_{OM}，y in the North China Power Grid were shown in tables below. The detailed calculation formulas are described in the section B6.
Table A-3, A-4, and A-5 provide annual thermal power electricity generation in North Power Power Grid from 2003 to 2005.

Table A-3 Thermal power electricity generation in North China Power Grid in 2003

Province	Generating capacity （MWh）	Rate of electricity consumption （%）	Power supply （MWh）
Beijing	18608000	7.52	17,208,678.40
Tianjin	32191000	6.79	30,005,231.10
Hebei	108261000	6.5	101,224,035.00
Shanxi	93962000	7.69	86,736,322.20
Inner Mongolia	65106000	7.66	60,118,880.40
Shandong	139547000	6.79	130,071,758.70
Total（MWh）			**425,364,905.80**

《China Electric Power Yearbook 2004》P709，P670

Table A-4 Thermal power electricity generation in North China Power Grid in 2004

Province	Generating capacity (MWh)	Rate of electricity consumption (%)	Power supply (MWh)
Beijing	18579000	7.94	17,103,827.40
Tianjin	33952000	6.35	31,796,048.00
Hebei	124970000	6.5	116,846,950.00
Shanxi	104926000	7.7	96,846,698.00
Inner Mongolia	80427000	7.17	74,660,384.10
Shandong	163918000	7.32	151,919,202.40
Total（MWh)			**489,173,109.90**

《China Electric Power Yearbook 2005》P472，P474

Table A-5 Thermal power electricity generation in North China Power Grid in 2005

Province	Generating capacity (MWh)	Rate of electricity consumption (%)	Power supply (MWh)
Beijing	20880000	7.73	19,265,976.00
Tianjin	36993000	6.63	34,540,364.10
Hebei	134348000	6.57	125,521,336.40
Shanxi	128785000	7.42	119,229,153.00
Inner Mongolia	92345000	7.01	85,871,615.50
Shandong	189880000	7.14	176,322,568.00
Total（MWh)			**560,751,013.00**

《China Electric Power Yearbook 2006》

Table A-6, A-7, and A-8 provide the electricity generation in Northeast Power Grid from 2003 to 2005. The main data sources come from China Electric Power Yearbook 2004, 2005 and 2006.

Table A-6 Total electricity and power supply of Northeast power grid in 2003

Province	Generating capacity	Rate of electricity consumption	Power supply	Hydroelectric output	Others output	Total
	(MWh)	(%)	(MWh)	(MWh)	(MWh)	(MWh)
Liaoning	82336000	7.17	76432508.8	2383000	202000	
Jilin	33883000	7.32	31402764.4	4080000	64000	
Heilongjiang	49598000	8.48	45392089.6	1105000	0	
Total (MWh)			**153227362.8**	**7568000**	**266000**	**153227362.8**

《China Electric Power Yearbook 2004 》

Table A-7 Total electricity and power supply of Northeast power grid in 2004

Province	Generating capacity	Rate of electricity consumption	Power supply	Hydroelectric output	Rate of electricity consumption	Power supply	Others output	Total
	(MWh)	(%)	(MWh)	(MWh)	(%)	(MWh)	(MWh)	(MWh)
Liaoning	84543000	7.21	78447450	3947000	1.33	3894504.9	264000	
Jilin	33242000	7.68	30689014	6147000	0.75	6100897.5	81000	
Heilongjiang	53482000	7.84	49289011	1338000	1.27	1321007.4	46000	
Total MWh)			**158425475**			**11316409.8**	**391000**	**170132885**

《China Electric Power Yearbook 2005 》

Table A-8 Total electricity and power supply of Northeast power grid in 2005

Province	Generating capacity	Rate of electricity consumption	Power supply	Hydroelectric output	Others output	Thermal output	**Total**
	(MWh)	(%)	(MWh)	(MWh)	(MWh)	(MWh)	(MWh)
Liaoning	89668000	7.03	83364339.6	5726000	245000	83697000	
Jilin	43395000	6.59	40535269.5	8002000	99000	35294000	

Heilongjiang	59900000	7.96	55131960	1800000	100000	58000000	
Total （MWh）			**179031569.1**				**179031569.1**

《China Electric Power Yearbook 2006》

Table A-9, A-10, and A-11 provide the calculation of the average emission factor of Northeast Power Grid from 2003 to 2005. Table A-12, A-13, and A-14 provide the calculation of the simple OM emission factor of the North China Power Grid from 2003 to 2005.

Table A-9 The average emission factor of Northeast Power Grid in 2003

Fuel	Unit	Liaoning	Jilin	Heilongjiang	Sub-Total	Carbon content （tc/TJ）	OXID （%）	NCV （MJ/t,m^3,tce）	CO_2 emissions（tCO_2e）
		A	B	C	D = A+B+C	E	F	G	H=D*E*F*G*44/12/100
Raw coal	Mt	35.5651	20.0666	27.6362	83.2679	25.8	100	20908	164695313.0
Clean coal	Mt	0.7083	0	0.03	0.7383	25.8	100	26344	1839948.7
Other washed coal	Mt	6.1704	0.159	0.5341	6.8635	25.8	100	8363	5429988.0
Coke oven gas	Billion m^3	0.166	0	0	0.166	12.1	100	16726	123184.8
Other gas	Billion m^3	0.531	0	0	0.531	12.1	100	5227	123141.3
Crude oil	Mt	0.0339	0	0	0.0339	20	100	41816	103954.6
Diesel	Mt	0.0032	0.0034	0	0.0066	20.2	100	42652	20850.0
Fuel oil	Mt	0.1487	0.007	0.0432	0.1989	21.1	100	41816	643474.2
LPG	Mt	0.0155	0	0	0.0155	17.2	100	50179	49051.6
Refinery gas	Mt	0.0403	0	0.0046	0.0449	15.7	100	46055	119040.4
Natural gas	Billion m^3	0	0.004	0.447	0.451	15.3	100	38931	984997.1
Other energy	Mtce	0.2938	0	0	0.2938	0		29271.2	0.0
Total									**174132943.7**
Average emission factor									**1.13644**

Data sources: China Energy Statistical Yearbook 2004

Table A-10 The average emission factor of Northeast Power Grid in 2004

Fuel	Unit	Liaoning	Jilin	Heilongjiang	Sub-Total	Carbon content (tc/TJ)	OXID (%)	NCV (MJ/t,m³,tce)	CO_2 emissions (tCO_2e)
		A	B	C	D = A+B+C	E	F	G	H=D*E*F*G*44/12/100
Raw coal	Mt	41.442	23.109	30.848	95.399	25.8	100	20908	188689376.8
Clean coal	Mt	0.8475	0.0109	0.0488	0.9072	25.8	100	26344	2260871.6
Other washed coal	Mt	5.7767	0.1426	0.61	6.5293	25.8	100	8363	5165589.1
Coke oven gas	Billion m^3	0.483	0.291	0	0.774	12.1	100	16726	574367.5
Other gas	Billion m^3	5.733	0.419	0	6.152	12.1	100	5227	1426676.9
Crude oil	Mt	0	0	0	0	20	100	41816	0.0
Diesel	Mt	0.0204	0.0116	0.0024	0.0344	20.2	100	42652	108672.7
Fuel oil	Mt	0.1281	0.0178	0.0286	0.1745	21.1	100	41816	564536.2
LPG	Mt	0.0219	0	0	0.0219	17.2	100	50179	69305.2
Refinery gas	Mt	0.0979	0	0.0114	0.1093	15.7	100	46055	289779.7
Natural gas	Billion m^3	0	0.003	0.253	0.256	15.3	100	38931	559111.4
Other energy	Mtce	0.2697	0.0507	0	0.3204	0		29271.2	0
Total									**199708287.3**
Average emission factor									**1.17384**

Data sources: China Energy Statistical Yearbook 2005

Table A-11 The average emission factor of Northeast Power Grid in 2005

Fuel	Unit	Liaoning	Jilin	Heilongjiang	Sub-Total	Carbon content （tc/TJ）	OXID（%）	NCV （MJ/t,m3,tce）	CO_2 emissions（tCO2e）
		A	B	C	D = A+B+C	E	F	G	H=D*E*F*G*44/12/100
Raw coal	Mt	43.0541	24.4613	33.8321	101.3475	25.8	100	20908	200454895.9
Clean coal	Mt	0	0	0	0	25.8	100	26344	0.0
Other washed coal	Mt	5.2474	0.1926	0.2416	5.6816	25.8	100	8363	4494939.9
Coke oven gas	Billion m^3	0.103	0.357	0.068	0.528	12.1	100	16726	391816.6
Other gas	Billion m^3	1.262	0.837	0	2.099	12.1	100	5227	486767.7
Crude oil	Mt	0.0116	0	0	0.0116	20	100	41816	35571.5
Diesel	Mt	0.0118	0.0148	0.0057	0.0323	20.2	100	42652	102038.7
Fuel oil	Mt	0.0932	0.0246	0.0155	0.1333	21.1	100	41816	431247.4
LPG	Mt	0.0012	0	0	0.0012	17.2	100	50179	3797.5
Refinery gas	Mt	0.0548	0	0.0132	0.068	15.7	100	46055	180283.8
Natural gas	Billion m^3	0	0.084	0.224	0.308	15.3	100	38931	672681.0
Other energy	Mtce	0.1618	0	0	0.1618	0	100	29271.2	0.0
Total									**207254040**
Average emission factor									**1.15764**

Data sources: China Energy Statistical Yearbook 2006

Table A-12 The fuel consumption and total emissions of North China Power Grid in 2003

Fuel	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Sub-Total	Carbon content	OXID	NCV	CO2 emissions（tCO2e）
									（tc/TJ）	（%）	（MJ/t,km3）	K=G*H*I*J*44/12/10000（Quality units）
								G=A+B+C+D+E+				K=G*H*I*J*44/12/1000
		A	B	C	D	E	F	F	H	I	J	(Volume units)
Raw coal	10^4t	714.73	1052.74	5482.64	4528.5	3949.32	6808	22535.94	25.8	100	20908	445737636.11
Clean coal	10^4t						9.41	9.41	25.8	100	26344	234510.60
Other washed coal	10^4t	6.31		67.28	208.21		450.9	732.7	25.8	100	8363	5796681.31
Coke	10^4t					2.8		2.8	29.2	100	28435	85244.34
Coke oven gas	10^8m^3	0.24	1.71		0.9	0.21	0.02	3.08	12.1	100	16726	228559.67
Other gas	10^8m^3	16.92		10.63		10.32	1.56	39.43	12.1	100	5227	914399.71
Crude oil	10^4t						29.68	29.68	20	100	41816	910139.18
Gasoline	10^4t						0.01	0.01	18.9	100	43070	298.48
Diesel	10^4t	0.29	1.35	4		2.91	5.4	13.95	20.2	100	42652	440693.26
Fuel oil	10^4t	13.95	0.02	1.11		0.65	10.07	25.8	21.1	100	41816	834672.45
LPG	10^4t							0	17.2	100	50179	0.00
Refinery gas	10^4t			0.27			0.83	1.1	15.7	100	46055	29163.56
Natural gas	10^8m^3		0.5				1.08	1.58	15.3	100	38931	345076.60
Other oil products	10^4t							0	20	100	38369	0.00
other Coking products	10^4t							0	25.8	100	28435	0.00

Other energy	10^4tce	9.83					39.21	49.04	0	0	0	0.00
											Total	**455557075.3**

Data sources: China Energy Statistical Yearbook 2004

Table A-13 The fuel consumption and total emissions of North China Power Grid in 2004

Fuel	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Sub-Total	Carbon content	OXID	NCV	CO2 emissions（tCO2e）
									（tc/TJ）	（%）	（MJ/t,km3）	K=G*H*I*J*44/12/10000（Quality units ）
		A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	J	K=G*H*I*J*44/12/1000 (Volume units)
Raw coal	10^4t	823.09	1410	6299.8	5213.2	4932.2	8550	27228.29	25.8	100	20908	538547476.60
Clean coal	10^4t						40	40	25.8	100	26344	996856.96
Other washed coal	10^4t	6.48		101.04	354.17		284.22	745.91	25.8	100	8363	5901190.88
Coke	10^4t					0.22		0.22	29.2	100	28435	6697.77
Coke oven gas	10^8m^3	0.55		0.54	5.32	0.4	8.73	15.54	12.1	100	16726	1153187.45
Other gas	10^8m^3	17.74		24.25	8.2	16.47	1.41	68.07	12.1	100	5227	1578574.39
Crude oil	10^4t							0	20	100	41816	0.00
Gasoline	10^4t									100		0.00
Diesel	10^4t	0.39	0.84	4.66				5.89	20.2	100	42652	186070.49
Fuel oil	10^4t	14.66		0.16				14.82	21.1	100	41816	479451.38
LPG	10^4t							0	17.2	100	50179	0.00
Refinery gas	10^4t		0.55	1.42				1.97	15.7	100	46055	52229.29
Natural gas	10^8m^3		0.37		0.19			0.56	15.3	100	38931	122305.63
Other oil products	10^4t							0	20	100	38369	0.00

other Coking products	10^4t							0	25.8	100	28435	0.00
Other energy	10^4tce	9.41		34.64	109.73	4.48		158.26	0	0	0	0.00
											Total	**549024040.8**

Data sources: China Energy Statistical Yearbook 2005

Table A-14 The fuel consumption and total emissions of North China Power Grid in 2005

Fuel	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Sub-Total	Carbon content	OXID	NCV	CO2 emissions (tCO2e)
									(tc/TJ)	(%)	(MJ/t,km3)	K=G*H*I*J*44/12/10000 (Quality units)
		A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	J	K=G*H*I*J*44/12/1000 (Volume units)
Raw coal	10^4t	897.75	1675.2	6726.5	6176.45	6277.23	10405.4	32158.53	25.8	100	20908	636062535.80
Clean coal	10^4t						42.18	42.18	25.8	100	26344	1051185.66
Other washed coal	10^4t	6.57		167.45	373.65		108.69	656.36	25.8	100	8363	5192725.19
Coke	10^4t					0.21	0.11	0.32	29.2	100	28435	9742.21
Coke oven gas	10^8m^3	0.64	0.75	0.62	21.08	0.39	0	23.48	12.1	100	16726	1742396.48
Other gas	10^8m^3	16.09	7.86	38.83	9.88	18.37	0	91.03	12.1	100	5227	2111027.27
Crude oil	10^4t					0.73	0	0.73	20	100	41816	22385.50
Gasoline	10^4t			0.01			0	0.01	18.9	100	43070	298.48
Diesel	10^4t	0.48	0	3.54	0	0.12	0	4.14	20.2	100	42652	130786.39
Fuel oil	10^4t	12.25	0	0.23	0	0.06	0	12.54	21.1	100	41816	405689.63
LPG	10^4t							0	17.2	100	50179	0.00
Refinery gas	10^4t			9.02				9.02	15.7	100	46055	239141.20
Natural gas	10^8m^3	0.28	0.08	0	2.76	0	0	3.12	15.3	100	38931	681417.08

Other oil products	10^4t							0	20	100	38369	0.00
other Coking products	10^4t							0	25.8	100	28435	0.00
Other energy	10^4tce	8.58	0	32.35	69.31	7.27	118.9	236.41	0	100	0	0.00
												647649330.9

Data sources: China Energy Statistical Yearbook 2006

Table A-15 The OM factor of North China Power Grid

Years	Thermal generation delivered to North China Power Grid	Generation imported from Northeast China Power Grid[33]	Total generation	The emissions from North China Power Grid	The average emission factor of Northeast China Power Grid	The emissions from Northeast China Power Grid	Total emissions	OM
	A	B	C=A+B	D	E	F=B*E	G=D+F	H=G/C
2003	425364905.8	4244380	429609285.8	455551793.4	1.13644	4823462.142	460380537.4	1.07162613
2004	489173109.9	4514550	493687659.9	549031577.7	1.17384	5299346.142	554323387	1.12282204
2005	560,751,013.00	23423000	584174013	647686276.3	1.15764	27115393.13	674764724	
Total			**1507470958.7**				**1689468648**	
Average OM								**1.1207**

[33] *China Electric Power Yearbook 2004, 2005, 2006*

Step 2. Calculation of the Build Margin Emission Factor （ $EF_{BM,y}$ ）

According to the ACM0002 methodology, the Build Margin emission factor $EF_{BM,y}$ *ex-ante* was selected to identify sample group for calculating Build Margin emission factor. Based on the description of formulas in section B6, the Build Margin emission factor is calculated to be 0.9397 tCO_2/MW•h.
The power data and processes for the calculation of the $EF_{BM,y}$ in the North China Power Grid were shown in table A-16 ~ A-20 . The detailed calculation formulas are described in the section B6.

Step 2a: calculating the respective percentages of CO_2 emissions from coal fired power generation, oil fired power generation, and gas fired power generation against total CO_2 emissions from fossil fuel fired power generation

Table A-16 Calculation of emission weight of solid fuel, liquid fuel and gas fuel in all fuel emission

Fuel	unit	Beijing	Tianjin	Hebei	Shanxi	Shandong	Inner Mongolia	Total	NCV(MJ/t,km³,tce)	Emission Factor (Tc/TJ)	Carbon oxidation rate(%)	CO_2 emission(tCO_2e)
		A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	J	K=G*H*I*J*44/12/100
Raw coal	10^4t	897.75	1675.20	6726.50	6176.45	10405.4	6277.23	32158.53	20908	25.80	1	636,062,536
Clean coal	10^4t	0	0	0	0	42.18	0	42.18	26344	25.80	1	1,051,186
Other washed coal	10^4t	6.57	0	167.45	373.65	108.69	0	656.36	8363	25.80	1	5,192,725
coke	10^4t	0	0	0	0	0.11	0.21	0.32	28435	29.20	1	9,742
Sub-total												**642,315,054**
Crude oil	10^4t	0	0	0	0	0	0.73	0.73	41816	20.00	1	22,385
Gasoline	10^4t	0	0	0.01	0	0	0	0.01	43070	18.90	1	298
Kerosene	10^4t	0	0	0	0	0	0	0	43070	19.60	1	0
Diesel	10^4t	0.48	0	3.54	0	0	0.12	4.14	42652	20.20	1	130,786
Fuel oil	10^4t	12.25	0	0.23	0	0	0.06	12.54	41816	21.10	1	405,690
other petroleum product	10^4t	0	0	0	0	0	0	0	38369	20.00	1	0
Sub-total												**559,160**
Natural gas	10^7m^3	2.8	0.8	0	27.6	0	0	31.2	38931	15.30	1	681,417
COG	10^7m^3	6.4	7.5	6.2	210.8	0	3.9	234.8	16726	12.10	1	1,742,396
Other Gas	10^7m^3	160.9	78.6	388.3	98.8	0	183.7	910.3	5227	12.10	1	2,111,027
LPG	10^4t	0	0	0	0	0	0	0	50179	17.20	1	0
Refinery gas	10^4t	0	0	9.02	0	0	0	9.02	46055	15.70	1	239,141
Sub-total												**4,773,982**

Total												**647,649,331**

From above table and formulae (5), (6) and (7), the weights are as follows:

λ_{coal} =99.17% λ_{oil} =0.08% λ_{gas} =0.74%

Step 2b: calculating the corresponding emission factor for fossil fuel fired power generation

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} = 0.9466 \text{ (} tCO_2/MWh \text{)}$$

Step 2c: calculating the $EF_{BM,y}$ of local grid

Table A-17 Installed capacity of North China Power Grid in 2005

Installed capacity	unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Thermal Power	MW	3833.5	6149.9	22333.2	22246.8	19173.3	37332	111068.7
Hydropower	MW	1025	5	784.5	783	567.9	50.8	3216.2
Nuclear	MW	0	0	0	0	0	0	0
Wind power and other	MW	24	24	48	0	208.9	30.6	335.5
Total	MW	4882.5	6178.9	23165.7	23029.8	19950.1	37413.4	114620.4

Data sources:《China Electric Power Yearbook2006》

Table A-18 Installed capacity of North China Power Grid in 2004

Installed capacity	unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Thermal Power	MW	3458.5	6008.5	19932.7	17693.3	13641.5	32860.4	93594.9
Hydropower	MW	1055.9	5	783.8	787.3	567.9	50.8	3250.7
Nuclear	MW	0	0	0	0	0	0	0
Wind power and other	MW	0	0	13.5	0	111.8	12.3	137.6
Total	MW	4514.4	6013.5	20730	18480.6	14321.2	32923.5	96983.2

Data sources:《China Electric Power Yearbook2005》

Table A-19 Installed capacity of North China Power Grid in 2003

Installed capacity	unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Thermal Power	MW	3347.5	6008.5	17698.7	15035.8	11421.7	30494.4	84006.6
Hydropower	MW	1058.1	5	764.3	795.7	592.1	50.8	3266
Nuclear	MW	0	0	0	0	0	0	0
Wind power and other	MW	0	0	13.5	0	76.6	0	90.1

Total	MW	4405.6	6013.5	18476.5	15831.5	12090.4	30545.2	87362.7

Data sources:《China Electric Power Yearbook2004》

Table A-20 The new installed capacity from 2003-2005 in the North China Power Grid

	Installed capacity in 2003	Installed capacity in 2004	Installed capacity in 2005	Addition capacity from 2003 to 2005	Addition share**(%)**
	A	B	C	D=C-A	
Thermal Power	84006.6	93594.9	111068.7	27062.1	99.28%
Hydropower	3266	3250.7	3216.2	-49.8	-0.18%
Nuclear	0	0	0	0	0.00%
Wind power	90.1	137.6	335.5	245.4	0.90%
Total（MW）	87362.7	96983.2	114620.4	27257.7	100.00%
Share of 2004 installed capacity	0.762191547	84.61%	100.00%		

Build Margin emission factor

$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal}$ =0.9465×99.28%=0.9398tCO_2/MW•h

where:

CAP_{Total} is the total capacity addition,

$CAP_{Thermal}$ is the fossil fuel fired capacity addition.

Step 3. Calculation of the Baseline Emissions Factor（ EF_y ）

According to the baseline methodology (ACM0002), the baseline emission factor EF_y is calculated as the weighted average of the Operating Margin emission factor $EF_{OM,y}$ and the Build Margin emission factor $EF_{BM,y}$, as shown in table A-21。

Table A-21 Baseline Emission factor (EF_y) of the North China Power Grid

Calculation of the Key factors:

Operating Margin emission factor（$EF_{OM,y}$)（tCO_2/MWh）：1.1207

Build Margin emission factor（$EF_{BM,y}$)（tCO_2/MWh）：0.9465×99.28%=0.9398

Baseline Emission factor（EF_y）（tCO_2/MWh）：1.07969×0.75+0.91878×0.25=1.0755

Note: the latest version of ACM0002 (version 6) provides the following default weights for wind power projects: Operating Margin, ω_{OM} = 0.75; Build Margin, ω_{BM} = 0.25.

Annex 4

MONITORING PLAN

Please refer to B7.2 in the PDD.