



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

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**SECTION A. General description of project activity****A.1. Title of the project activity:**

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CECIC Zhangbei Dayangzhuang Wind Farm Project
 PDD version 1.2
 Date of document: 16 April 2008

A.2. Description of the project activity:

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CECIC Zhangbei Dayangzhuang Wind Farm Project (hereinafter referred to as the proposed project) is located in Zhangbei County, Hebei Province, and is developed by CECIC Wind Power (Zhangbei) Yunwei Co. Ltd. Based on the condition of the project site, the proposed project is planned to install and operate 66 wind turbines of 750kW. Therefore, the total installed capacity of proposed wind farm is 49.5MW. According to the description of FSR, the available generation hours of the Project is 1950hours with a load factor of 0.2226 which considered the wind resource analysis data from 1971 to 2006, the characters of wind turbine, captive power and line losses of the transmission lines. Therefore the Estimated annual electricity supplied to the grid is about 96530MWh at the full capacity, which will be sold to the North China Power Grid (NCPG). As the NCPG is dominated by thermal power generation, the establishment of the proposed project will lead to greenhouse gas (GHG) emission reductions, estimated to be approximately 103,796 tonnes of CO₂e per year.

The proposed project will therefore help reduce GHG emissions versus the high-growth, coal-dominated business-as-usual scenario. The proposed project promotes local sustainable development through the following aspects:

- reducing CO₂, SO₂ and NO_x emissions;
- creating local employment opportunity during the assembly and installation of wind turbines, and for operation of the proposed project; and
- reducing other particulate pollutants resulting from the fossil fuel fired power plants compared with a business-as-usual scenario.

A.3. Project participants:

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Name of Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
P.R. China (host)	CECIC Wind Power (Zhangbei) Yunwei Co. Ltd.	No
Switzerland	Vitol SA	No

Please see Annex 1 for detailed contact information.

A.4. Technical description of the project activity:**A.4.1. Location of the project activity:**

A.4.1.1. Host Party(ies):

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People's Republic of China

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

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Hebei Province

A.4.1.3. City/Town/Community etc:

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Zhangbei County, Zhangjiakou City

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

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The proposed Windfarm is located in the southwest of Zhangbei County. It is located longitude 114°33'4" East to 114°37'23" East and latitude 41°07'22" North to 41°10'36" North. The altitude of the site ranges from 1422m to 1562m above mean sea level. Figure 1 shows the location of the project.

Figure 1 Map showing the location of the Project**A.4.2. Category(ies) of project activity:**

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Category: Renewable electricity in grid connected applications

Sector scope: (1) Energy industries

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

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According to the analysis in the Feasibility Study Report approved by local government, the net average operation hours of the proposed project will be 1950h, and the proposed project will provide total installed capacity of 49.5MW so the net electricity supplied to the grid is expected to be 96,530 MWh annually. The electricity generated from the project will be transmitted to Zhangbei 220kV substation of NCPG.

Based on the condition of the project site, the proposed project is planned to install and operate 66 wind turbines of 750kW. The selected turbines will be manufactured by Zhejiang Windey Wind Generating Engineering Co. Ltd. The detailed parameters of selected turbines are provided in Table 1.

Table 1 Key technology to be employed at the proposed project wind farm

Parameter	Value
Manufacture	Zhejiang Windey Wind Generating Engineering Co. Ltd.
Model	WD49/750kW
Rated power(kW)	750
Number of rotors	3
Rotor diameter (m)	49
Swept area(m ²)	1886
Rated rotor speed (rpm)	15
Cut-in wind speed (m/s)	3.5
Rated wind speed (m/s)	15
Cut-out wind speed (m/s)	23
Hub height of the wind turbines (m)	50 to 65
Rated Voltage	690

The wind farm will be connected with one expanded 110kV substation, and then connected with 220kV Zhangbei substation via 110kV transmission line. Each wind turbine will have a transformer from 690V to 35kV, and connects with the expanded 110kV substation. The project will newly install an 110kV/35kV transformer with the capacity of 50MVA.

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

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The project participants chose renewable crediting period. The ex-ante estimated average annual emission reductions over the first seven-year crediting period of the project are as follows:

Table 2 Ex-ante estimated amount of emission reductions over the chosen crediting period

Years*	Annual estimation of emission reductions (tCO ₂ e)
2008	103,796
2009	103,796
2010	103,796
2011	103,796
2012	103,796
2013	103,796



2014	103,796
Total estimated reductions(tCO₂e)	726,572
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tCO ₂ e)	103,796

Note: * Using 12-monthly periods from the start of the crediting period, not calendar years.

A.4.5. Public funding of the project activity:

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

SECTION B. Application of a baseline and monitoring methodology

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

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- Approved baseline and monitoring methodology ACM0002 (version 07) “Consolidated methodology for grid-connected electricity generation from renewable sources”
- “Tool for the demonstration and assessment of additionality (version 04)”
- “Tool to calculate the emission factor for an electricity system” (version 01)

Each of these documents is available from

<http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html>.

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

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The approved methodology ACM0002 is applicable to the proposed project activity, because:

- The proposed project involves electricity capacity addition from wind sources; and
- The proposed project is connected to the grid; and
- The proposed project does not involve switching from fossil fuels to renewable energy at the site of the project activity; and
- The geographic and system boundaries for the North China Power Grid (NCPG) can be clearly identified and information on the characteristics of the grid is available.

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

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

According to the “Tool to calculate the emission factor for an electricity system”, the delineation of grid boundaries as provided by the DNA of China is used. NCPG including Beijing, Tianjin, Hebei, Shanxi, Inner Mongolia and Shandong¹ is the project electricity system, which is defined by the spatial extent of the power plants that can be dispatched without significant transmission constraints. The electricity

¹ Chinese DNA designates it at <http://cdm.cchina.gov.cn/english/NewsInfo.asp?NewsId=2190>.



transmission between different provinces in the NCPG is very large and it is unreasonable for the proposed project to regard the Provincial Power Grid as the project boundary.

The connected electricity system is the Northeast Power Grid (NEPG), consisting of three provincial grids: Jilin, Liaoning and Heilongjiang.

According to the approved methodology ACM0002, the emission sources and GHGs in the project boundary are as follows:

Table 3 Emission sources and GHG included in the project boundary

	Source	Gas	Included?	Justification / Explanation
Baseline	Grid	CO ₂	Yes	Main emission source
		CH ₄	No	Minor emission source
		N ₂ O	No	Minor emission source
Project Activity	Fossil fuel use	CO ₂	No	According to ACM0002, the project emission of renewable energy project activity is zero.
		CH ₄	No	
		N ₂ O	No	

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

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The proposed project is the installation of a new grid-connected renewable power plant/unit, as described in ACM0002, the baseline scenario is the following:

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

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

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As shown in common practice analysis, many windfarms developed during recent years in Hebei Province were developed and registered as CDM projects, and the CDM income was suggested in the FSR² (completed in May 2007) to improve the IRR above benchmark as the IRR without carbon income is lower than the benchmark, so the developer decided to develop the proposed project as a CDM project on 3rd Sep 2007 and confirmed Carbon Resource Management Ltd as the CDM manager and developer to develop this proposed project as a CDM project on 20th Sep 2007. After the FSR was approved on 28th Sep 2007, the proposed project launched construction on 28th Jan 2008. The incentive from the CDM, therefore, had been fully taken into account prior to the starting date of the project activity, aiming to obtain the additional funding to secure the project financially.

² Relevant section of the FSR was translated and sent to DOE.



The approved methodology ACM0002 requires the use of the latest version of the “Tool for the demonstration and assessment of additionality” agreed by the Executive Board to demonstrate and assess the additionality of the proposed project. The steps are described below.

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

Realistic and credible alternatives to the project activity that can be part of the baseline scenario are defined through the following sub-steps:

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

The demonstration about the alternative that provides outputs or services comparable with the proposed CDM project activity is as follows:

- a) *The proposed project activity undertaken without being registered as a CDM project activity.*
- b) *A fossil fuel-fired power plant with the comparable capacity or electricity generation.*
- c) *A power plant using other source of renewable energy with the comparable capacity or electricity generation, such as PV, biomass and hydro, etc.*
- d) *Comparable capacity or electricity generation addition provided by the NCPG.*

Because there is no exploitable hydropower and biomass resource in the project area which is desert,³ and there are technical and cost barriers to developing solar energy or other renewable energy sources, alternative (c) is not a feasible alternative

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

For the alternative (b) described in sub-step 1a, if taking the capacity that can generate the same annual electricity generation and estimating annual utilization hours as 5,865 which is the average utilization hours of the thermal units in China in 2005, the alternative baseline scenario for the proposed project should be a fuel-fired power plant with installed capacity of 16.5MW. Further, as the proposed project is a grid-connected wind power generation project, the alternative baseline scenario must be a grid-connected fuel-fired power generation project. However, according to Chinese regulations, coal-fired power plants of less than 135MW are prohibited to be built in the areas covered by the large grids such as provincial grids⁴. For these reasons, the possible alternative baseline scenario of building a 16.5MW fossil fuel-fired power plant conflicts with Chinese regulations. So, scenario b) is not compliant with the mandatory laws and regulations.

Alternatives (a), (c) and (d) are compliant with the mandatory laws and regulations.

Step 2 of the Additionality Tool will show that the alternative (a) would be lack of finance attraction, and is not the baseline. Therefore, alternative (d) *comparable capacity or electricity generation addition provided by North China Power Grid* can be taken as a realistic alternative for the project activity and

³ <http://www.sp.com.cn/zgsd/snzy/hebei.htm>

⁴ Notice on Strictly Prohibiting the Installation of Fuel fired Generators with the Capacity of 135MW or below issued by the General Office of the State Council, Decree No. 2002-6.



comply with the applicable laws and regulations.

Step 2. Investment analysis

The purpose of this step is to determine whether the proposed project activity is economically or financially less attractive than at least one other alternatives, identified in step 1, without the revenue from the sale of certified emission reductions (CERs), using the following sub-steps:

Sub-step 2a. Determine appropriate analysis method

This step determines whether to apply the simple cost analysis, investment comparison analysis or benchmark analysis (sub-step 2b):

The proposed project activity generates financial benefits by the sales of electricity, so the simple cost analysis (Option I) should not be applied. Therefore, the benchmark analysis (Option III) is adopted.

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

According to the *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects* issued by State Power Corporation of China in 2002, the benchmark of total investment financial internal rate of return (IRR) of electric power industry is 8%, and only if the total investment IRR of the project is higher than or equivalent to this benchmark, the proposed project is financially feasible. So this benchmark is widely used in assessment and approval of Chinese electricity power industrial Feasibility Study Report, especially for new project. The approved FSR of the proposed project adopted this Interim Rules and used 8% as the benchmark too. The benchmark of 8% IRR, therefore, is used in this analysis for the proposed project activity.

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

The investment analysis in the Feasibility Study Report is based on the national regulation, the material and equipment price level, and the data used in this benchmark analysis is from FSR and shown as follows:

Table 4 Data regarding finance

Item	Value
Annual Generation	96,530 MWh
Investment	378.17 million RMB Yuan
Annual O&M costs	13.82 million RMB Yuan
Operational lifetime	20 years
On-grid tariff (Excluding VAT)	0.51RMB Yuan/kWh
Value added tax	8.5%
Revenue tax	25%
Education tax	4%
City building tax	1%
Assumed CER price	8.0 €/t CO ₂ e

Source: Feasibility Study Report.



Table 5 shows the IRR of the project without and with CER revenue from CDM: without CER revenue the IRR of the proposed project is below the benchmark 8%; with revenue from the CDM the proposed project would be more financially attractive at the assumed CER price with an IRR above the benchmark.

Table 5 IRR analysis of the proposed project

Without CDM	With CDM
6.11%	8.91%

Sub-step 2d. Sensitivity analysis

A sensitivity analysis is used to assess the impact of uncertainties in the input values of the financial model on the calculated IRR. By identifying the most critical variable, the impact of potential changes in these variables on the IRR was assessed in the FSR. Based on the analysis in the FSR, for a wind farm project without CDM funding, the critical factors that influences the calculated IRR are:

- 1) Static Investment;
- 2) Annual O&M cost;
- 3) On-grid tariff.
- 4) Annual power supply

According to the industrial rules and relative regulations, the sensitivity analysis in FSR assumed the above critical factors varying from –10% to +10%, so the sensitivity analysis in this section uses this variation range too. The analysis of IRR sensitivity is presented in the following Figure 2.

Figure 2: IRR sensitivity analysis for the proposed project



Figure 2 shows that, with the critical variables in the $\pm 10\%$ range, the calculated IRR of the proposed project is unlikely to reach the benchmark 8%. Therefore, the proposed project is not financially feasible without the revenue of CERs under any reasonable variation of the critical parameters.

→ *If after the sensitivity analysis it is concluded that the proposed CDM project activity is unlikely to be the most financially attractive (as per step 2c para 8a) or is unlikely to be financially attractive (as per step 2c para 8b), then proceed to Step 3 (Barrier analysis) or Step 4 (Common practice analysis).*

The financial analysis shows that the project is not the most financially attractive alternative, and the sensitivity analysis shows that it is unlikely to be financially attractive under reasonable variations in the assumptions.

Step 4. Common practice analysis

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

In Hebei Province, such as Zhangjiakou region, where the proposed project locates, and Chengde region, there is a rich wind resources, so many wind farms were developed in these regions. The similar wind farms developed and being developed within five years in Hebei Province are listed in Table 6 below.

Table 6 Similar wind farm projects located in Hebei Province

Name	Commissioning Date	Capacity (MW)	Notes
Shangyi Damanjing	Jul 2005	34.5	Facing financial barriers, receiving carbon funding



Chengde Hongsong	Dec 2005	50.1	Facing financial barriers, receiving carbon funding
Zhangbei Manjing	Apr 2006	45	Registered CDM project (0233)
Shangyi Manjing East	Sep 2006	49.5	Registered CDM project (0842)
Zhangbei Mijiagou	Jan 2007	49.5	Registered CDM project (0845)
Kangbao Wolongtushan	Jan 2007	30	Registered CDM project (0878)
Chengde Songshan	Feb 2007	49.5	Registered CDM project (0877)
Hebei Guyuan	Under construction	30.6	Registered CDM project (0873)
Wanquan Yulong	Under construction	36	Applying as CDM project
Shangyi Shirensan	Under construction	49.5	Applying as CDM project
Hebei Haixing	Under construction	49.5	Applying as CDM project
Hebei Huanghua	Under construction	49.5	Applying as CDM project

Source: http://www.cwea.org.cn/download/display_info.asp?cid=2&sid=16&id=19;
<http://cdm.unfccc.int/Projects/registered.html>; <http://cdm.unfccc.int/Projects/Validation/index.html>

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

All the wind farms in Table 6 are applying carbon income and some of these wind farms have already successfully been registered or are applying as CDM projects. Presently, similar wind farms in Hebei province faces financial barriers and is not feasible in Hebei province without carbon income. Therefore, the wind power projects similar with the proposed project without carbon income are not the common practice in Hebei Province.

→ *If Sub-steps 4a and 4b are satisfied, i.e. similar activities cannot be observed or similar activities are observed, but essential distinctions between the project activity and similar activities can reasonably be explained, then the proposed project activity is additional.*

In conclusion, all the steps above are satisfied, the proposed CDM project is not the baseline scenario, and the project activity is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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1. Baseline Emission Calculation

According to ACM0002, the baseline emissions include only CO₂ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity, calculated as follows:

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



Where:

BE_y = Baseline emissions in year y (tCO₂/yr).

EG_y = Electricity supplied by the project activity to the grid (MWh).

$EG_{baseline}$ = Baseline electricity supplied to the grid in the case of modified or retrofit facilities (MWh).

For new power plants this value is taken as zero. The proposed project is a new power plant, so this value is 0.

$EF_{grid,CM,y}$ = Combined margin CO₂ emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system”.

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

Step 1. Identify the relevant electric power system

The power generated from the proposed project activity will be supplied to the grid. As the DNA has published a delineation of the project electricity system and connected electricity systems, these delineations are used.

Following the DNA delineation, the project electricity system is the North China Power Grid (NCPG), consisting of six provincial grids: Beijing, Tianjin, Hebei, Shanxi, Inner Mongolia and Shandong.

The connected electricity system is the Northeast Power Grid (NEPG), consisting of three provincial grids: Jilin, Liaoning and Heilongjiang. There is electricity transferring from the connected electricity systems to the project electricity system, so the CO₂ emission factor for net electricity imports ($EF_{grid,import,y}$) from the connected electricity system should be determined using one of the following options for the purpose of determining the operating margin emission factor:

- (a) 0 tCO₂/MWh, or
- (b) The weighted average operating margin (OM) emission rate of the exporting grid, determined as described in step 3 (d) below; or
- (c) The simple operating margin emission rate of the exporting grid, determined as described in step 3 (a), if the conditions for this method, as described in step 2 below, apply to the exporting grid; or
- (d) The simple adjusted operating margin emission rate of the exporting grid, determined as described in step 3 (b) below.

The option (b) is selected to calculate the CO₂ emission factor(s) for net electricity imports ($EF_{grid,import,y}$).

The electricity imports from the Northeast Power Grid to the North China Power Grid has not changed significantly from 2002 to 2005 (see Annex 3), so for the purpose of determining the build margin emission factor, the spatial extent is limited to the project electricity system according to the tool.

Step 2. Select an operating margin (OM) method

According to the tool, four various methods are provided for calculating the operating margin emission factor ($EF_{grid,OM,y}$), including:



- a) Simple OM;
- b) Simple Adjusted OM;
- c) Dispatch data analysis OM;
- d) Average OM

According to the tool, the Simple OM method is applicable to the project if the low-cost resources constitute less than 50% of total grid generation in average of the five most recent years. Since generation from all sources (including hydro power) other than thermal plants were less than 2% of total generation in the North China Power Grid in 2004⁵ and this percentage has not changed significantly in recent years, the Simple OM method is applicable to the proposed project.

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

- (ex-ante option) the full generation-weighted average for the most recent 3 years for which data are available at the time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period if or;
- (ex-post option) the year in which project generation occurs, if $EF_{OM,y}$ is updated based on ex-post monitoring.

Here ex-ante vintage is chosen, and the three most recent years for which data is available are 2003-2005. $EF_{grid,OM}$ is fixed during the first crediting period.

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

The Simple Operating Margin emission factor $EF_{grid,OM,y}$ is defined as the generation-weighted average emissions per unit net electricity generation (tCO_2/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants. Three options can be selected to calculate the simple OM:

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

As data for options A and B are not available, the published DNA data uses option C for the calculation of the operating margin emission factor.

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

⁵ Page 474, Electric Power in China (2005) by China Electricity Council.



$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{EG_y} \quad (2)$$

Where

$EF_{grid,OMsimple,y}$ = the simple operating margin CO2 emission factor in year y (tCO₂/MWh)

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

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

$EF_{CO_2,i,y}$ = the CO₂ emission factor of fossil fuel type i in year y (tCO₂/GJ)

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

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

y = when using the ex-ante option, is the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation

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

$$EF_{grid,OMsimple} = 1.1202 \text{ tCO}_2/\text{MWh}$$

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

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

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

As sample group (b) comprises the larger annual generation, sample group (b) is chosen as the cohort of power units when calculating the build margin.

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

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

Step 5. Calculate the build margin emission factor

The Build Margin is calculated as the generation-weighted average emission factor (tCO₂/MWh) of a sample of power plants *m*, as follows:



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

$EF_{grid,BM,y}$ = the Build margin CO₂ emission factor in year y (t CO₂/MWh);

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

$EF_{EL,m,y}$ = the CO₂ emission factor of power unit m in year y (tCO₂/MWh);

m = the power units included in the build margin;

y = the most recent historical year for which power generation data is available.

The CO₂ emission factor of each power unit m ($EF_{EL,m,y}$) should be determined as per the guidance in step 3 (a) for the simple OM, using options B1, B2 or B3, using for y the most recent historical year for which power generation data is available, and using for m the power units included in the build margin. On the basis of the data available, the published emission factor calculations of the DNA uses option B2:

$$EF_{EL,m,y} = EF_{CO2,m,i,y} * 3.6 / \eta_{m,y} \quad (4)$$

Where

$EF_{EL,m,y}$ is the CO₂ emission factor of power unit m in year y (tCO₂/MWh)

$EF_{CO2,m,i,y}$ is the average CO₂ emission factor of fuel type i used in power unit m in year y (tCO₂/GJ)

$\eta_{m,y}$ is the average net energy conversion efficiency of power unit m in year y (%)

y is the most recent historical year for which power generation data is available

On the basis of the data available, the build margin emission factor is calculated by the DNA on the basis of the share of the fuel/technology in latest 20% capacity additions⁶:

Using this method, the $EF_{grid,BM,y}$ of North China Power Grid is calculated as 0.9404 tCO₂/MWh (see Annex 3 for more details).

Step 6. Calculation of the combined margin emission factor

The combined margin emission factor is calculated as follows:

$$EF_{grid,CM,y} = w_{OM} \cdot EF_{grid,OM,y} + w_{BM} \cdot EF_{grid,BM,y} \quad (5)$$

Where

$EF_{grid,BM,y}$ is the build margin CO₂ emission factor in year y (tCO₂/MWh)

$EF_{grid,OM,y}$ is the operating margin CO₂ emission factor in year y (tCO₂/MWh)

w_{OM} is the weighting of operating margin emissions factor (%)

w_{BM} is the weighting of build margin emissions factor (%).

⁶ This is conservative as the load factor of the highest-emitting plant are higher than those of the lower emitting plant, i.e. the share of coal in capacity additions is smaller than the share of generation from coal from these capacity additions. The project proponents have chosen to use the published data from the DNA as the authoritative figure, without the need to re-base the BM calculation on generation.



The default weights are used, i.e. for the wind farm projects in the first crediting period and the subsequent crediting period, $w_{OM} = 0.75$ and $w_{BM} = 0.25$.

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

$$EF_{grid,CM,y} = 1.0753 \text{ tCO}_2/\text{MWh}$$

Using Operating Margin and Build Margin emission factors that are fixed for the duration of the first crediting period, the baseline emissions factor is also fixed for the first crediting period. These parameters will be recalculated at any renewal of the crediting period using the same steps 1-6 in the tool and the latest data available at that time.

Table 7 gives an overview of EF:

Table 7 Values obtained when calculating the baseline emission factor using ACM0002

Variable	Value
Operating Margin Emissions Factor ($EF_{grid,OM,y}$ in tCO_2/MWh)	1.1202
Build Margin Emissions Factor ($EF_{grid,BM,y}$ in tCO_2/MWh)	0.9404
Baseline Emissions Factor ($EF_{grid,CM,y}$ in tCO_2/MWh)	1.0753

Baseline emissions (BE_y) now can be calculated as the combined margin CO_2 emission factor ($EF_{grid,CM,y}$) multiplied by the annual net generation of the Proposed Project (EG_y).

2. Project emissions (PE_y)

According to ACM0002, Project emission of the proposed wind farm project is zero. $PE_y=0$.

3. Leakage (L_y)

According to ACM0002, no leakage is considered for the proposed wind farm project. $L_y=0$.

4. Calculate Emission Reduction

The emission reduction ER_y by the project activity during a given year y is the difference between baseline emission (BE_y), project emissions (PE_y) and emission due to leakage (L_y), as follows:

$$ER_y = BE_y - PE_y - L_y \quad (6)$$

Where the baseline emissions (BE_y in tCO_2) are the product of the baseline emissions factor (EF_y in tCO_2/MWh) times the net electricity supplied by the project activity to the grid (EG_y in MWh, equals to the power generation exported to NCPG minus the power imported from NCPG). The calculation formula is as follows:

$$BE_y = EG_y \times EF_{grid,CM,y} = (EG_{export,y} - EG_{import,y}) \times EF_{grid,CM,y} \quad (7)$$

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

Data / Parameter:	$FC_{i,y}$
Data unit:	tonne or m ³
Description:	the amount of the fossil fuel <i>i</i> consumed by power sources in year <i>y</i>
Source of data used:	China Energy Statistical Yearbook (2004,2005,2006)
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The aggregate amount of each fuel is applied because the amount of a fuel of each plant can not be acquired.
Any comment:	

Data / Parameter:	GEN_y
Data unit:	MWh
Description:	Electricity supplied to power grid by power source in year <i>y</i>
Source of data used:	China Electric Power Yearbook (2004,2005,2006)
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The aggregate amount of electricity is applied because the amount of each plant can not be obtained.
Any comment:	

Data / Parameter:	NCV_i
Data unit:	MJ/t(m ³)
Description:	the net calorific value (energy content) per mass or volume unit of a fuel <i>i</i>
Source of data used:	China Energy Statistic Yearbook (2005)
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the Tools, if the local value is not available, the national value can be applied.
Any comment:	

Data / Parameter:	$EF_{CO_2,i}$
Data unit:	tCO ₂ /TJ
Description:	the carbon dioxide emission factor per unit of energy of the fuel <i>i</i>
Source of data used:	Taken from DNA of China, see http://cdm.ccchina.gov.cn:80/english/NewsInfo.asp?NewsId=2190 . Original data used are the IPCC default values from the 2006 IPCC Guidelines for National Greenhouse gas Inventories, Volume 2, Energy.
Value applied:	See Annex 3
Justification of the choice	International default values, and officially accepted by the Chinese DNA in



of data or description of measurement methods and procedures actually applied :	their emission factor calculations.
Any comment:	

Data / Parameter:	<i>Installed Capacity</i>
Data unit:	MW
Description:	Installed capacity of the NCPG in year <i>y</i>
Source of data used:	China Electric Power Yearbook (2004,2005,2006)
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	Efficiency of the best technology commercially
Data unit:	%
Description:	Best commercial available efficiency of coal, gas, oil fuel power plant
Source of data used:	http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=2184
Value applied:	Best efficiency for coal plant is 35.82% Best efficiency for oil plant is 47.67% Best efficiency for gas plant is 47.67%
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	<i>Import Electricity</i>
Data unit:	MWh
Description:	Net import electricity from NEPG to the NCPG in year <i>y</i>
Source of data used:	China Electric Power Yearbook (2004,2005,2006)
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

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

>>



Based on the Feasible Study Report, the net power generation of this proposed project will be 96,530 MWh annually. The emission reduction ER_y by the project activity is calculated as follows (for each 12-monthly period):

$$BE_y = EG_y \cdot EF_y = 96530 \text{MWh} \times 1.0753 \text{tCO}_2/\text{MWh} = 103796 \text{tCO}_2$$

$$ER_y = BE_y - PE_y - L_y = 103796 - 0 - 0 = 103796 \text{tCO}_2$$

The total emission reduction in the first crediting period is 726,572tCO₂.

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

>>

Emission reductions achieved by the proposed project in the first crediting period are given in Table 8 below.

Table 8 Values obtained when applying formulae above (tCO₂e)

Year*	Estimation of project activity emissions (tonnes of CO ₂ e)	Estimation of baseline emissions (tonnes of CO ₂ e)	Estimation of leakage (tonnes of CO ₂ e)	Estimation of overall emission reduction (tonnes of CO ₂ e)
2008	0	103,796	0	103,796
2009	0	103,796	0	103,796
2010	0	103,796	0	103,796
2011	0	103,796	0	103,796
2012	0	103,796	0	103,796
2013	0	103,796	0	103,796
2014	0	103,796	0	103,796
Total	0	726,572	0	726,572

Note: * Using 12-monthly periods from the start of the crediting period, not using calendar years.

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

>>

Following approved methodology ACM0002, the data that is required to be monitored to establish the emission reductions, is the net electricity generation (EG_y).

B.7.1. Data and parameters monitored:

Data / Parameter:	Electricity exportation (EG_{export})
Data unit:	MWh
Description:	Quantity of annual electricity exported to the grid by the proposed project
Source of data to be used:	Monitored from electricity meters
Value of data applied for the purpose of calculating expected emission reductions in section B.5	96,530 MWh when fully operating
Description of	The electricity exported to the grid by the proposed project will be monitored



measurement methods and procedures to be applied:	through metering equipment at the substation of the wind farm continuously. Monthly generation data will be approved and signed off by CDM manager before it is accepted and stored.
QA/QC procedures to be applied:	Monthly generation is cross-checked against sales receipts. The metering equipments are calibrated and checked for accuracy according to local industry standards so that the metering equipment shall have sufficient accuracy.
Any comment:	Details information shown in the attached monitoring plan

Data / Parameter:	Electricity importation (EG_{import})
Data unit:	MWh
Description:	Quantity of annual electricity imported from the grid by the proposed project
Source of data to be used:	Monitored from electricity meters
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	The power imported from the grid will be monitored through metering equipment at the substation of the wind farm continuously. Monthly importation data will be approved and signed off by CDM manager before it is accepted and stored.
QA/QC procedures to be applied:	Monthly importation is cross-checked against receipts. The metering equipments are calibrated and checked for accuracy according to local industry standards so that the metering equipment shall have sufficient accuracy.
Any comment:	Details information shown in the attached monitoring plan

B.7.2. Description of the monitoring plan:

>>

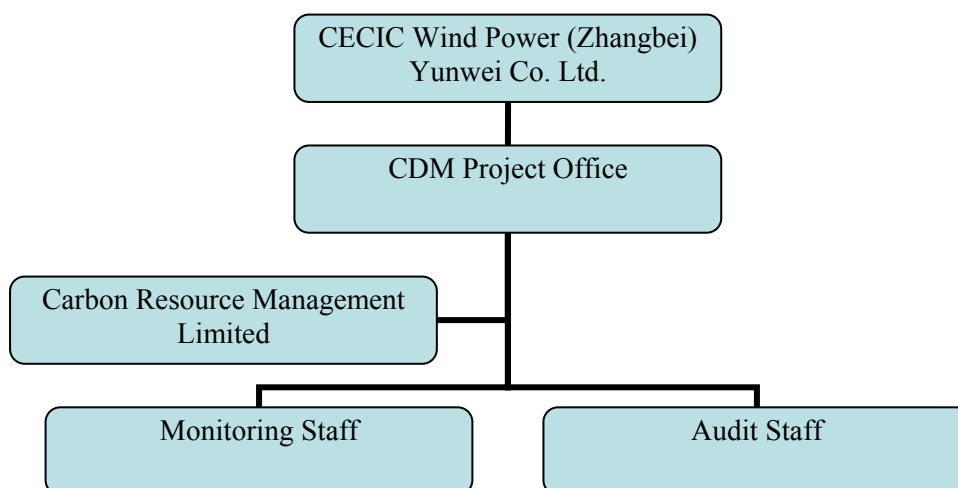
Overall responsibility for monitoring and carrying out the monitoring following this monitoring plan lies with CECIC Wind Power (Zhangbei) Yunwei Co. Ltd.

The CDM manager of CECIC Wind Power (Zhangbei) Yunwei Co. Ltd. is responsible for the monitoring and reporting of the wind farm.

The output from the project is monitored and recorded using two meters. One main meter of them is used for both CDM purposes and sales of the electricity generated to the grid company.



The operating and management structure is illustrated as follows:



The detailed information about the monitoring plan is described in Annex 4.

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 the baseline study and monitoring methodology: 25 December 2007.

- Mr. Zhu Hailei, Ms. Qian Yiwen, Ms. Yao Yanxia, zhl@carbonresource.com, Carbon Resource Management China Representative Office, Suite 1203, Air China Plaza, No. 36 Xiaoyun Road, Chaoyang District, Beijing, 100027, China, Tel: +86 10 8447 5246/8.
- Mr. Christiaan Vrolijk, cv@carbonresource.com, Carbon Resource Management Ltd, Technology House, 16-18 Whiteladies Road, Bristol BS8 2LG, UK, Tel: +44 117 980 9442.
- Ms. Chen Dongjuan, Dongjuan.chen@gmail.com, CECIC Wind Power (Zhangbei) Yunwei Co., Ltd, 18th Floor, East Wing, Sichuan Mansion, No.1 Fuwai St., Xicheng District, Beijing, 100037 China, Tel: +86 10 8833 7332.

CECIC Wind Power (Zhangbei) Yunwei Co. Ltd. is project participant and Carbon Resource Management Ltd is not.

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:

>>

28/01/2008 (launch of construction)

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



>>
20y

C.2. Choice of the <u>crediting period</u> and related information:
--

C.2.1. <u>Renewable crediting period</u>

C.2.1.1. Starting date of the first <u>crediting period</u>:

>>
01/08/2008

C.2.1.2. Length of the first <u>crediting period</u>:
--

>>
7y-0m

C.2.2. <u>Fixed crediting period</u>:
--

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 line with the requirements of local government, an Environmental Impact Assessment (EIA) for the proposed wind farm project was carried out. The EIA has been completed by Hebei Province Engineering Consulting Institute and it has been approved by the Environmental Protection Bureau of Hebei Province. Here is a summary of the EIA.

1. The analysis of the environment impact in the construction period

- Dust: Since the local residential area is 500m away from the wind farm site, the impact of construction dust to the local region is limited. Several measures will be implemented to reduce the impact of dust on local residents and the construction staff, including watering and covering.
- Noise: Construction machines, transportation vehicles and construction work will generate noise. However, the noise levels are within acceptable levels at the nearest habitation, which is 500m away from the project site. Furthermore, using machinery and equipments with low noise levels, and arranging the construction times during day time, reduces the impact to the environment significantly.



- Solid waste: The solid wastes from the construction include waste soil and stone and construction wastes, as well as a little office waste. All these wastes are collected and disposed of properly.
- Waste water: The waste water generated includes washing water from machines and wastewater from the project office. The water will be treated and be used again on the construction site or as fertilizer. So waste water has little impact to the environment.
- Ecosystem: After construction, the land temporarily occupied by the project will be recovered by grass, so as to recreate the original ecosystem. So the project has little impact to the ecosystem.

2. The analysis of the environment impact in operation period

- Noise: The operating level of these turbines range from 96dB to 104dB. At a range of 300 meters from the turbines the noise has been greatly weakened, and drops down below the national standard of 45dB. Furthermore, the residential areas are 500m away from the wind farm, so the noise does not influence the residential districts nearest to the site.
- Dust: After revegetation upon completion of the construction work, no dust will be generated by the wind turbines and the growth of the local plant will not be impacted.
- Waste: Solid waste and waste water will be produced by operation staff during operation period. The emitted waste quantity is very small and will cause no interference with the environment after proper treatment or collection.

3. Conclusion

Wind power is green power and the impact caused by wind farm on the surrounding ecosystem, water, noise, and atmosphere is very little. Therefore, the proposed project is feasible from aspect of environment 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 environmental impacts of the proposed project are not considered significant. The Environmental Protection Bureau of Hebei Province has approved the EIA.

SECTION E. Stakeholders' comments

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

>>

On May 10th 2007, consultations were carried out in the Zhangbei County by CECIC Wind Power (Zhangbei) Yunwei Co. Ltd. The consultations resulted in a clear support from the local residents. The developer introduced the background of the proposed project by speaker and then made a questionnaire survey using a random sampling method. Respondents filled in a questionnaire with the following sections:

- Project introduction
- Respondent's basic information and education level
- Questions:
 1. Do they agree with the development and construction of the project?
 2. Will the project have a negative impact on your environment of living, studying and working?



3. Will the project have a negative impact on the environment, such as noise, water and electromagnetism?
4. Will the project have a negative impact on the ecosystem?
5. Do you think the proposed project will have promotion in local economic development?
6. Do you have some suggestion about the project?

E.2. Summary of the comments received:

>>

The questionnaires were sent to 50 households and the survey had a 100% response rate.⁷ The result of the survey indicates support for the project.

- 100% of respondents agreed with the development of the project.
- 100% of respondents believed that the project construction will not do harm to the environment.
- 98% believed that the project construction will do no harm to the ecosystem and 2% didn't have an opinion on this.
- 100% believed that the project construction will have no impact to the environment of living, studying and working.
- 100% believed that the project construction will have positive impact on local economic development.

Conclusions:

The survey shows that the proposed project has strong local support among the local people. They all believe the proposed project will promote the local economic development and agree the project construction.

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

>>

The local residents are all supportive of the proposed project and to date there has been no need to modify the project design according to the comments received.

The project owner has an overall environment-friendly plan to guarantee that the project has the minimum negative impact on the environment during the project construction and operation.

⁷ The survey forms are available from the project owner.

**Annex 1****CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY**

Organization:	CECIC Wind Power (Zhangbei) Yunwei Co. Ltd.
Street/P.O.Box:	Hailiutu Village, Zhangbei County, Zhangjiakou City, Hebei Province
Building:	/
City:	Zhangjiakou
State/Region:	Hailiutu Village, Zhangbei County
Postfix/ZIP:	076750
Country:	People's Republic of China
Telephone:	+86 10 8833 7332
FAX:	+86 10 8833 7350
E-Mail:	Dongjuan.Chen@gmail.com
URL:	/
Represented by:	Ms. Chen Dongjuan
Title:	/
Salutation:	/
Last Name:	Chen
Middle Name:	/
First Name:	Dongjuan
Department:	/
Mobile:	/
Direct FAX:	010--88337332
Direct tel:	010--88337350
Personal E-Mail:	Dongjuan.Chen@gmail.com

Organization:	Vitol SA
Street/P.O.Box:	Arve 28 CH 1205
Building:	Boulevard Du Pont-D
City:	Geneve
State/Region:	
Postfix/ZIP:	3841211
Country:	Switzerland
Telephone:	+ 41 22 322 11 11
FAX:	+ 41 22 781 66 11
E-Mail:	dbf@vitol.com
URL:	
Represented by:	David Fransen
Title:	Managing Director
Salutation:	Mr.
Last Name:	Fransen
Middle Name:	
First Name:	David
Department:	
Mobile:	



Direct FAX:	+ 41 22 781 66 11
Direct tel:	+ 41 22 322 11 11
Personal E-Mail:	dbf@vitol.com



Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding for the proposed wind farm project.

**Annex 3****BASELINE INFORMATION****Step 1. Identify the relevant electric power system**

Following the DNA delineation, the project electricity system is the North China Power Grid (NCPG), consisting of six provincial grids: Beijing, Tianjin, Hebei, Shanxi, Inner Mongolia and Shandong. The connected electricity system is the Northeast Power Grid (NEPG), consisting of three provincial grids: Jilin, Liaoning and Heilongjiang.

Step 2. Select an operating margin (OM) method

According to Tool to calculate the emission factor for an electricity system, the Simple OM method is applicable to the project if the low-cost resources constitute less than 50% of total grid generation on average in the five most recent years or based on long-term normal for hydroelectric production. The Simple OM method, therefore, is applicable to the proposed project as the share of low-cost/must-run generation does not exceed 1% in the most recent last 5 years, with the average being 0.81% as presented below.

The most recent year for which data is available in the yearbook is the year 2005. Table A1 presents the shares of generation from all sources including hydro power, other than thermal plants. The table shows that over the last five years generation from these sources has been consistently less than 1%.

Table A1 Power generation in the North China Power Grid from 2001 to 2005

Year	Low-cost/must-run generation (10 ⁸ kWh)	Total generation (10 ⁸ kWh)	Share	Source* (edition/page)
2001	29.27	3,611.19	0.81%	2002/p617
2002	36.25	4,075.45	0.89%	2003/p585
2003	39.79	4,616.53	0.86%	2004/p709
2004	40.32	5,308.04	0.76%	2005/p474
2005	45.51	6,077.82	0.75%	2006/p568
Total	191.14	23,689.03	0.81%	
Average	38.23	4,737.81	0.81%	

Note: * China Electric Power Yearbook

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

$EF_{CO_2,i,y}$, the CO₂ emission factor of fossil fuel type *i* in year *y*, is calculated as follows:

$$EF_{CO_2,i,y} = EF_{CO_2,i,y} * 44/12$$

Table A2 Emission Factors of Fuels



Fuel types	Unit	Net caloric value (MJ/unit)	Carbon Emission Factor (tC/TJ)	CO2 Emission Factor (tCO2e/unit)
Raw coal	tonnes	20,908	25.8	94.60
Cleaned coal	tonnes	26,344	25.8	94.60
Other washed coal	tonnes	8,363	25.8	94.60
Coke	tonnes	28,435	29.2	107.07
Coke oven gas	1000 m3	16,726	12.1	44.37
Other coal gas	1000 m3	5,227	12.1	44.37
Crude oil	tonnes	41,816	20.0	73.33
Gasoline	tonnes	43,070	18.9	69.30
Diesel	tonnes	42,652	20.2	74.07
Fuel oil	tonnes	41,816	21.1	77.37
LPG	tonnes	50,179	17.2	63.07
Refinery gas	tonnes	46,055	15.7	57.57
Natural gas	1000 m3	38,931	15.3	56.10
other petro products	tonnes (coal equivalent)	38,269	20.0	73.33
other coking products	tonnes	28435	25.8	94.60
other energy	tonnes	0	-	-

Fossil fuel consumption

Fuel consumption is taken from the latest China Energy Statistical Yearbook editions. The yearbooks present a range of more than 10 fuels for each province. Data is presented in Table A3 below. The share of emissions from coal consumption is also given in the table.

Table A3 Energy consumption and CO₂ emissions in NCPG

2003										
Fuel types	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	NCPG total	Emissions (MtCO ₂ e)	Fuel share (%)
Raw coal	million tonnes	7.1473	10.5274	54.8264	45.2851	39.4932	68.0800	225.3594	445.74	Coal
Cleaned coal	million tonnes	-	-	-	-	-	0.0941	0.0941	0.23	99.19%
Other washed coal	million tonnes	0.0631	-	0.6728	2.0821	-	4.5090	7.3270	5.80	
Coke	million tonnes	-	-	-	-	0.0280	-	0.0280	0.09	
Coke oven gas	billion m ³	0.0240	0.1710	-	0.0900	0.0210	0.0020	0.3080	0.23	
Other coal gas	billion m ³	1.6920	-	1.0630	-	1.0320	0.1560	3.9430	0.91	
Crude oil	million tonnes	-	-	-	-	-	0.2968	0.2968	0.91	
Gasoline	million tonnes	-	-	-	-	-	0.0001	0.0001	0.00	
Diesel	million tonnes	0.0029	0.0135	0.0400	-	0.0291	0.0540	0.1395	0.44	
Fuel oil	million tonnes	0.1395	0.0002	0.0111	-	0.0065	0.1007	0.2580	0.83	
LPG	million tonnes	-	-	-	-	-	-	-	-	
Refinery gas	million tonnes	-	-	0.0027	-	-	0.0083	0.0110	0.03	
Natural gas	billion m ³	-	0.0500	-	-	-	0.1080	0.1580	0.35	
Other petroleum products	million tonnes	-	-	-	-	-	-	-	-	
Other coking products	million tonnes	-	-	-	-	-	-	-	-	
Other fuel	million tonnes#	0.0983	-	-	-	-	0.3921	0.4904	-	
Total emission	MtCO ₂ e								455.56	

2004										
Fuel types	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	NCPG total	Emissions (MtCO ₂ e)	Fuel share (%)
Raw coal	million tonnes	8.2309	14.1000	62.9980	52.1320	49.3220	85.5000	272.2829	538.55	Coal
Cleaned coal	million tonnes	-	-	-	-	-	0.4000	0.4000	1.00	99.35%
Other washed coal	million tonnes	0.0648	-	1.0104	3.5417	-	2.8422	7.4591	5.90	
Coke	million tonnes	-	-	-	-	0.0022	-	0.0022	0.01	
Coke oven gas	billion m ³	0.0550	-	0.0540	0.5320	0.0400	0.8730	1.5540	1.15	
Other coal gas	billion m ³	1.7740	-	2.4250	0.8200	1.6470	0.1410	6.8070	1.58	
Crude oil	million tonnes	-	-	-	-	-	-	-	-	
Gasoline	million tonnes	-	-	-	-	-	-	-	-	
Diesel	million tonnes	0.0039	0.0084	0.0466	-	-	-	0.0589	0.19	
Fuel oil	million tonnes	0.1466	-	0.0016	-	-	-	0.1482	0.48	
LPG	million tonnes	-	-	-	-	-	-	-	-	
Refinery gas	million tonnes	-	0.0055	0.0142	-	-	-	0.0197	0.05	
Natural gas	billion m ³	-	0.0370	-	0.0190	-	-	0.0560	0.12	
Other petroleum products	million tonnes	-	-	-	-	-	-	-	-	
Other coking products	million tonnes	-	-	-	-	-	-	-	-	
Other fuel	million tonnes#	0.0941	-	0.3464	1.0973	0.0448	-	1.5826	-	
Total emission	MtCO ₂ e								549.02	

2005										
Fuel types	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	NCPG total	Emissions (MtCO ₂ e)	Fuel share (%)
Raw coal	million tonnes	8.9775	16.7520	67.2650	61.7645	62.7723	104.0540	321.5853	636.06	Coal
Cleaned coal	million tonnes	-	-	-	-	-	0.4218	0.4218	1.05	99.18%
Other washed coal	million tonnes	0.0657	-	1.6745	3.7365	-	1.0869	6.5636	5.19	
Coke	million tonnes	-	-	-	-	0.0021	0.0011	0.0032	0.01	
Coke oven gas	billion m ³	0.0640	0.0750	0.0620	2.1080	0.0390	-	2.3480	1.74	
Other coal gas	billion m ³	1.6090	0.7860	3.8830	0.9880	1.8370	-	9.1030	2.11	
Crude oil	million tonnes	-	-	-	-	0.0073	-	0.0073	0.02	
Gasoline	million tonnes	-	-	0.0001	-	-	-	0.0001	0.00	
Diesel	million tonnes	0.0048	-	0.0354	-	0.0012	-	0.0414	0.13	
Fuel oil	million tonnes	0.1225	-	0.0023	-	0.0006	-	0.1254	0.41	
LPG	million tonnes	-	-	-	-	-	-	-	-	
Refinery gas	million tonnes	-	-	0.0902	-	-	-	0.0902	0.24	
Natural gas	billion m ³	0.0280	0.0080	-	0.2760	-	-	0.3120	0.68	
Other petroleum products	million tonnes	-	-	-	-	-	-	-	-	
Other coking products	million tonnes	-	-	-	-	-	-	-	-	
Other fuel	million tonnes#	0.0858	-	0.3235	0.6931	0.0727	1.1890	2.3641	-	
Total emission	MtCO ₂ e								647.65	

Note: # coal equivalent

Sources:

China Energy Statistical Yearbook (2004) P146-P165, P202-P205

China Energy Statistical Yearbook (2005) P202-P221, P258-P261

China Energy Statistical Yearbook (2006) P126-P145, P182-P185

Calculation of net generation from included sources



Gross generation for each province is presented in the yearbooks. The data is also broken down into three categories: thermal, hydro and other sources. For the OM calculations, only thermal generation is included. Gross generation and own consumption are used to calculate net generation from included sources. The calculations are presented in Table A4 below.

Table A4 Thermal generation, own consumption rate, and net supply in NCPG

2003								
	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	NCPG total
Gross generation	10 ⁸ kWh	186.08	321.91	1,082.61	939.62	651.06	1,395.47	4,576.75
Self use rate*	%	7.52	6.79	6.50	7.69	7.66	6.79	
Net generation	10 ⁸ kWh	172.09	300.05	1,012.24	867.36	601.19	1,300.72	4,253.65
2004								
	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	NCPG total
Gross generation	10 ⁸ kWh	185.79	339.52	1,249.70	1,049.26	804.27	1,639.18	5,267.72
Self use rate	%	7.94	6.35	6.50	7.70	7.17	7.32	
Net generation	10 ⁸ kWh	171.04	317.96	1,168.47	968.47	746.60	1,519.19	4,891.73
2005								
	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	NCPG total
Gross generation	10 ⁸ kWh	208.80	369.93	1,343.48	1,287.85	923.45	1,898.80	6,032.31
Self use rate*	%	7.73	6.63	6.57	7.42	7.01	7.14	
Net generation	10 ⁸ kWh	192.66	345.40	1,255.21	1,192.29	858.72	1,763.23	5,607.51

Sources:

China Electric Power Yearbook (2004) p709, p670

China Electric Power Yearbook (2005) p472, p474

China Electric Power Yearbook (2006) p568, p558

*From China Electric Power Yearbook (2004,2006), only the self-use rate of all the plants including the thermal plants and hydro plants can be found, the self-use rate of the thermal plants is higher than hydro plants, so here adopt the self-use rate of all the plants as the self-use rate of thermal power plants and such method is conservative.

Imports

The connected electricity system is the Northeast Power Grid (NEPG), consisting of three provincial grids: Jilin, Liaoning and Heilongjiang. According to the tool, there is electricity transferring from the connected electricity systems to the project electricity system, so the CO₂ emission factor for net electricity imports ($EF_{grid,import,y}$) from the connected electricity system should be determined to use “The weighted average operating margin (OM) emission rate of the exporting grid”.

The average emission rate is calculated using the same steps as above for NCPG, namely fuel consumption and net generation as indicated in Table A5 and A6 below, but including low-cost/must-run generation types.

Fuel consumption in NEPG is taken from the latest China Energy Statistical Yearbook editions. The yearbooks present a range of more than 10 fuels for each province.



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Table A5 Fuel consumption and CO₂ emissions in NEPG (connected system)

2003						
Fuel types	Unit	Liaoning	Jilin	Heilongjiang	NEPG total	Emissions (MtCO ₂ e)
Raw coal	million tonnes	35.5651	20.0666	27.6362	83.2679	164.70
Cleaned coal	million tonnes	0.7083		0.0300	0.7383	1.84
Other washed coal	million tonnes	6.1704	0.1590	0.5341	6.8635	5.43
Coke	million tonnes				-	-
Coke oven gas	billion m ³	0.1660			0.1660	0.12
Other coal gas	billion m ³	0.5310			0.5310	0.12
Crude oil	million tonnes	0.0339			0.0339	0.10
Gasoline	million tonnes	-	-	-	-	-
Diesel	million tonnes	0.0032	0.0034		0.0066	0.02
Fuel oil	million tonnes	0.1487	0.0070	0.0432	0.1989	0.64
LPG	million tonnes	0.0155			0.0155	0.05
Refinery gas	million tonnes	0.0403		0.0046	0.0449	0.12
Natural gas	billion m ³		0.0040	0.4470	0.4510	0.98
Other petroleum products	million tonnes				-	-
Other coking products	million tonnes				-	-
Other fuel	million tonnes#	0.2938			0.2938	-
Total emission	MtCO ₂ e					174.13
2004						
Fuel types	Unit	Liaoning	Jilin	Heilongjiang	NEPG total	Emissions (MtCO ₂ e)
Raw coal	million tonnes	41.4420	23.1090	30.8480	95.3990	188.69
Cleaned coal	million tonnes	0.8475	0.0109	0.0488	0.9072	2.26
Other washed coal	million tonnes	5.7767	0.1426	0.6100	6.5293	5.17
Coke	million tonnes				-	-
Coke oven gas	billion m ³	0.4830	0.2910		0.7740	0.57
Other coal gas	billion m ³	5.7330	0.4190		6.1520	1.43
Crude oil	million tonnes				-	-
Gasoline	million tonnes				-	-
Diesel	million tonnes	0.0204	0.0116	0.0024	0.0344	0.11
Fuel oil	million tonnes	0.1281	0.0178	0.0286	0.1745	0.56
LPG	million tonnes	0.0219			0.0219	0.07
Refinery gas	million tonnes	0.0979		0.0114	0.1093	0.29
Natural gas	billion m ³		0.0030	0.2530	0.2560	0.56
Other petroleum products	million tonnes				-	-
Other coking products	million tonnes				-	-
Other fuel	million tonnes#	0.2697	0.0507		0.3204	-
Total emission	MtCO ₂ e					199.71
2005						
Fuel types	Unit	Liaoning	Jilin	Heilongjiang	NEPG total	Emissions (MtCO ₂ e)
Raw coal	million tonnes	43.0541	24.4613	33.8321	101.3475	200.45
Cleaned coal	million tonnes				-	-
Other washed coal	million tonnes	5.2474	0.1926	0.2416	5.6816	4.49
Coke	million tonnes				-	-
Coke oven gas	billion m ³	0.1030	0.3570	0.0680	0.5280	0.39
Other coal gas	billion m ³	1.2620	0.8370		2.0990	0.49
Crude oil	million tonnes	0.0116			0.0116	0.04
Gasoline	million tonnes				-	-
Diesel	million tonnes	0.0118	0.0148	0.0057	0.0323	0.10
Fuel oil	million tonnes	0.0932	0.0246	0.0155	0.1333	0.43
LPG	million tonnes	0.0012			0.0012	0.00
Refinery gas	million tonnes	0.0548		0.0132	0.0680	0.18
Natural gas	billion m ³		0.0840	0.2240	0.3080	0.67
Other petroleum products	million tonnes				-	-
Other coking products	million tonnes				-	-
Other fuel	million tonnes#	0.0162			0.0162	-
Total emission	MtCO ₂ e					207.25

Note: # coal equivalent

Sources:

China Energy Statistical Yearbook (2005) p166-177

China Energy Statistical Yearbook (2005) p222-233

China Energy Statistical Yearbook (2006) p146-157



Net generation is calculated from gross generation and own consumption data presented.

Table A6 Power generation, own consumption and net supply in NEPG (2003-2005)

2003					
	Unit	Liaoning	Jilin	Heilongjiang	NEPG total
Gross generation	10 ⁸ kWh	823.36	338.83	495.98	1,658.17
Self use rate	%	7.17	7.32	8.48	
Net generation	10 ⁸ kWh	764.33	314.03	453.92	1,532.27
2004					
	Unit	Liaoning	Jilin	Heilongjiang	NEPG total
Gross generation	10 ⁸ kWh	887.54	394.70	548.66	1,830.90
Self use rate	%	6.94	6.64	7.69	
Net generation	10 ⁸ kWh	825.94	368.49	506.47	1,700.90
2005					
	Unit	Liaoning	Jilin	Heilongjiang	NEPG total
Gross generation	10 ⁸ kWh	896.68	433.95	599.00	1,929.63
Self use rate	%	7.03	6.59	7.96	
Net generation	10 ⁸ kWh	833.64	405.35	551.32	1,790.32

Sources:

China Electric Power Yearbook (2004) p709, p670

China Electric Power Yearbook (2005) p472, p474

China Electric Power Yearbook (2006) p568, p558

Using these data the emissions factor for imports from NEPG are calculated in Table A7.

Table A7 Import emissions factor

	Unit	2003	2004	2005
Emissions	MtCO ₂ e	174.13	199.71	207.25
Generation	10 ⁸ kWh	1,532.3	1,700.9	1,790.3
Emissions factor	tCO ₂ e/MWh	1.136	1.174	1.158

Operating Margin Emission Factor calculations

The Operating Margin Emissions Factor is now calculated from the data presented above using the formula below, including adjustment for imports from NEPG. The calculation is shown in Table A8.

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{co_2,i,y}}{EG_y}$$

**Table A8 Operating margin emission factor calculation**

	Unit	2003	2004	2005	3-year total/average
NCPG					
Emissions	MtCO ₂ e	455.56	549.02	647.65	1,652.23
Generation	TWh	425.36	489.17	560.75	1,475.29
Import					
Imports from NEPG*	TWh	4.24	4.51	3.93	12.69
EF NEPG	tCO ₂ e/MWh	1.136	1.174	1.158	
Emissions from imports	MtCO ₂ e	4.82	5.30	4.55	14.67
Total					
Emissions	MtCO ₂ e	460.38	554.32	652.20	1,666.90
Supply	TWh	429.61	493.69	564.68	1,487.98
Operating Margin Emissions Factor tCO ₂ e/MWh					1.120

*Source:

China Electric Power Yearbook (2005) p491, China Electric Power Yearbook (2006) p351

Based on above data, the simple OM emission factor of NCPG is calculated ex-ante using a 3-year generation-weighted average as 1.1202 tCO₂e/MWh.

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

The sample group of power units m used to calculate the build margin consists of the set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. This option is chosen as it comprises larger annual generation than the five units built most recently. Following the deviation, the latest statistical data available (from the China Power Yearbook) is used by the DNA to determine the most recent year from which the added generation capacity is equal to or just exceeds 20% of the latest statistic year 2005. The added generation capacity is the sample group of power units m used to calculate the build margin.

Step 5. Calculate the build margin emission factor

As described in step4, because of the limited availability of publicly available data, this proposed project uses a substitute method accepted by EB to calculate $EF_{BM,y}$:

Sub-step 1: calculate the thermal emission factor

Calculate the different CO₂ emission percentage of solid, liquid and gas fuel in the total emission of NCPG in 2005 using latest statistical data from China Energy Statistical Yearbook 2006.

Table A9 Calculation of CO₂ Emission of North China Power Grid in 2005

Fuel type	CO ₂ Emission (tCO ₂)	Share
coal	642316188.9	99.18%
oil	559159.993	0.09%
gas	4773982.034	0.74%
Total	647649330.9	100%

Source: China Energy Statistical Year Book (2006).



$$\lambda_{Coal} = 99.18\%;$$

$$\lambda_{Oil} = 0.09\%;$$

$$\lambda_{Gas} = 0.74\%.$$

Sub-step 2:

Based the emission percentage (λ_i) of different kind fossil fuels and the corresponding emission factor (EF_i) according to the best technology commercially available in the China, the weighted emission factor of thermal power ($EF_{thermal}$) is calculated.

Table A10 Calculation of CO₂ Emission Factor of Coal, Oil and Gas Fuel Power Plant with the Best Commercial Efficiency in China

Power plant type	Parameter	Best efficiency	Carbon factor (tC/TJ)	CO ₂ emission factor (tCO ₂ /MWh)
		A	B	D=3.6/A/1000*B*C*44/12
Coal	$EF_{Coal,Adv}$	35.82%	25.8	0.9508
Gas	$EF_{Gas,Adv}$	47.67%	15.3	0.4237
Oil	$EF_{Oil,Adv}$	47.67%	21.1	0.5843

Source: <http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1365.pdf>

So, emission factor of thermal plant is:

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

Sub-step3:

Using the latest statistical data available (from the China Electric Power Yearbook) determine the year from which the added generation capacity is equal to or just exceeds 20% of the latest statistic year 2005.

Table A11 Identify the year from which the added generation capacity is equal to or just exceeds 20% of the latest statistic year 2005

	Capacity, 2003 (MW)	Capacity, 2004 (MW)	Capacity, 2005 (MW)	Added capacity, 2003-2005 (MW)	Conservative Modification	Share (%)
	A	B	C	D=C-A	E	
Hydro	3266.0	3250.7	3242.6	-23.4	0.0	0.00%
Thermal	84006.6	93594.9	111139.7	27133.1	27133.1	99.35%
Other	90.1	137.5	292.3	202.2	202.2	0.74%
Total	87362.7	96983.2	114674.5	27311.8	27335.3	100%
Added share to Capacity 2005	23.82%	15.43%	0			

Source: China Electric Power Year Book (2004, 2005, 2006).

$$EF_{BM} = (CAP_{Thermal} / CAP_{Total}) * EF_{Thermal}$$



CAP_{Thermal} is the thermal capacity among the new capacity from 2003 to 2005, and CAP_{Total} is the total capacity from 2003 to 2005.

$$EF_{BM} = 0.9466 \times 99.35\% = 0.9404 \text{ tCO}_2/\text{MWh}$$

Step 6. Calculation of the combined margin emission factor

The combined margin emission factor is calculated as follows:

$$EF_{\text{grid,CM,y}} = w_{OM} \cdot EF_{\text{grid,OM,y}} + w_{BM} \cdot EF_{\text{grid,BM,y}} = 0.75 \times 1.1202 + 0.25 \times 0.9404 = 1.0753 \text{ tCO}_2/\text{MWh}$$



Annex 4

MONITORING INFORMATION

1. Introduction

The proposed project adopts the approved consolidated monitoring methodology ACM0002 “Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources” (version 07) to determine the emission reductions from the net electricity generation from the windfarm. This plan describes in more detail the process.

2. Installation of meters

The main electricity energy meters are installed on the substation of the wind farm to measure the electricity exported to the grid by the project activity and the electricity imported from the grid to the project site directly and continuously.

The imported and exported electricity will be cross-checked with the electricity receipts issued by the power grid company. The receipts will be issued based on the power purchase agreement (PPA) signed between the project entity and the power grid company and the readings from the 220kV substation metering equipment, which will serve as the back-up meters.

3. Monitored data

The main monitored data of the proposed project is the electricity delivered to the grid by the proposed project (EG_{export}) and the power imported from the grid (EG_{import}). The net generation is calculated as exports minus imports.

3.1 Monitoring generation for part of a month

The monitoring procedures will follow the generation and invoice months, not necessarily calendar months, for the proposed project activity.

If it is necessary to monitor part of a month, for example if the date of registration is not at the start of the generation month, the following procedure will be used:

- A special meter reading will take place on 0:00 of the starting date of the first crediting period.
- A special receipt will be issued based on this special reading for the use of cross-check.

4. Calibration

The metering equipments are calibrated and checked for accuracy according to local industry standards to make sure that any error resulting from such equipment will not exceed 0.5% of full-scale rating. The net generation output registered by the meters alone will suffice for the purpose of billing and emission reduction verification as long as the error in the meters is within the agreed limits.

Both meters shall be jointly inspected and sealed on behalf of the parties concerned and shall not be interfered with by either party except in the presence of the other party or its accredited representatives.



Calibration is carried out by the qualified third party with the records being supplied to the proposed Wind farm, and these records will be maintained by the proposed Wind farm and the third party appointed by DOE.

All the meters installed shall be tested by the NCPG within 10 days after: the detection of a difference larger than the allowable error in the readings of both meters; the repair of all or part of meter caused by the failure of one or more parts to operate in accordance with the specifications.

If any errors are detected the party owning the meter shall repair, recalibrate or replace the meter giving the other party sufficient notice to allow a representative to attend during any corrective activity.

Should any previous months reading of the main meter be inaccurate by more than the allowable error, or otherwise functioned improperly, the net generation output shall be determined by (a) first, by reading backup meter, unless a test by either party reveals it is inaccurate; (b) if the backup system is not with acceptable limits of accuracy or operation is performed improperly the proposed Wind farm and the NCPG shall jointly prepare a reasonable and conservative estimate of the correct reading, and provide sufficient evidence that this estimation is reasonable and conservative when DOE undertakes verification; and (c) if the NCPG and the proposed Wind farm fail to agree then the matter will be referred for arbitration according to agreed procedures.

5. Data collection and management system

- Zhangjiakou Electric Power Company reads main meter and reports the result to NCPG Company monthly.
- Zhangjiakou Electric Power Company supplies reading to the proposed wind farm monthly.
- The proposed wind farm records readings from the backup meter monthly.
- The proposed windfarm carries out an internal audit on the readings and calculations.
- The proposed wind farm calculates the emission reductions after each monitoring period.

Physical document such as paper-based maps, diagrams and environmental assessments will be collated in a central place, together with this monitoring plan. In order to facilitate auditors' reference of relevant literature relating to the proposed Wind farm project, the project material and monitoring results will be indexed. All paper-based information will be stored by the technology department of the proposed Wind farm and all the material will have a copy for backup.

And all data including calibration records is kept until 2 years after the end of the total crediting period of the CDM project.

6. Quality control

Monthly net generation data will be approved and signed off by CDM manager before it is accepted and stored.

This audit will check compliance with operational procedures in this monitoring plan.

This internal audit will also identify potential improvements to procedures to improve monitoring and reporting in future years. If such improvements are proposed these will be reported to the DOE and only operated after approval from the DOE.



7. Reporting

CECIC Wind Power (Zhangbei) Yunwei Co. Ltd, with the help of Carbon Resource Management Ltd, will complete the monitoring report and provide it to a DOE for verification.
