



**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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Hangjin Yihewusu Phase I 49.5MW Wind Power Project**Version: 2.0****Date: 01/08/2012**

Version number	Date	Reason
1.0	29/01/2012	PDD for GSP
2.0	01/08/2012	Revised PDD based on DOE's comments

A.2. Description of the project activity:

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The Hangjin Yihewusu Phase I 49.5MW Wind Power Project (hereinafter referred to as “the proposed project”) is located in Hangjin County, Ordos City, in the western part of the Inner Mongolia Autonomous Region in China. The goal of the proposed project is to generate electricity from wind resources by using wind power generation technology, and to deliver the electricity to the North China Power Grid (NCPG).

Based on the conditions of the local wind resources, the proposed project will have the total installed capacity of 49.5 MW, which will be achieved by the planned installation and operation of 33 sets of wind turbines, each with the capacity of 1.5 MW. The proposed project is expected to deliver 117,784 MWh to the NCPG annually. The project's operational lifetime is 20 years. Electricity generated by the proposed project will displace part of the electricity generated by the NCPG, which is dominated by fossil-fuel fired power plants. Thus, greenhouse gas (GHG) emission reductions could be achieved. The estimated annual GHG emission reductions are 105,520 tCO₂e during the first crediting period.

Prior to the implementation of the project activity, the electricity was generated by grid-connected power plants, which is the same as the baseline scenario as described in B.4.

The proposed project will not only supply renewable electricity to the grid, but it will also contribute to the sustainable development of the local community and the host country by means of:

- Creating short-term and long-term job opportunities in the project area during the project's construction and operation
- Displacing part of the electricity generated by coal-fired power plants, and thus improving the local environment and reducing greenhouse gas (GHG) emissions.

**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)
People's Republic of China (host)	Inner Mongolia Guodian New Energy Co., Ltd. (Private Entity, Project owner)	No
United Kingdom of Great Britain and Northern Ireland	Climate Bridge Ltd. (the CERs buyer)	No

Detailed information on participants is included in Annex 1.

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

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A.4.1.1. Host Party(ies):

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People's Republic of China

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

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Inner Mongolia Autonomous Region

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

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Ordos City

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

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The proposed project is located in Hangjin County, Ordos City, in the western Inner Mongolia of China. The geographical coordinates¹ of the centre of the project area are E107.5411 ° N40.0589 ° . The detailed location of the proposed project is shown in Figure A-1.

¹ Reference: Feasibility Study Report

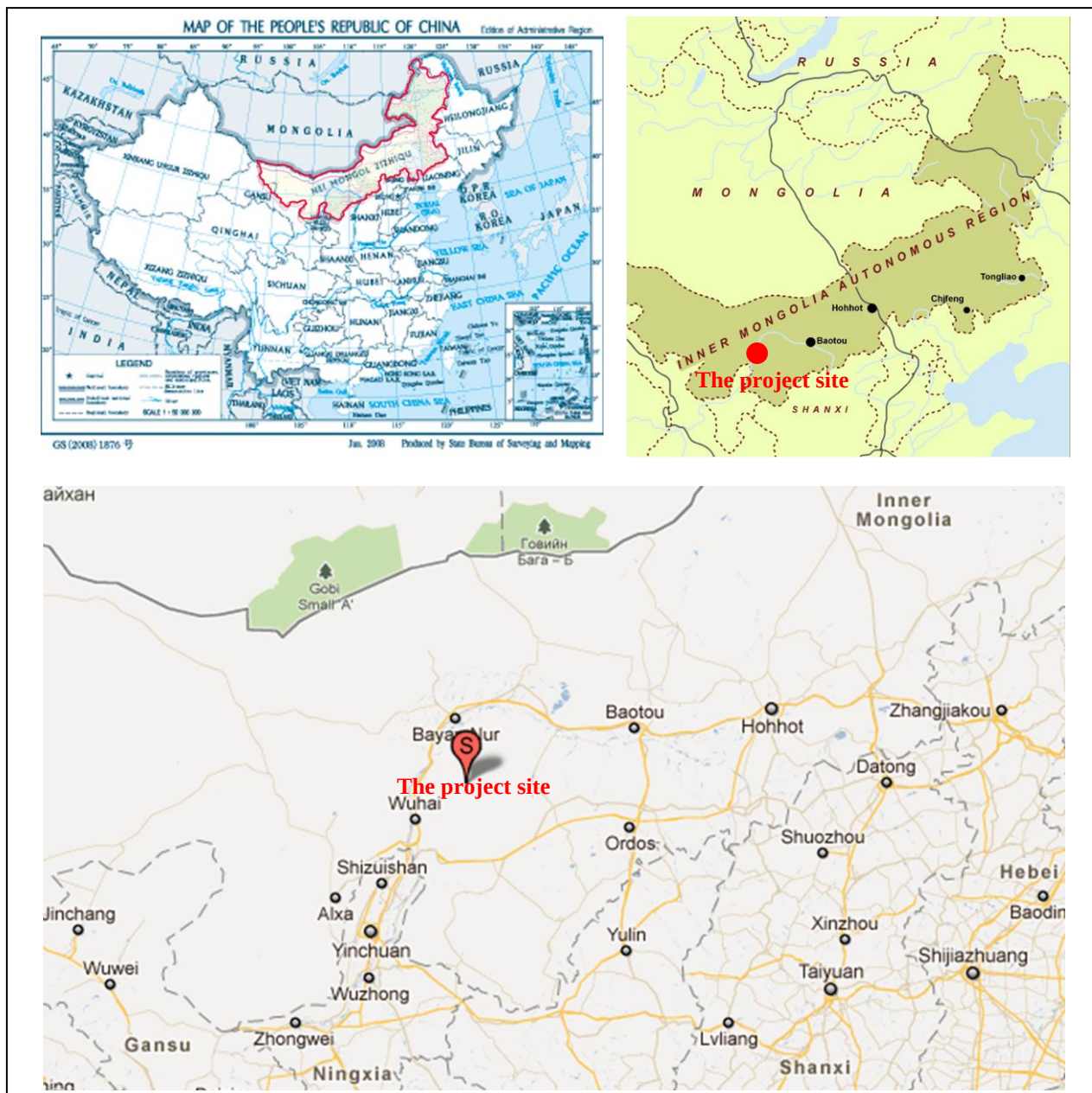


Figure A-1. Geographic location of the project

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

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Sectoral Scope 1: Energy industries (renewable-/non-renewable sources)

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

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The proposed project involves the installation of 33 wind turbines, each of which with a rated capacity of 1,500kW, providing a total installed capacity of 49.5 MW. The proposed project is expected to deliver 117,784MWh to the NCPG annually. There is no technology transfer from other countries.

The main technical parameters of the proposed project are shown in Table A-1.

Table A-1. Main technical parameters of the proposed project

Item	Value	Source
Installed capacity (MW)	49.5	Feasibility Study Report (FSR)
Annual operation time (hour)	2,379	FSR
Annual electricity delivered to the grid (MWh)	117,784	FSR
Power load Factor (%)	27.16 ²	FSR

The main technical specifications of the wind turbines are shown in Table A-2.

Table A-2. Turbine specifications³

Item	Value
Unit capacity(kW)	1500
Quantity of turbine	33
Rotor diameter (m)	82
Cut-in wind speed (m/s)	3
Rated wind speed (m/s)	10.5
Cut-out wind speed (m/s)	25
Rated voltage (V)	690
Operational lifetime (ys)	20

Each turbine will have a box-type transformer that increases the voltage from 690V to 35kV. The 35kV transmission lines will be connected to the main on-site transformer, through which the electricity generated by the project will be transformed to 220kV, after which it will be transmitted to the substation and then to the NCPG. The net electricity supplied by the proposed project activity to the grid will be monitored by the electricity meters installed at the onsite and the substation, which will record the electricity exported to and imported from the grid. The designed operational lifetime of the wind farm is 20 years.

Prior to the implementation of the project activity, the electricity was generated by grid-connected power plants, which is the same as the baseline scenario (described in B.4).

² PLF is calculated as $2,379 / (24 \times 365) = 27.16\%$.

³ Refer to technical agreement on wind turbines

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

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The 3×7 year renewable crediting period is chosen for the proposed project. The annual emission reductions of the proposed project are estimated to be 105,520 tCO₂e during the first crediting period from 1 December 2012 to 30 November 2019.

Years	Estimation of annual emission reductions in tonnes of CO ₂ e
01/12/2012-30/11/2013	105,520
01/12/2013-30/11/2014	105,520
01/12/2014-30/11/2015	105,520
01/12/2015-30/11/2016	105,520
01/12/2016-30/11/2017	105,520
01/12/2017-30/11/2018	105,520
01/12/2018-30/11/2019	105,520
Total estimated reductions (tonnes of CO ₂ e)	738,640
The number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO ₂ e)	105,520

A.4.5. Public funding of the project activity:

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No public funding from Annex I Parties is involved in this project activity.

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

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Title of the approved baseline and monitoring methodology:

- ACM0002 – Consolidated baseline methodology for grid-connected electricity generation from renewable sources (Version 12.3.0).

Title of Methodological Tool:

- Tool for the demonstration and assessment of additionality (Version 06.0.0)
- Tool to calculate the emission factor for an electricity system (Version 02.2.1)

For more information regarding the methodology, please refer to the following website:
<http://cdm.unfccc.int/methodologies/PAMethodologies/approved.html>

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

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The methodology ACM0002 (Version 12.3.0) is applicable to the proposed project as the project meets all the applicability criteria as follows:

- The project activity is the installation of a new grid-connected wind power plant;
- The project does not involve switching from fossil-fuels to a renewable energy source at the site of the project activity;
- The geographic and system boundaries for the electricity grid (NCPG) can be clearly identified, and information on the characteristics of the grid is available.
- The proposed project is not a biomass-fired power project.

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

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

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

The spatial extent of the project boundary includes the Inner Mongolia Hangjin Yihewusu Phase I 49.5MW Wind Power Project and all power plants physically connected to the North China Power Grid, to which the proposed project is connected. Using the boundary definitions of the Chinese DNA⁴ issued

⁴ <http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2720.pdf>



on 20 October 2011, the latest available data when the GSP commenced, the North China Power Grid consists of independent provincial-level electricity systems, including Beijing, Tianjin, Hebei, Shanxi, Inner Mongolia, and Shandong province. A significant amount of power is exchanged between these systems, which depends on the demand and can be dispatched without major transmission constraints. The connected electricity system is the Northeast Power Grid (NEPG) and the Central China Power Grid (CCPG). There is power inflow from the NEPG and CCPG to the NCPG.

The greenhouse gases and emission sources included in or excluded from the project boundary are shown in Table B-1.

Table B-1. Emissions sources included in or excluded from the project boundary

	Source	Gas	Included?	Justification/Explanation
Baseline	CO ₂ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity.	CO ₂	Yes	Main emission source.
		CH ₄	No	Excluded for simplicity. This is deemed a conservative measure.
		N ₂ O	No	Excluded for simplicity. This is deemed a conservative measure.
Project Activity	CO ₂ emissions of the proposed project	CO ₂	No	According to ACM0002 (Version 12.3.0), the project emissions of wind farm project activity are 0.
		CH ₄	No	
		N ₂ O	No	

Below is the flow diagram of the project boundary:

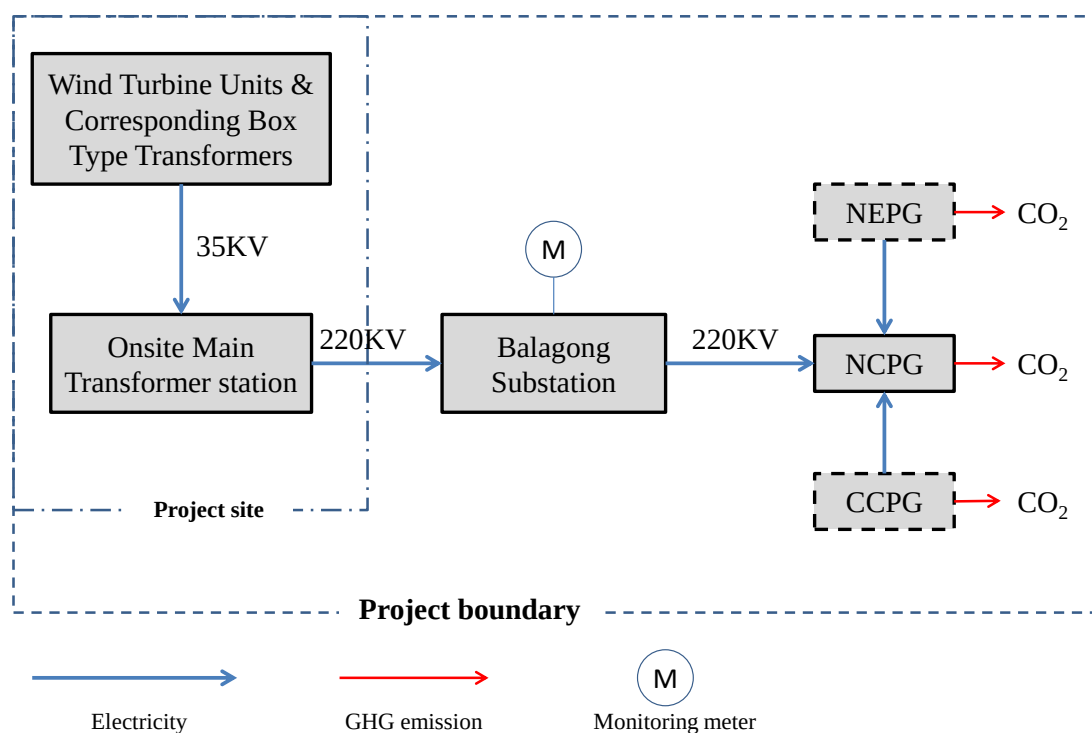


Figure B-1. Boundary of the proposed project

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

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The project activity is the installation of a new grid-connected wind power plant. According to the methodology ACM0002 (Version 12.3.0), 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”(Version 02.2.1).

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

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

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CDM consideration

The Feasibility Study Report (FSR) of the project was completed by the Inner Mongolia Electric Power Survey & Design Institute. The Economic Evaluation in the FSR reveals that the tariff is required to reach the 10% benchmark (equity IRR, after tax) is 0.614 CNY/kWh. However, the prevalent approved tariff of similar wind farms developed in western Inner Mongolia at that time was 0.51 CNY/kWh.⁵ The tariff 0.51 CNY/kWh was, therefore, applied in the investment analysis. It is shown that the financial status would be greatly improved when CDM revenues are taken into account. A detailed investment analysis will also be presented in this section. In May 2008, the board of the Inner Mongolia Energy Power Generation Investment Co., Ltd. decided to develop the project as a CDM project to overcome the financial barriers it faced.

The CDM consultancy contract was signed between the project owner and the Beijing Xiangyuyingtai International Engineering Consulting Co., Ltd. on 15 January 2009. Due to the suspension of the project's construction between March 2009 and August 2010, which was caused by the restructuring (see Figure B-2) of the Inner Mongolia Energy Power Generation Investment Co., Ltd. (which became the Inner Mongolia Guodian Energy Investment Co., Ltd. following the reorganization), the CDM consultancy contract was terminated on 22 January 2010. After the resumption of the project, Emission Reduction Purchase Agreement (ERPA) negotiations were started with Climate Bridge Ltd., with a Letter of Intent (LOI) signed between the Project Preparing Office (a representative of the Project Owner) and Climate Bridge Ltd. on 3 September 2010. The formal contract was finally signed between the PO and Climate Bridge Ltd. on 16 May 2011. The stakeholder consultation process of the proposed CDM project was undertaken between 17 August 2011 and 19 August 2011.

⁵ <http://news.stockstar.com/info/darticle.aspx?id=SS,20100322,30745278> (Fagai Jiage [2007] No.3033).

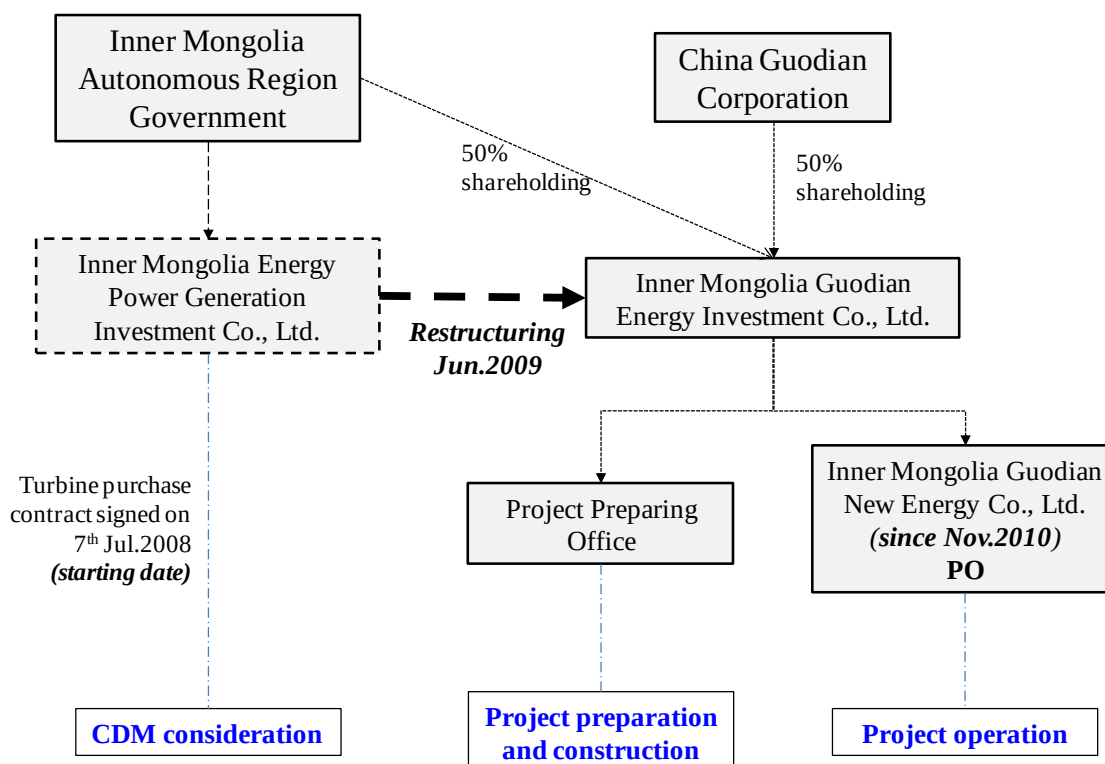


Figure B-2. Restructuring history of the PO

Table B-2. Timeline of project implementation and CDM consideration

Time	Milestone of project implementation
01/2008	The Feasibility Study Report was finalized.
01/2008	The EIA was finalized.
01/02/2008	The EIA was approved by the Inner Mongolia Environmental Protection Bureau.
14/04/2008	The Feasibility Study Report was approved by the Inner Mongolia Development and Reform Commission.
07/07/2008	Turbine Purchase Contract was signed between the Project Owner and the Equipment Supplier (Project's starting date).
25/02/2009	Project construction licence was issued, and the construction was started on the next day.
30/03/2009~20/08/2010	The project construction was suspended due to the restructuring of the project owner.
22/12/2011	The commissioning date of the first wind turbine and generator.
Time	Milestone of CDM consideration
05/05/2008	Board resolution was made on implementing the project as a CDM project.
15/01/2009	CDM consultancy contract signed with Beijing Xiangyuyingtai International Engineering Consulting Co., Ltd.
22/01/2010	Termination of CDM consultancy contract.
03/09/2010	Letter of Intent was signed between the Project Preparing Office and



Time	Milestone of project implementation
	Climate Bridge Ltd.
16/05/2011	ERPA was signed between the PO and Climate Bridge Ltd.
17/08/2011~19/08/2011	Stakeholder CDM consultation meeting.

The project uses the *Tool for the demonstration and assessment of additionality* (Version 06.0.0) to demonstrate its additionality. The tool calls for the following steps to be taken:

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

The credible and realistic alternative is identified to be:

Continuation of the current situation, i.e. equivalent electricity will continue to be provided by NCPG.

Step 2. Investment analysis

Determine whether the proposed project activity is not:

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

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

Sub-step 2a. Determine appropriate analysis method

Tool for the demonstration and assessment of additionality (Version 06.0.0) recommends three analysis methods, including the simple cost analysis (Option I), the investment comparison analysis (Option II), and the benchmark analysis (Option III).

Apart from CDM income, the proposed project generates financial and economic benefits through the sales of electricity; therefore, the simple cost analysis (Option I) is not applicable. The investment comparison analysis (Option II) is only applicable to projects where alternatives should be similar investment projects. The alternative baseline scenario of the proposed project is the NCPG providing the equivalent electricity rather than a new investment project. Out of the investment comparison analysis (Option II) and the benchmark analysis (Option III), the benchmark analysis (Option III) is chosen.

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

According to the Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects,⁶ the investment benchmark of Equity IRR in the electric power industry is 10%. The project can only be financially feasible if the equity IRR reaches the benchmark. This benchmark of 10% is widely used in the assessment and approval of electricity power projects in China; therefore, it is applied in this analysis to determine whether the proposed project is financially feasible.

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

The values of the parameters to calculate the equity IRR are presented in Table B-3 below:

⁶ Published by the Operation Department of Power Generation and Transmission under the State Power Corporation of China on 10/09/2002.

Table B-3. Basic parameters for financial evaluation

Parameter	Unit	Value	Source
Installed capacity	MW	49.5	FSR
Net electricity generation	MWh	117,784	FSR
Total static investment	CNY	535,720,000	FSR
Electricity tariff (VAT Incl.)	CNY/KWh	0.51	Expected tariff
Annual O&M costs	CNY	7,423,600	FSR
Value added tax (VAT)	%	8.5	FSR
Income tax	%	25 ⁷	FSR
The expected price of CERs	€/tCO ₂ e	10	Assumed market price
Project operational lifetime	year	20	FSR

Table B-4 shows the equity IRR of the project without and with CERs revenue from CDM.

Table B-4. IRR comparison without/with CERs

Item	Without CERs	Benchmark	With CERs
Equity IRR	2.41%	10%	9.32%

It is reflected that the equity IRR without CER revenues is 2.41%, which is below the benchmark 10% and, thus, financially not feasible. The financial status would be greatly improved if the project was registered as a CDM project.

Sub-step 2d. Sensitivity analysis

The sensitivity analysis is used to show whether the conclusion regarding the project's financial attractiveness is reliable under reasonable variations in the critical assumptions. The investment analysis provides a valid argument in favour of additionality only if it consistently supports (within a realistic fluctuation range of the key assumptions) the conclusion that the project activity is unlikely to be financially/economically attractive.

According to the latest EB Guidelines on the Assessment of Investment Analysis, only variables that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation. For the project, the most important parameters impacting the IRR include:

- Total static investment;
- Annual electricity delivered to the grid;
- Annual O&M cost;
- On-grid tariff

The outcomes of the equity IRR sensitivity analysis are presented in Table B-5, and Figure B-3.

Table B-5. Sensitivity analysis

	90%	95%	100%	105%	110%	Critical value
Total static investment	6.31%	4.25%	2.41%	0.82%	-0.57%	82%

⁷ The project is planned to enjoy a favourable income tax policy, according to which, the PO will not need to pay income tax during the first 3 years of operation and will only need to pay half of the standard income tax in the following 3 years. After these 6 years, the PO will have to pay full income tax.

	90%	95%	100%	105%	110%	Critical value
Annual electricity delivered to the grid	-0.70%	0.80%	2.41%	4.16%	6.02%	121%
Annual O & M cost	2.85%	2.63%	2.41%	2.19%	1.98%	6.84% ⁸
On-grid tariff	-0.70%	0.80%	2.41%	4.16%	6.02%	120%

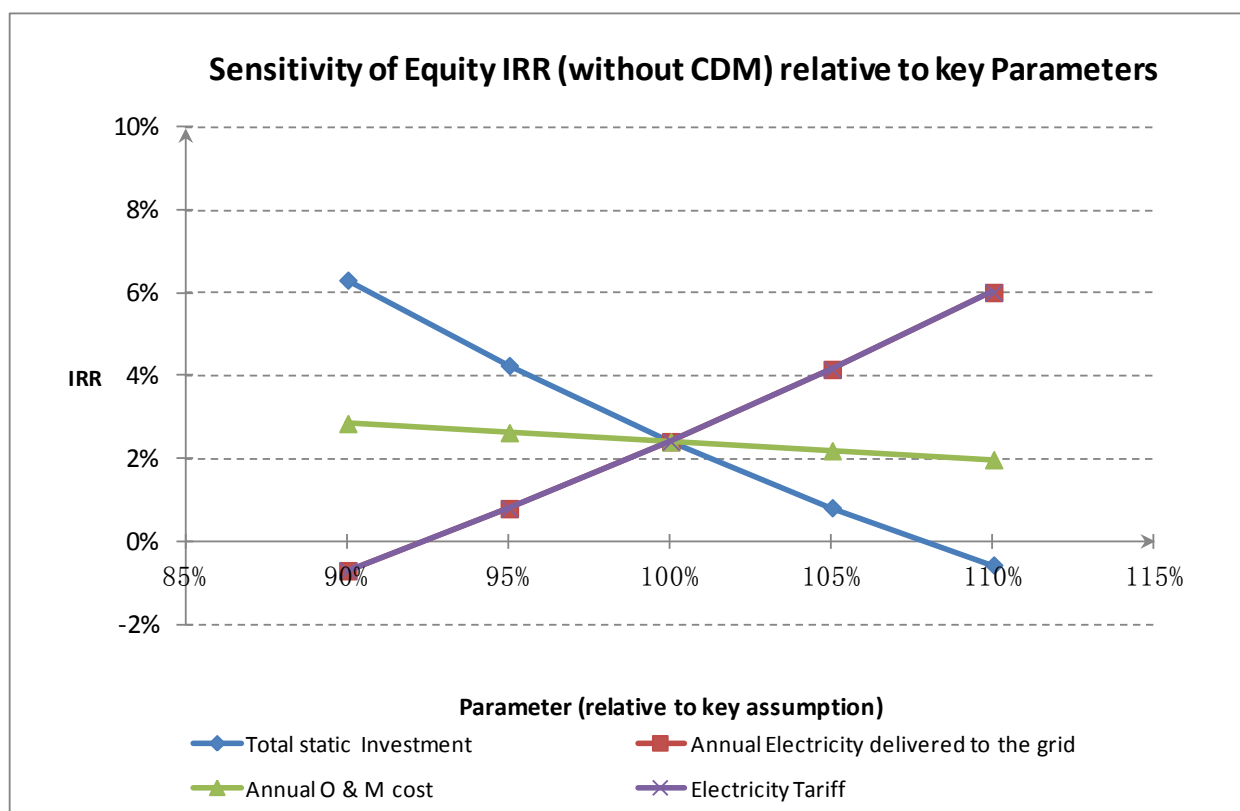


Figure B-3. Sensitivity analysis

As reflected in Figure B-3, the IRR is mainly impacted by total static investment, annual electricity delivered to the grid, and on-grid tariff. The impact of annual O&M cost on the IRR is less significant. Table B-4 also shows that without CER revenues, the equity IRR of the project could reach the 10% benchmark if the total investment was decreased by 18% or if either the tariff or the annual electricity delivered to the grid was increased by 21%.

The detailed analysis on the variation of each parameter is demonstrated in the following:

⁸ If the annual O&M costs were assumed to be zero, the equity IRR would be 6.84%, which is still below the 10% benchmark.

**Total static investment**

The equity IRR of the project can only reach the benchmark if the total static investment is decreased by 18%. However, this is very unlikely scenario due to the increasing prices in the Inner Mongolia Autonomous Region from 2005 to 2008,⁹ which clearly represents a trend of increasing investment costs. Therefore, the total static investment cost of this project is extremely unlikely to decrease.

Compared to the total static investment in the Feasibility Study Report (CNY 535,720,000), the actual investment has reached about 501.7 million CNY by June 2012. Since the actual investment is over the critical investment to reach the benchmark (439million), a decrease of 18% is not possible.

Annual electricity delivered to the grid

The equity IRR of the project can reach the benchmark only if the annual electricity delivered to the grid is increased by 21%. However such a rise is unlikely to happen due to the following reasons:

The annual electricity delivered to the grid is calculated by the annual electricity output (theoretical power generation) minus the energy loss factors. The calculation of the annual electricity output is carried out using professional WASP software in accordance with the “Wind Resources Evaluation method of Wind Farms” (GB/T 18710-2002), and it is based on the one-year wind resource measurement conducted on-site in 2006 as well as the available historical meteorological data of 30 years (1978-2006) from the local Hangjin Yihewusu Weather Station. Loss factors impacting the annual power supply, such as air density, wake flow loss, turbine load loss, blade contamination loss, power curve loss, internal consumption loss, and other losses have been taken into consideration and deducted from the annual electricity output, resulting in the generation of 117,784 MWh, which is the annual electricity delivered to the grid. The total loss factor for the proposed project is only 28.52% of the annual electricity output, while according to the *Statement on Chinese Wind Power Electricity Generation Loss Factor* issued by Chinese DNA on 2 June 2009, the total loss factor used in the calculations of power generation in China is typically 20%-45%.

The PLF is 27.16% in the FSR, which was completed by a qualified third party commissioned by the project owner. The PLF was provided to the government while applying for implementation approval. Electricity supplied depends on the average wind speed at the project site, the attributes of the specific wind turbine, and it is in positive correlation with the wind speed. It can be concluded from following Figure B-4 that the annual average wind speed at the Hangjin Yihewusu Weather Station kept decreasing slightly over the past 33 years,¹⁰ the annual electricity output is not anticipated increase by 21% in the future. Even applying the highest PLF of the registered projects with installed capacity of 49.5MW in Inner Mongolia¹¹, the Equity IRR of the proposed project would still below the benchmark.

⁹ <http://www.nmgtj.gov.cn/Html/jjshfztjgb/2009-7/0/1449.shtml>

<http://www.nmgtj.gov.cn/Html/jjshfztjgb/2009-7/0/1467.shtml>

<http://www.nmgtj.gov.cn/Html/jjshfztjgb/2009-7/0/1525.shtml>

<http://www.nmgtj.gov.cn/Html/jjshfztjgb/2009-7/0/2385.shtml>

¹⁰ See the following figure on the annual average wind speed from 1978 to 2010. It can be concluded from the fitting curve that it is a decreasing function, so there has been a slight decrease in annual average wind speed.

¹¹ Data up to the day of GSP of the proposed project

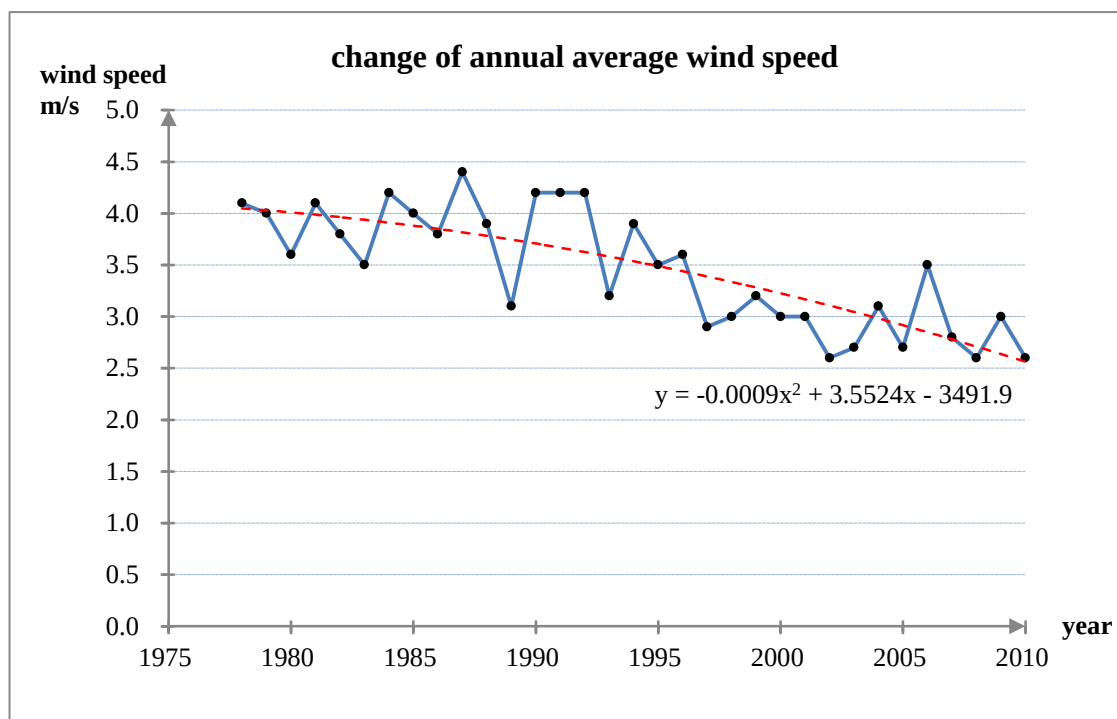


Figure B-4. The changes of the annual average wind speed¹²

Annual O&M Cost

As reflected in Figure B-3, O&M cost only has a small impact on the project's IRR. The level of O&M costs is mainly determined by the employee expenditure, maintenance and repair rate, material costs, and other costs. The employee expenditure, maintenance and repair rate, materials cost make up more than 87% of all O&M costs. Taking the inflation as well as the increasing wages and prices of raw materials into account, a significant reduction in O&M cost is obviously unlikely.

Even if annual O&M costs were assumed to be zero, the equity IRR would still only reach 6.84%, which is below the 10% benchmark.

On-grid tariff

The tariff would need to be increased by 20%, to 0.612 CNY/kWh, for the proposed equity IRR to reach the benchmark. However, this scenario is highly unlikely as well. In China, the electricity tariff of wind farm projects is regulated by the central and local government. Based on the tariff notifications issued by the government for western Inner Mongolia in the past three years, it shows the tariffs for wind projects in the region have been kept the same since 2007.

Table B-6. Public tariff notification for western Inner Mongolia

Date	Document	Tariff (CNY/kWh, incl.VAT)
09/06/2007	Fagaijiage [2007]No.1260	0.51
03/12/2007	Fagaijiage [2007]No.3303	0.51
23/07/2008	Fagaijiage [2008]No.1876	0.51
20/07/2009	Fagaijiage [2009]No.1906	0.51

¹² Historical wind speed data from 1978~2006 originated from FSR; Wind speed data from 2007~2010 originated from local weather station.

The tariff applied in the investment analysis is derived from the comparable wind power projects developed in western Inner Mongolia, which have obtained the tariff approvals (Fagaijiage [2007] No.3303) from the National Development and Reform Commission (NDRC), and represents a realistic assumption of the tariff of the proposed project at the time the investment decision was made.

As the tariff has already been fixed prior to the start date of the project and is still valid now even after the project has been put into operation, a great variation in the tariff rate is not realistic. Even if a 10% increase in the tariff was applied, the equity IRR would still not reach the benchmark.

Highest historical tariff

According to the “*Information Note on the Highest Tariffs Applied by the Executive Board in Its Decisions on Registration of Projects in the People’s Republic of China (version 02)*” published on 3 June 2011, the highest historical tariff in Inner Mongolia is 0.54 CNY/kWh (incl. VAT). However, the proposed project would require a 0.612 CNY/kWh tariff to reach the benchmark 10% (see IRR spreadsheet), which is higher than the highest historical tariff ever granted. Therefore, it can be seen that the tariff used in the investment analysis is appropriate after reviewing the highest historical tariff.

Step 3: Barrier analysis

Not applicable

Step 4: Common practice analysis

Sub-step 1: Define the applicable output range

The installed capacity of the project is 49.5 MW, so the $\pm 50\%$ range is 24.75~74.25MW.

Sub-step 2: Identify N_{all}

- Applicable geographic area: Considering the size of the People’s Republic of China, the geographical differences (e.g.: access to natural resources, climate, terrain, etc.) as well as the social and economic differences (e.g.: regulatory framework, infrastructure, economic development levels, economic structure, access to technology, access to financing, tariff levels, etc.) between the provinces, the applicable geographic area is the Inner Mongolia Autonomous Region.
- Applicable project size: Identify all plants which deliver the output of 24.75~74.25MW electricity in the Inner Mongolia Autonomous Region and started commercial operation before 7 July 2008 (the start date of the proposed project activity), excluding registered CDM projects.

$$N_{all} = \sum N_i \text{ (i mean different energy sources)}$$

According to the *China Electricity Year Book of 2005~2010* and the *Water Resource Year Book of 2005~2009*, the following results are obtained.

Table B-7. Number of projects with electricity outputs of 24.75~74.25MW in Inner Mongolia Autonomous Region and started commercial operation before 7 July 2008

item	Projects of different energy sources	Number
1	Coal power	$N_{\text{coal power}}^{13}$
2	Hydropower	0

¹³ Number of coal power plants is not available and it is assumed to be an unknown number $N_{\text{coal power}}$.

item	Projects of different energy sources	Number
3	Biomass-based power	0
4	Wind power	2
5	Solar power	0
6	Nuclear power	0
7	Geothermal power	0
8	Tidal power	0

$$\therefore N_{\text{all}} = \sum N_i = N_{\text{windpower}} + N_{\text{coalpower}}$$

Table B-8 Wind power projects involved in $N_{\text{wind-power}}$

Item No.	Project Name	Installed Capacity (MW)	Commissioning year
1	Dali wind Phase III project ¹⁴	31.2	2004
2	Bailingmiao Wind Phase I Project ¹⁵	50	2007

Therefore $N_{\text{all}} = 2 + N_{\text{coal power}}$.

Sub-step 3: Identify N_{diff}

Different technologies are defined as those that have differing:

- 1) Energy sources. Coal power projects are included in N_{diff} ;
- 2) Financing access:
 - Dali wind Phase III project: the project was financed by the “Program of Promoting Wind projects”¹⁶ of the NDRC and had the loans from the Netherlands government.
 - Bailingmiao Wind Phase I Project: the project has applied for voluntary emission reductions under the voluntary carbon scheme, the Gold Standard

The two wind power projects, the Dali wind Phase III project and the Bailingmiao Wind Phase I Project, are included in N_{diff} .

A total of 2 wind power projects have been excluded in sub-step 3, and are considered part of N_{diff} .

It can, therefore, be concluded that $N_{\text{diff}} = N_{\text{coal power}} + 2$.

Sub-step 4: calculate F

It can be concluded that $N_{\text{diff}} = N_{\text{all}}$, so $F = 1 - \frac{N_{\text{diff}}}{N_{\text{all}}} = 1 - \frac{(2 + N_{\text{coalpower}})}{(2 + N_{\text{coalpower}})} = 0 < 20\%$, and $N_{\text{all}} - N_{\text{diff}} = 0 < 3$

¹⁴ <http://news.eastday.com/eastday/node545/node12905/u1a153684.html>

¹⁵ <http://www.sgsqualitynetwork.com/tradeassurance/ccp/projects/project.php?id=423>

¹⁶ http://blog.sina.com.cn/s/blog_4efe19b201000bwk.html



Result of common practice assessment

$$F_{\max}=0 < 20\%$$

$$N_{\text{all}}-N_{\text{diff}}=0 < 3$$

The project is not common practice and is additional.

**B.6. Emission reductions:****B.6.1. Explanation of methodological choices:**

>>

Project Emissions (PE_y)

According to ACM0002, there are no expected project emissions for a wind farm project. Therefore, PE_y=0.

Baseline Emissions (BE_y)

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

$$BE_y = EG_{PJ,y} \cdot EF_{grid,CM,y} \quad (1)$$

Where:

- BE_y = Baseline emissions in year y (tCO₂/yr)
 EG_{PJ,y} = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)
 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” (tCO₂/MWh)

$$EG_{PJ,y} = EG_{facility,y} \quad (2)$$

Where:

- EG_{PJ,y} = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)
 EG_{facility,y} = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr)

The “combined margin” emission factor of the electricity system (CM) is calculated based on the estimation of the “operating margin” (OM) and the ‘build margin’ (BM), according to ‘Tool to calculate the emission factor for an electricity system’. The following six steps are applied to determine OM, BM, and CM used for calculating the project baseline emissions:

Step 1: Identify the relevant electricity systems

According to the delineation of the project electricity system and connected electricity systems published by China’s DNA¹⁷, the project electricity system for the proposed project is North China Power Grid which covers the grids of which includes Beijing, Tianjin, Hebei, Shanxi, Shandong, and Inner Mongolia Power Grid.

There is net electricity imported from the NEPG and CCPG to the NCPG grid, so they are the connected electricity system. The Option B) is selected among the following options to determine the OM for net electricity imported:

0 tCO₂/MWh; or

¹⁷ <http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2708.pdf>



- a) The weighted average operating margin (OM) emission rate of the exporting grid, determined as described in step 4 (d) of the “Tool to calculate the emission factor for an electricity system”; or
- b) The simple operating margin emission rate of the exporting grid, determined as described in step 4(a) of the “Tool to calculate the emission factor for an electricity system”, if the conditions for this method, as described in step 3 below, apply to the exporting grid; or
- c) The simple adjusted operating margin emission rate of the exporting grid, determined as described in step 4 (b) of the “Tool to calculate the emission factor for an electricity system”.

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

Option I: Only grid power plants are included in the calculation.

Option II: Both grid power plants and off-grid power plants are included in the calculation.

Based on China's real situation, Option I is selected, and grid power plants are included in the calculation.

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

The calculation of operating margin emission factor ($EF_{grid,OM,y}$) can be based on one of four options listed as follows:

- (a) Simple OM, or
- (b) Simple adjusted OM, or
- (c) Dispatch data analysis OM, or
- (d) Average OM.

In China, specific data from the grid or each power plant is treated as business confidential and thus not public available. Therefore, Option (b) and Option (c) cannot be possibly used for the proposed project. For the most recent 5 years (2005-2009), the low-cost/must run resources constituted less than 50% of total power generation of NCPG and the relevant ratios are respectively were 0.67%, 0.75%, 0.75%, 1.12% and 2.25% for 2005, 2006, 2007, 2008 and 2009. Hence, the low operating cost/must run sources is much less than 50% of the total grid generation, which complies with the defined condition of Option (a), but not Option (d). Based on these reasons, **Option (a)** is selected to calculate the Operating Margin emission factor of the proposed project.

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

- **Ex ante option:** If the *ex ante* option is chosen, the emission factor is determined once at the validation stage. Thus, no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, or
- **Ex post option:** If the *ex post* option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emission factor to be updated annually during monitoring. If the data required to calculate the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year y-1 may be used. If the data is usually only available 18 months after the end of the year y, the emission factor of the year proceeding the previous year y-2 may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

This PDD uses **Ex ante Option** for $EF_{grid,simple OM, y}$ calculation to be in accordance with the baseline emissions factor calculation for regional power grids published by China DNA.

**Step 4: Calculate the operation margin emission factor according to the selected method**

The simple OM emission factor is calculated as the generation-weighted average CO₂ emission per unit net electricity generation (tCO₂e/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

The simple OM may be calculated:

Option A: Based on the net electricity generation and a CO₂ emission factor of each power unit; or

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

Option B can only be used if:

- (a) The necessary data for option A is not available; and
- (b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and
- (c) Off-grid power plants are not included in the calculation.

As the data required by option A is not available in China, and the nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known in china, and off-grid power plants are not included in the calculation. Therefore, Option B is used for calculating project OM as follows:

$$EF_{grid, OMsimple, y} = \frac{\sum FC_{i, y} \times NCV_{i, y} \times EF_{CO2, i, y}}{EG_y} \quad (3)$$

Where:

- $EF_{grid, OMsimple, y}$ = Simple operating margin CO₂ emission factor in year y (tCO₂/MWh)
- $FC_{i, y}$ = Amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit)
- $NCV_{i, y}$ = Net calorific value (energy content) of fossil fuel type i in year y (GJ/mass or volume unit)
- $EF_{CO2, i, y}$ = CO₂ emission factor of fossil fuel type i in year y (tCO₂/GJ)
- EG_y = Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plants/units, in year y (MWh)
- i = All fossil fuel types combusted in power sources in the project electricity system in year y
- y = The relevant year as per the data vintage chose in Step 3

Based on the most recent three years (2007~2009) where the data are the latest and available at the time of this PDD submission, the $EF_{grid, OM simple, y}$ is estimated to be 0.9803 tCO₂e/MWh. Please refer to Annex 3 for detailed calculation.

Step 5 Calculate the build margin emission factor (BM)

In terms of vintages of data, project participants can choose between one of the following two options:

Option 1 For the first crediting period, Calculate the Build Margin Emission Factor $EF_{grid BM, y}$, *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 second crediting period should be used. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2 For the first crediting period, the build margin emission factor shall be updated annually, *ex post*, including those units built up to the year of registration of the project activity or, if information up to year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated *ex ante*, as described in option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

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

The sample group of power units m used to calculate the build margin should be determined as per the following procedure, consistent with the data vintage selected above:

(a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5-units}$) and determine their annual electricity generation ($AEG_{SET-5-units}$, in MWh);

(b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total} , in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\%}$) and determine their annual electricity generation ($AEG_{SET-\geq 20\%}$, in MWh);

(c) From $SET_{5-units}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample});

Otherwise:

(d) Exclude from SET_{sample} the power units which started to supply electricity to the grid more than 10 years ago. Include in that set the power units registered as CDM project activity, starting with power units that started to supply electricity to the grid most recently, until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) to the extent is possible. Determine for the resulting set ($SET_{sample-CDM}$) the annual electricity generation ($AEG_{SET-sample-CDM}$, in MWh);

If the annual electricity generation of that set is comprises at least 20% of the annual electricity generation of the project electricity system (i.e. $AEG_{SET-sample-CDM} \geq 0.2 \times AEG_{total}$), then use the sample group $SET_{sample-CDM}$ to calculate the build margin. Ignore steps (e) and (f).

(e) Include in the sample group $SET_{sample-CDM}$ the power units that started to supply electricity to the grid more than 10 years ago until the electricity generation of the new set comprises 20% of the annual



electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation);

(f) The sample group of power units m used to calculate the build margin is the resulting set (SETsample-CDM->10yrs).

However, in China, it is very difficult to obtain the data of the five existing power plants built most recently or the power plants supply electricity to the grid that comprise 20% of the annual electricity generation (in MWh) and that were built most recently, since no data of plant specific generation and fossil fuel consumption is currently available in China. As none of the above options can be selected, the following deviations are adopted to calculate the BM¹⁸:

First, to calculate the newly added installed capacity and the contribution component of other various power generation technologies, then calculate of the weight of newly added installed capacity of each power generation technology, and finally, to calculate BM emission factor using the commercially optimal efficiency level of each power generation technology.

According to the “Tool to calculate the emission factor for an electricity system”, the build margin emissions factor ($EF_{grid,BM,y}$) is calculated as the generation-weighted average emission factor (tCO₂e/MWh) of all power units m during the most recent year y for which power generation data is available. The calculation equation is as follows:

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

Where:

- $EF_{grid,BM,y}$ = Build margin CO₂ emission factor in year y (tCO₂/MWh)
- $EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
- $EF_{EL,m,y}$ = CO₂ emission factor of power unit m in year y (tCO₂e/MWh)
- m = Power units included in the build margin
- y = Most recent historical year for which power generation data is available.

Since the generating capacity of coal-fired, oil-fired and gas-fired technologies can't be separated from the existing statistical data, the following measures are taken for the calculation:

First, based on the available data of the latest year, determine the ratio of CO₂ emissions from coal, oil, and gas consumption for power generation to the total CO₂ emission; Second, to calculate the emission factor of the thermal power based on the weight of CO₂ emission from coal, oil, and gas, and the emissions factors using commercial technologies with optimal efficiency. And finally, to multiply the thermal emission factor with the portion of the thermal power comprising 20% of the newly added capacity.

¹⁸ <http://cdm.unfccc.int/UserManagement/FileStorage/6POIAMGYOEDOTKW25TA20EHEKPR4DM>

Sub-Step 1: Calculate the proportion of CO₂ emissions from solid, liquid and gaseous fuels corresponding to the total CO₂ emissions.

$$\lambda_{Coal} = \frac{\sum_{i \in COAL, j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (5)$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (6)$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO_2,i,j,y}} \quad (7)$$

Where:

- $F_{i,j,y}$ = the amount of fuel i (tce) consumed by plants in province j in year y
 $NCV_{i,y}$ = the net calorific value (energy content) of fossil fuel type i in year y (GJ/mass or volume unit)
 $EF_{CO_2,i,j,y}$ = the CO₂ emission factor of fossil fuel type i in province j in year y
 Coal, Oil and Gas is the feet for solid fuels, liquid fuels and gas fuels.

Sub-Step 2: Calculate the emission factor of thermal power ($EF_{Thermal}$)

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

$EF_{Coal, Adv}$, $EF_{Oil, Adv}$, $EF_{Gas, Adv}$ are the operating margin emission factors respectively consumed by coal-fired, oil-fired and gas-fired generation technology at the commercially optimal efficiency.

Sub-Step 3: Calculation of BM in the grid.

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

Where:

- $CAP_{thermal,y}$ = the added installed capacity of thermal power generation sources (MW) in year y
 $CAP_{total,y}$ = the total added installed capacity of all kinds of power generation sources (MW) in year y which comprises at least 20% of the existing installed capacity
 $EF_{Thermal,y}$ = the emission factor of thermal power plants in year y

Key parameters used to calculate BM emission factor include the low calorific value of each fossil fuel, the oxidation rate, the potential emission factors, and the efficiency of various power generation technologies. The data of low calorific value of each fossil fuel and their oxidation rate comes from China Energy Statistical Yearbook 2010. The potential emission factors are sourced from “2006 IPCC Guidelines for National Greenhouse Gas Inventories” Table 1.3 and Table 1.4 of Page 1.21-1.24 in Chapter one, Volume 2 Energy.



According to the latest and available data at the time of this PDD submission, $EF_{grid, BM, y}$ is calculated to be 0.6426 tCO₂e/MWh. Please refer to Annex 3 for the details of calculation.

Step 6: Calculate the combined margin emissions factor

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

- (a) Weighted average CM; or
- (b) Simplified CM.

The weighted average CM method (option A) should be used as the preferred option.

The simplified CM method (option b) can only be used if:

- The project activity is located in a Least Developed Country (LDC) or in a country with less than 10 registered projects at the starting date of validation; and
- The data requirements for the application of step 5 above cannot be met.

The PDD will choose option A.

The combined margin emissions factor is calculated as follows:

$$EF_{grid, CM, y} = \omega_{OM} \times EF_{grid, OM, y} + \omega_{BM} \times EF_{grid, BM, y} \quad (10)$$

Where:

- $EF_{grid, BM, y}$ = Build margin CO₂ emission factor in year y (tCO₂/MWh)
- $EF_{grid, OM, y}$ = Operating margin CO₂ emission factor in year y (tCO₂/MWh)
- ω_{BM} = Weighting of build margin emissions factor (%)
- ω_{OM} = Weighting of operating margin emissions factor (%)

As specified in “Tool to calculate the emission factor for an electricity system”, the proposed wind power project shall use $\omega_{OM}=0.75$ and $\omega_{BM}=0.25$ for the first crediting period unless otherwise specified in the approved methodology which refers to this tool.

So for the first crediting period, the $EF_{grid, CM, y} = 0.75 \times 0.9803 + 0.25 \times 0.6426 = 0.8959$ t CO₂/MWh

Leakage

According to the ACM0002, no leakage emissions are considered.

Emissions Reduction (ER_y)

According to the ACM0002, emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y \quad (11)$$

Where:

- ER_y = Emission reductions in year y (tCO₂/yr)
- BE_y = Baseline emissions in year y (tCO₂/yr)



PE_y = Project emissions in year y (tCO_2/yr)

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

Data / Parameter:	$EG_{imported, y}$
Data unit:	MWh
Description:	Net quantity of electricity imported to the NCPG in year y
Source of data used:	<i>China Electricity Yearbook 2008~2010</i>
Value applied:	see Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	National statistic value
Any comment:	Used to calculate OM

Data / Parameter:	$FC_{i, y}$
Data unit:	$10^4 t$ or $10^8 m^3$
Description:	Amount of fossil fuel type i consumed in the project electricity system in year y ; or The amount of fossil fuel type i consumed in the project electricity system of province j in year y .
Source of data used:	<i>China Energy Statistical Yearbook 2008-2010</i>
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistical data
Any comment:	Used for the calculation of OM and BM

Data / Parameter:	$NCV_{i, y}$
Data unit:	GJ/mass or volume unit
Description:	Net calorific value (energy content) of fossil fuel type i in year y
Source of data used:	<i>China Energy Statistical Yearbook 2009.</i>
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistical data
Any comment:	Used for the calculation of OM and BM

Data / Parameter:	$EF_{CO_2, i, y}$
Data unit:	t C/TJ



Description:	CO ₂ emission factor of fossil fuel type <i>i</i> used in power unit <i>m</i> in year <i>y</i>
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC default value
Any comment:	Used for the calculation of OM and BM

Data / Parameter:	EG _{<i>y</i>}
Data unit:	MWh
Description:	Net electricity generated and delivered to the grid by all power sources in the project electricity system, not including low-cost/must-run power plants/units, in year <i>y</i>
Source of data used:	China Electric Power Yearbook 2008-2010
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistical data
Any comment:	Used for the calculation of OM.

Data / Parameter:	EF _{coal, Adv, <i>y</i>}
Data unit:	kgCO ₂ /TJ
Description:	Emission factors reflecting the efficiency level of the best coal-based power generation technology commercially available in China.
Source of data used:	Notification of 2011 Baseline Emission Factors for Regional Power Grids in China published by China's DNA.
Value applied:	87,300
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released data
Any comment:	Used for the calculation of BM

Data / Parameter:	EF _{Oil, Adv, <i>y</i>}
Data unit:	kgCO ₂ /TJ
Description:	Emission factors reflecting the efficiency level of the best oil-based power generation technology commercially available in China.
Source of data used:	Notification of 2011 Baseline Emission Factors for Regional Power Grids in China published by China's DNA.



Value applied:	75,500
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released data
Any comment:	Used for the calculation of BM

Data / Parameter:	$EF_{Gas, Adv, y}$
Data unit:	kgCO ₂ /TJ
Description:	Emission factors reflecting the efficiency level of the best gas-based power generation technology commercially available in China.
Source of data used:	<i>Notification of 2011 Baseline Emission Factors for Regional Power Grids in China published by China's DNA.</i>
Value applied:	54,300
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released data
Any comment:	Used for the calculation of EF_{BM}

Data / Parameter:	$CAP_{i, j, y}$
Data unit:	MW
Description:	Installed capacity of power source i of province j of the NCPG in the year y
Source of data used:	<i>China Electric Power Yearbook 2008-2010</i>
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released data
Any comment:	Used for the calculation of BM

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

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1. Project emission

$$PE_y = 0$$

2. Baseline emission

According to section B.6.1, the baseline emission factor of the NCPG ($EF_{grid, CM, y}$) is calculated as 0.8959 tCO₂e/MWh. The annual net electricity supplied to the grid is estimated to be 117,784 MWh. Therefore, the baseline emissions can be calculated as follows:

$$BE_y = 0.8959 \times 117,784 = 105,520 \text{ tCO}_2\text{e/year}$$

**3. Leakage**

Leakage=0

4. Emission reduction

The annual estimated emission reductions of the project activity can be calculated by formula (11):

$$ER_y = BE_y - PE_y - \text{leakage} = 105,520 - 0 - 0 = 105,520 \text{ tCO}_2\text{e/year}$$

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

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Year	Estimation of project activity emissions (tCO ₂ e)	Estimation of baseline emissions (tCO ₂ e)	Estimation of leakage (tCO ₂ e)	Estimation of overall emission reductions (tCO ₂ e)
01/12/2012-30/11/2013	0	105,520	0	105,520
01/12/2013-30/11/2014	0	105,520	0	105,520
01/12/2014-30/11/2015	0	105,520	0	105,520
01/12/2015-30/11/2016	0	105,520	0	105,520
01/12/2016-30/11/2017	0	105,520	0	105,520
01/12/2017-30/11/2018	0	105,520	0	105,520
01/12/2018-30/11/2019	0	105,520	0	105,520
Total (tonnes of CO ₂ e)	0	738,640	0	738,640

B.7. Application of the monitoring methodology and description of the monitoring plan:**B.7.1 Data and parameters monitored:**

Data / Parameter:	$EG_{facility,y}$
Data unit:	MWh
Description:	Quantity of net Electricity delivered to the grid by the proposed project
Source of data to be used:	Monitoring electricity meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	117,784
Description of measurement methods and procedures to be applied:	The parameter will be calculated and recorded for the purpose of project verification.
QA/QC procedures to be applied:	The meters should be calibrated annually by an independent qualified calibration entity in accordance with the relevant national and industrial regulations. Cross check measurement results with records for sold and purchased electricity.
Any comment:	

B.7.2. Description of the monitoring plan:

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An overall monitoring plan will be put into place in order to guarantee the long-term precise measurement of the proposed project's GHG emission reductions and to have a complete and reliable emission reductions calculation. The details of the monitoring plan are summarized as follows:

1. Operation and management structure of monitoring

In order to obtain reliable monitoring data, the project developer will establish a monitoring management structure. Clear responsibilities will be assigned to all staff involved in the CDM project. A CDM manager will be appointed who will have the overall responsibilities of monitoring the project. The measurement of the electricity exports and imports will be carried out by the monitoring officers. In addition, the project developer will designate internal verifiers who will be responsible for the internal verification of the measurement, the collection of electricity records, and the calculation of the emission reductions.

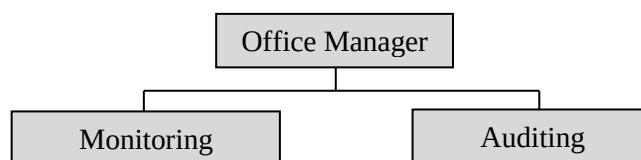


Figure B-5. Operations and Management Structure of the proposed project

2. Monitoring equipment and installation

The quantity of net Electricity delivered to the grid by the proposed project (refer to Section B.7.1) needs to be monitored. The electricity generated by the 33 wind turbine generators will be transformed to 35kV by the 33 box-type transformers, connected to the on-site main transformer which will increase the voltage to 220kV, and then delivered to the nearby Balagong substations. All electricity will finally be delivered to the Inner Mongolia Grid and the NCPG.

The metering systems include M_S , M_S' , M_I , of which M_S and M_S' will be installed at the Balagong substation, and M_I will be installed at the Yihewusu substation. All the electricity meters except M_I are bi-directional meters which will measure the amount of electricity supplied to the grid and the amount of electricity imported from the grid. M_I measures the electricity imported from the 10kV backup power supply grid for emergencies.

M_S is the main meter and M_S' is the backup meter, which will be used when main meter is malfunctioning. The net electricity delivered to the grid of M_S (M_S') minus the electricity imported from the grid through M_I is the total net electricity delivered to the grid of the proposed project ($EG_{facility,y} = EG_{net,M_S,y} - EG_{imp,M_I,y}$), which will be used as for the ER calculation.

All meters should be installed in accordance with the national standard 'Electricity meter installation technical management code' (DL/T448-2000). The accuracy of the meters will be no less accurate than 0.5.

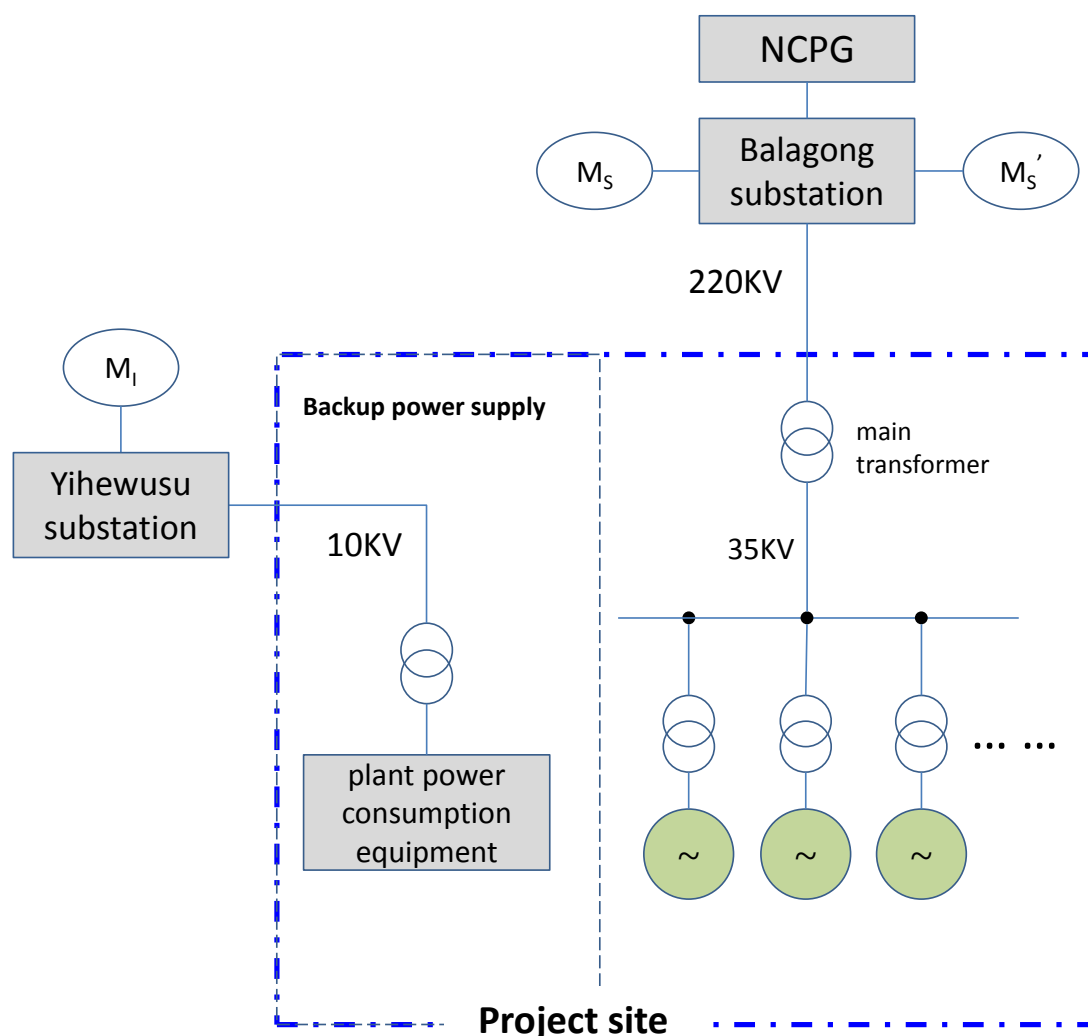


Figure B-6. Diagram of grid connection

3. Data collection and management

The project owner and the local power grid company will read and confirm the meters and record the data on a regular basis. The monitored data will be archived electronically each month.

All written documents, such as diagrams and reports, should be stored and made available to the verifier, so that the reliability of the information may be checked. All data should be archived for 2 years after the end of the last crediting period.

4. Quality assurance and quality control

The meters should be installed in accordance with the relevant national and industrial regulations. Prior to the project operation, the project owner and the grid company should check the meters according to the relevant national and industrial regulations. The meters should be calibrated annually by an independent qualified calibration entity in accordance with the relevant national and industrial regulations. Data and records will be checked prior to being recorded and archived, and possible errors should be identified at this step. In case the main meter operates abnormally, the readings from the backup meter will be adopted.



If both the main and back-up meters are out of order, the data monitored within this certain period shall not be counted.

Training on CDM monitoring will be provided to the relevant staff in order to guarantee the implementation of the monitoring plan.

5. Monitoring results and verification

The verification of the monitoring results of the project activity is required for each crediting period. The monitoring results will be compiled in a monitoring report that will serve as a basis for project verification in each crediting year.

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):

>>

The baseline study and monitoring methodology of the proposed project was completed on 01/08/2012.

Name of person/entity determining baseline study and monitoring methodology:

Dong Jian and Melinda Hu, Climate Bridge Ltd.²⁰

Email: dong.jian@climatebridge.com

melinda.hu@climatebridge.com

²⁰ As one of the project participants of the proposed project

**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:**

>>

07/07/2008²¹**C.1.2. Expected operational lifetime of the project activity:**

>>

20 year, 0 month

C.2. Choice of the crediting period and related information:**C.2.1. Renewable crediting period:****C.2.1.1. Starting date of the first crediting period:**

>>

01/12/2012 or the effective registration date, whichever is later

C.2.1.2. Length of the first crediting period:

>>

7 years, 0 month

C.2.2. Fixed crediting period:**C.2.2.1. Starting date:**

>>

Not applicable

C.2.2.2. Length:

>>

Not applicable

²¹ The starting date of a CDM project activity is the earliest date at which either the implementation or construction or real action of a project activity begins. According to the definition, the starting date of the proposed project activity is the signature date of the Turbine Purchase Contract, as it is the earliest date at which real action related to the project activity was made.

**SECTION D. Environmental impacts**

>>

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

>>

According to the *Classification of Environmental Management for Construction Projects*,²² the project owner submitted the *Environmental Impact Assessment Registration Form* to the Environmental Protection Bureau (EPB) of the Inner Mongolia Autonomous Region, which was approved on 1 February 2008.²³ A summary of the main findings of the EIA is provided as follows:

- **Waste water**

Construction period: The wastewater of the proposed project is mainly consists of domestic wastewater from the staff's everyday activities and the operation of the employee canteen. Recycled domestic wastewater will be used for landscaping and spraying for the purpose of dust control.

Operation period: Wastewater generated at the site during the operation period primarily includes domestic wastewater. After its treatment through oxygenation, sedimentation, and disinfection, the wastewater will meet the Class I requirements of the Integrated Wastewater Discharge Standard, following which it will be used for landscaping and spraying.

- **Noise pollution**

Construction period: Noise during the construction period mainly comes from the operation of construction machinery and transportation vehicles. The major measures to be taken for noise control include applying low-noise machinery and technology, pre-planning the construction, maintaining the construction machinery regularly, slowing down speed, and forbidding the use of auto horns while vehicles pass through the residential area. There is no environmentally sensitive area within 500 m of any one of the wind turbines, and thus the requirements of the applicable standards will be met.

Operation period: The operation of wind turbines consists of the major source of noise during the operational period. Based on the data provided by the manufacturer of the wind turbines, the noise of the wind turbines applied by the proposed project meets the relevant standards. As the proposed site is located far from residential areas, the noise impact of the proposed project on the surrounding area is negligible.

- **Air pollution**

Construction period: The air pollution during the construction period is mainly due to the dust emitted by the construction activity. The major measures for dust control include sprinkling water at the construction site and along the roads used for transportation, and covering the temporary excavation sites.

Operation period: The operation of the wind farm will not impact the air quality.

- **Solid waste**

Construction period: Construction waste and excavated materials are regarded as being a significant source of waste, in addition to domestic solid waste. The excavation sites will be backfilled so as to minimize waste excavation. The excavated materials will be placed at the designated site and then treated

²² Issued by the Ministry of Environmental Protection, and has become effective on 1 October 2008.

²³ Refer to "neihuanbiao [2008] No. 25"



by engineering and biological measures. Domestic solid waste will be collected and treated by the local sanitary department.

Operation period: Domestic solid waste generated by the staff's activities during the operation period of the proposed project will be collected and treated by the designated sanitary department.

● **Ecological environment**

Construction period: The ecological impacts of the proposed project during the construction period mainly include the loss of vegetation and landform disturbance. In addition, the installation of the wind turbines, box transforms, and other facilities will disturb the original habitats of birds and other animals. Measures are to be taken in order to minimize the potential ecological impacts during the construction period, including:

- Reinforcing the construction management and minimizing the construction scope;
- Vehicles using designated routes only;
- Planting seeds after the completion of the construction in order to recover lost vegetation;
- Covering different sites, including the collection sites of materials, excavated soil, earthworks, etc.

Operation period: The ecological impacts of the proposed project during the operation period mainly include the impacts of staff activities and the running of wind turbines on wild animals at the proposed site. Measures to be taken in order to minimize the potential ecological impacts during the operation period include: recovering vegetation, disposing domestic solid waste properly, and restoring the original ecological conditions, and increasing the environmental awareness of employees.

In conclusion, as a clean renewable energy project, the project will not have significant negative impacts on the local environment during its construction or operation.

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

>>

According to the *Environmental Impact Assessment Registration Form* and its approval, no significant environmental impacts have been discovered by the project participants or the host party.

**SECTION E. Stakeholders' comments**

>>

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

>>

Questionnaire

Between 17 August 2011 and 19 August 2011, the staff from the Inner Mongolia Guodian New Energy Co., Ltd. carried out a survey among local villagers and residents living in the project area. The questionnaires used for assessing the project's impacts on the local environment, as well as on the region's social and economic development were sent out to local villagers and residents. 50 questionnaires were distributed, and 46 questionnaires had been returned. The response rate is 92%. The questions listed in the questionnaires are summarized as follows:

- (1) Do you agree with the development of the project?
- (2) What do you think the project's impact on the local job market will be?
- (3) What do you think the project's impact on the local economy will be?
- (4) What do you think the project's impact on the local people's way of living, studying, and working will be?
- (5) Will the project have a negative impact on the environment, such as noise, water or electromagnetism?
- (6) What do you think the project's impact on the ecosystem?
- (7) Will the project have a negative impact on your studying and work?
- (8) What will be the general impact of the project's construction and operation?

Table E-1 summarizes the basic information on the respondents.

Table E-1. Stakeholders' Basic information

Item		Number	Percentage (%)
Total collected questionnaires		46	92
Nationality	Han	39	84.8
	Meng	7	15.2
Educational background	Primary School	6	13.04
	Junior Middle School	22	47.83
	High School	7	15.22
	College and above	11	23.91
Age	18~30	13	28.3
	30~50	20	43.4
	More than 50	13	28.3



Item		Number	Percentage (%)
Occupation	Doctor	1	2.2
	Teacher	1	2.2
	Worker	13	28.3
	Peasant	18	39.1
	Student	2	4.3
	Business man	11	23.9

The respondents are representative in terms of age, occupation and education, so their attitude towards the impacts of the project can therefore be seen as a comprehensive reflection of the attitudes of the residents possibly affected by the project.

E.2. Summary of the comments received:

>>

The results of the survey are presented in Table E-2 below.

Table E-2. Summary of Questionnaires

Item	Response		
	Yes	No	No comments
1. Do you agree with the development of the project?	89.13%	0	10.87%
2. What do you think the project's impact on the local job market will be?	Positive	No impact	Negative
	54.35%	45.65%	0
3. What do you think the project's impact on the local economy will be?	Positive	No Impact	Negative
	82.61%	17.39%	0
4. What do you think the project's impact on the local people's way of living, studying and working will be?	Positive	No Impact	Negative
	50%	50%	0
5. Will the project have a negative impact on the environment, such as noise, water or electromagnetism?	No	Air pollution	
	95.65%	4.35%	
6. What do you think the project's impact on the ecosystem?	Positive	No Impact	Negative
	26.09%	73.91%	0%
7. Will the project have a negative impact on your studying and work?	Yes	No	Not Sure
	0	95.65%	4.35%
8. What will be the general impact of the project's construction and operation?	Positive	No impact	Negative
	97.83%	2.17%	0



The survey shows that the local people support and agree with the construction of the project. They believe that the project will have a positive impact on the local economic development and their living conditions, without having negative impacts on the environment and the ecosystem.

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

>>

The residents and local government officials are all very supportive toward the proposed project. There were no objections received during the survey. The most common public concerns regarding the project were about the noise and the rubbish produced during the construction period. The project owner will take proper measures, as described in the EIA, during the construction and the operation in order to minimize any ecological disturbance. The measures are summarized as follows:

- Backfilling the surface soil after digging in order to protect surface vegetation and soil.
- Afforesting the occupied areas after construction.
- Controlling the managing the disposal of rubbish effectively. Household trash and sewage will be collected and disposed at the local landfill.

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

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding from Annex I countries is involved in this project activity.

**Annex 3****BASELINE INFORMATION**

The baseline information for the calculation of *OM*, *BM*, and *CM* emission factors of the North China Power Grid is shown in the *Report on 2011 Baseline Emission Factors for Regional Power Grids* released by the Chinese DNA on 20 October 2011 (available at <http://cdm.ccchina.gov.cn>). The concrete processes are shown in the following tables.

Calculation of the Operating Margin emission factor ($EF_{OM,y}$)

The low calorific value, CO₂ emission factor and oxidation factor of fuels are listed in Table 1 below.

Table 1. Low calorific values, CO₂ emission factor and oxidation factor of fuels

Fuel type	Default Carbon Content	OXID	IPCC CO ₂ Emission Factor (the Lower Limits of the 95% Confidence Intervals)	Low Calorific Value
	(tc/TJ)	(%)		(MJ/t, km ³)
	H	I	(kgCO₂/TJ)	
Raw Coal	25.8	100	87,300	20908
Cleaned Coal	25.8	100	87,300	26344
Other Washed Coal	25.8	100	87,300	8363
Briquette	26.6	100	87,300	20908
Coke	29.2	100	95,700	28435
Crude Oil	20	100	71,100	41816
Gasoline	18.9	100	67,500	43070
Diesel Oil	20.2	100	72,600	42652
Fuel Oil	21.1	100	75,500	41816
Other Petroleum Products	20	100	72,200	41816
LPG	17.2	100	61,600	50179
Refinery Gas	15.7	100	48,200	46055
Natural Gas	15.3	100	54,300	38931



Coke Oven Gas	12.1	100	37,300	16726
Other Gas	12.1	100	37,300	5227
Other Coke Oven Products	25.8	100	95,700	28435
Other Energies	0	0	0	0

Data Source: The emission factors and oxidation factors are from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (Tables 1.3 and 1.4, pages 1.21-1.24, Chapter 1, Volume 2 Energy). The net calorific values are quoted from the China Energy Statistical Yearbook 2010.

1. Calculation of Simple OM Emission Factor of NCPG for Year 2007\

Table 2. CO₂ Emission Data of NCPG in Year 2007

Fuel type	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Sub-total	Effective CO ₂ EF	OXID	CO ₂ emission factor of fossil fuel	Average Low Calorific Value	CO ₂ emission (tCO ₂ e)
		A	B	C	D	E	F	G=A+B+C+D+E+F	(tc/TJ)	(%)	(kgCO ₂ /TJ)	(MJ/t, km ³)	L=G*J*K/100000 (for mass unit)
									H	I	J	K	L=G*J*K/10000 (for volume unit)
Raw Coal	10 ⁴ t	816.17	1753.99	7716.13	7510.06	10434.25	11884.83	40115.43	25.8	100	87,300	20,908	732,214,267
Cleaned Coal	10 ⁴ t						18.43	18.43	25.8	100	87,300	26,344	423,859
Other Washed Coal	10 ⁴ t	5.76		156.89	478.81	48.57	756.84	1446.87	25.8	100	87,300	8,363	10,563,452
Briquette	10 ⁴ t	7.93					42.86	50.79	26.6	100	87,300	20,908	927,054
Coke	10 ⁴ t			0.02			4.09	4.11	29.2	100	95,700	28,435	111,843
Coke Oven Gas	10 ⁸ m ³	0.07	0.72	3.13	25.46	2.58	13.61	45.57	12.1	100	37,300	16,726	2,843,020



Other Gas	10 ⁸ m ³	11.8	7.6	88.38	72.8	28.17	29.64	238.39	12.1	100	37,300	5,227	4,647,821
Crude Oil	10 ⁴ t							0	20	100	71,100	41,816	0
Gasoline	10 ⁴ t			0.01				0.01	18.9	100	67,500	43,070	291
Diesel Oil	10 ⁴ t	0.33		2.35		0.62	5.08	8.38	20.2	100	72,600	42,652	259,490
Fuel Oil	10 ⁴ t	4.74		0.18			2.35	7.27	21.1	100	75,500	41,816	229,522
LPG	10 ⁴ t							0	17.2	100	61,600	50,179	0
Refinery Gas	10 ⁴ t	0.06		2.85			1.65	4.56	15.7	100	48,200	46,055	101,225
Natural Gas	10 ⁸ m ³	5.03	0.73		0.54	4.22	0.01	10.53	15.3	100	54,300	38,931	2,225,993
Other Petroleum Products	10 ⁴ t	1.72						1.72	20	100	72,200	41,816	51,929
Other Coke Oven Products	10 ⁴ t	4.74						4.74	25.8	100	95,700	28,435	128,986
Other Energies	10 ⁴ tC _e	11.94		77.25	360.26	30.75	163.48	643.68	0	0	0	0	0
												Subtotal	754,728,750

Data source: China Energy Statistical Yearbook 2008



Table 3. NCPG Fuel-fired Electricity Generation and OM EF in Year 2007

Province	Total generation (10 ⁸ kWh)	Total generation (MWh)	Self-consumption electricity (%)	Total supply (MWh)		
Beijing	223	22,300,000	7.51	20,625,270	Electricity imported from NEPG MWh	1,789,750
Tianjin	399	39,900,000	6.53	37,294,530	Simple OM in NEPG in 2007	1.08186
Hebei	1633	163,300,000	6.67	152,407,890	Electricity imported from CCPG MWh	803,000
Shanxi	1734	173,400,000	7.99	159,545,340	Simple OM in CCPG in 2007	1.10197
Inner Mongolia	1801	180,100,000	7.77	166,106,230	Total Power Supply MWh	778,939,080
Shandong	2591	259,100,000	7.23	240,367,070	Total Emissions tCO ₂	757,549,895
Total		838,100,000		776,346,330	EF	0.97254

Data source: China Electric Power Yearbook 2008

2. Calculation of Simple OM Emission Factor of the NCPG for Year 2008

Table 4. CO₂ Emission Data of NCPG in Year 2008

Fuel type	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Monglolia	Shandong	Sub-total	Effective CO ₂ EF	OXID	CO ₂ emission factor of fossil fuel	Average Low Calorific Value	CO ₂ emission (tCO ₂ e)
		A	B	C	D	E	F	G=A+B+C+D+E+F	(tc/TJ)	(%)	(kgCO ₂ /TJ)	(MJ/t, km ³)	L=G*J*K/100000 (for mass unit)
									H	I	J	K	L=G*J*K/10000 (for volume unit)
Raw Coal	10 ⁴ t	755.75	1800.12	7353.33	7854.39	12607.82	12360.75	42732.16	25.8	100	87,300	20,908	779,976,613
Cleaned Coal	10 ⁴ t						23.88	23.88	25.8	100	87,300	26,344	549,200
Other Washed Coal	10 ⁴ t	5.05		134.52	582.39	66.2	691.21	1479.37	25.8	100	87,300	8,363	10,800,731
Briquette	10 ⁴ t	5.66			32.49		45.38	83.53	26.6	100	87,300	20,908	1,524,647



Coke	10 ⁴ t			0.02			6.07	6.09	29.2	100	95,700	28,435	165,723
Coke Oven Gas	10 ⁸ m ³	0.11	0.86	8.37	24.55	3.55	16.2	53.64	12.1	100	37,300	16,726	3,346,491
Other Gas	10 ⁸ m ³	10.4	9.08	187.54	36	34.32	29.76	307.1	12.1	100	37,300	5,227	5,987,440
Crude Oil	10 ⁴ t					0.02		0.02	20	100	71,100	41,816	595
Gasoline	10 ⁴ t							0	18.9	100	67,500	43,070	0
Diesel Oil	10 ⁴ t	0.15		3.08		0.35		3.58	20.2	100	72,600	42,652	110,856
Fuel Oil	10 ⁴ t	2.56		0.25				2.81	21.1	100	75,500	41,816	88,715
LPG	10 ⁴ t							0	17.2	100	61,600	50,179	0
Refinery Gas	10 ⁴ t	0.44		2.93				3.37	15.7	100	48,200	46,055	74,809
Natural Gas	10 ⁸ m ³	11.09	0.7		0.97	2.12		14.88	15.3	100	54,300	38,931	3,145,563
Other Petroleum Products	10 ⁴ t	1.45						1.45	20	100	72,200	41,816	43,777
Other Coke Oven Products	10 ⁴ t	7.97		7.61				15.58	25.8	100	95,700	28,435	423,968
Other Energies	10 ⁴ tCe	4.9	2.34	61.02	466	63.72	141.71	739.69	0	0	0	0	0
												Subtotal	806,239,126

Data source: China Energy Statistical Yearbook 2009

**Table 5. NCPG Fuel-fired Electricity Generation and OM EF in Year 2008**

Province	Total generation (10⁸ kWh)	Total generation (MWh)	Self-consumption electricity (%)	Total supply (MWh)		
Beijing	243	24,300,000	7.14	22,564,980		
Tianjin	397	39,700,000	7.05	36,901,150		
Hebei	1,580	158,000,000	6.9	147,098,000	Electricity imported from NEPG MWh	5,286,140
Shanxi	1,762	176,200,000	8.22	161,716,360	Simple OM in NEPG in2008	1.10489
Inner Mongolia	2,008	200,800,000	7.96	184,816,320	Total Power Supply MWh	808,083,490
Shandong	2,689	268,900,000	7.14	249,700,540	Total Emissions tCO ₂	812,079,707
Total		867,900,000		802,797,350	EF	1.00495

Data source: China Electric Power Yearbook 2009



3. Calculation of Simple OM Emission Factor of the NCPG for Year 2009

Table 6. CO₂ Emission Data of NCPG in Year 2009

Fuel type	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Monglolia	Shandong	Sub-total	Effective CO ₂ EF	OXID	CO ₂ emission factor of fossil fuel	Average Low Calorific Value	CO ₂ emission (tCO ₂ e)
		A	B	C	D	E	F	G=A+B+C+D+E+F	(tc/TJ)	(%)	(kgCO ₂ /TJ)	(MJ/t, km ³)	L=G*J*K/100000 (for mass unit)
									H	I	J	K	L=G*J*K/10000 (for volume unit)
Raw Coal	10 ⁴ t	665.16	1870.36	7623.94	8024.02	12538.57	12654.05	43376.1	25.8	100	87,300	20,908	791,730,246
Cleaned Coal	10 ⁴ t						11.7	11.7	25.8	100	87,300	26,344	269,080
Other Washed Coal	10 ⁴ t	6.15		247.51	586.04	104.69	862.02	1806.41	25.8	100	87,300	8,363	13,188,417
Briquette	10 ⁴ t	3.73					31.83	35.56	26.6	100	87,300	20,908	649,065
Coke	10 ⁴ t						10.43	10.43	29.2	100	95,700	28,435	283,824
Coke Oven Gas	10 ⁸ m ³	0.13	1.27	8.72	19.48	3.35	11.69	44.64	12.1	100	37,300	16,726	2,784,999
Other Gas	10 ⁸ m ³	10.23	13.43	228.32	35.89	48.35	37.21	373.43	12.1	100	37,300	5,227	7,280,656
Crude Oil	10 ⁴ t					0.13		0.13	20	100	71,100	41,816	3,865
Gasoline	10 ⁴ t						0.01	0.01	18.9	100	67,500	43,070	291
Diesel Oil	10 ⁴ t	0.1		2.38		2.64	3.07	8.19	20.2	100	72,600	42,652	253,606
Fuel Oil	10 ⁴ t	0.82		0.19		0.02	2.63	3.66	21.1	100	75,500	41,816	115,550
LPG	10 ⁴ t							0	17.2	100	61,600	50,179	0
Refinery Gas	10 ⁴ t	0.83		3.95			3.44	8.22	15.7	100	48,200	46,055	182,472
Natural Gas	10 ⁸ m ³	13.55	0.63		4.39	2.03	0.03	20.63	15.3	100	54,300	38,931	4,361,086
Other	10 ⁴ t	1.52					23.18	24.7	20	100	72,200	41,816	745,721



Petroleum Products													
Other Coke Oven Products	10 ⁴ t	6.62		7.79			5.52	19.93	25.8	100	95,700	28,435	542,341
Other Energies	10 ⁴ tCe		2.11	62.14	570.3	90.63	137.68	862.86	0	0	0	0	0
												Subtotal	822,391,221

Data source: China Energy Statistical Yearbook 2010

Table 7. NCPG Fuel-fired Electricity Generation and OM EF in Year 2009

Province	Total generation (10 ⁸ kWh)	Total generation (MWh)	Self-consumption electricity (%)	Total supply (MWh)		
Beijing	241	24,100,000	6.55	22,521,450		
Tianjin	413	41,300,000	6.8	38,491,600		
Hebei	1,733	173,300,000	6.92	161,307,640	Electricity imported from NEPG MWh	6,982,610
Shanxi	1,850	185,000,000	8.1	170,015,000	Simple OM in NEPG in 2008	1.06915
Inner Mongolia	2,135	213,500,000	7.82	196,804,300	Total Power Supply MWh	860,687,660
Shandong	2,858	285,800,000	7.43	264,565,060	Total Emissions tCO ₂	829,856,644
Total		923,000,000		853,705,050	EF	0.96418

Data source: China Electric Power Yearbook 2010



4. Calculation of Simple OM Emission Factor of the NCPG

Table 8. Calculation of Simple OM Emission Factor of NCPG

	Total Power Supply (MWh)	CO ₂ emission (tCO ₂)	OM Emission Factor (tCO ₂ /MWh)
2007	778,939,080	757,549,895	0.97254
2008	808,083,490	812,079,707	1.00495
2009	860,687,660	829,856,644	0.96418
The weighted average OM Emission Factor (tCO ₂ /MWh)			0.9803

The Operating Margin (OM) emission factor is the weighted average emission factors of year 2007-2009, as follows: $EF_{OM} = 0.9803 \text{ tCO}_2/\text{MWh}$

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

1. Calculation of percentages of CO₂ emissions from the coal-fired, gas-fired and oil-fired power plants in total fuel-fired CO₂ emissions

Table 9. Percentages of CO₂ emissions from the coal-fired, gas-fired and oil-fired power plants in total fuel-fired CO₂ emissions

Energy	Unit	Beijing	Tianjin	Hebei	Shanxi	Shandong	Inner Mongolia	Total	NCV (MJ/t or 1000m ³)	Emission factor (tC/TJ)	Oxidation rate (%)	Emission (tCO ₂ e)
		A	B	C	D	E	F	G=A+B+C+D+E+F	H	I	J	K=G*H*I*J/100000
Raw Coal	10 ⁴ t	665.16	1,870.36	7,623.94	8,024.02	12,654.05	12,538.57	43,376.10	20,908	87,300	1	791,730,246
Cleaned coal	10 ⁴ t	0	0	0	0	11.7	0	11.70	26,344	87,300	1	269,080
Other washed coal	10 ⁴ t	6.15	0	247.51	586.04	862.02	104.69	1,806.41	8,363	87,300	1	13,188,417
Briquette	10 ⁴ t	3.73	0	0	0	31.83	0	35.56	20,908	87,300	1	649,065
Coke	10 ⁴ t	0	0	0	0	10.43	0	10.43	28,435	95,700	1	283,824
Other	10 ⁴ t	6.62	0	7.79	0	5.52	0	19.93	28,435	95,700	1	542,341



Coke Oven Products												
Sub-Total	806,662,974											
Crude oil	10 ⁴ t	0	0	0	0	0	0.13	0.13	41,816	71,100	1	3,865
Gasoline	10 ⁴ t	0	0	0	0	0.01	0	0.01	43,070	67,500	1	291
Diesel	10 ⁴ t	0.1	0	2.38	0	3.07	2.64	8.19	42,652	72,600	1	253,606
Fuel oil	10 ⁴ t	0.82	0	0.19	0	2.63	0.02	3.66	41,816	75,500	1	115,550
Other petroleum products	10 ⁴ t	1.52	0	0	0	23.18	0	24.7	41,816	72,200	1	745,721
Sub-Total	1,119,034											
Nature gas	10 ⁷ m ³	135.5	6.3	0	43.9	0.3	20.3	206.3	38,931	54,300	1	4,361,086
Coke oven gas	10 ⁷ m ³	1.3	12.7	87.2	194.8	116.9	33.5	446.4	16,726	37,300	1	2,784,999
Other coal gas	10 ⁷ m ³	102.3	134.3	2283.2	358.9	372.1	483.5	3,734	5,227	37,300	1	7,280,656
LPG	10 ⁴ t	0	0	0	0	0	0	0	50,179	61,600	1	0
Refinery gas	10 ⁴ t	0.83	0	3.95	0	3.44	0	8.22	46,055	48,200	1	182,472
Sub-Total	14,609,213											
Total	822,391,221											

Data Source: China Energy Statistical Yearbook 2010

According to Table 9 and formula (5), (6), (7) in section B.6.1, the percentages of CO₂ emissions from the coal-fired, oil-fired and gas-fired power plants in total fuel-fired CO₂ emissions are calculated as:

$$\lambda_{Coal,y} = 98.09\%, \lambda_{Oil,y} = 0.14\%, \lambda_{Gas,y} = 1.78\%$$

2. Calculating the fuel-fired emission factor ($EF_{Thermal}$)



Table 10. Parameters used for calculating fuel-fired emission factor

	Parameter	Efficiency of Power Supply (%)	Emission Factor of Fuel (kgCO ₂ /TJ)	Oxidation Factor	Emission Factor (tCO ₂ /MWh)
		A	B	C	D=3.6/A/1,000,000*B*C
Coal-fired Power Plant	$EF_{Coal,Adv,y}$	39.45	87,300	1	0.7967
Oil-fired Power Plant	$EF_{Oil,Adv,y}$	51.77	75,500	1	0.5250
Gas-fired Power Plant	$EF_{Gas,Adv,y}$	51.77	54,300	1	0.3776

$$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y} = 0.7888 \text{ tCO}_2\text{e/MWh.}$$

3: Calculating the Build Margin (BM) emission factor ($EF_{BM,y}$)

Table 11. Installed Capacity data of NCPG in Year 2009

	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Thermal power	MW	5,120	10,030	35,140	39,150	48,300	58,860	196,600
Hydro power	MW	1,050	10	1,790	1,610	830	1,060	6,350
Nuclear power	MW	0	0	0	0	0	0	0
Wind power and other	MW	50	0	1,360	120	6,420	860	8,810
Total	MW	6,220	10,040	38,290	40,880	55,550	60,780	211,760

China Electric Power Yearbook 2010

Table 12. Installed Capacity data of NCPG in Year 2008

	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Thermal power	MW	4,760	7,490	29,870	35,250	45,740	55,930	179,040
Hydro power	MW	1,050	0	1,540	790	830	1,050	5,260
Nuclear power	MW	0	0	0	0	0	0	0
Wind power and	MW	0	0	700	0	2,300	370	3,370



other								
Total	MW	5,810	7,490	32,110	36,040	48,870	57,350	187,670

China Electric Power Yearbook 2009

Table 13. Installed Capacity data of NCPG in Year 2007

	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	Total
Thermal power	MW	3,900	6,920	29,020	30,950	39,870	54,140	164800
Hydro power	MW	1050	10	780	790	830	1,050	4510
Nuclear power	MW	0	0	0	0	0	0	0
Wind power and other	MW	2.7	0	410	0	1,096.50	210	1719.2
Total	MW	4,952.7	6,930.0	30,210.0	31,740.0	41,796.5	55,400.0	171029.2

China Electric Power Yearbook 2008

Table 14. Calculation of *BM* Emission Factor of NCPG

	Installed capacity in 2007	Installed capacity in 2008	Installed capacity in 2009	Newly added capacity from 2007 to 2009 ¹	Newly added capacity from 2008 to 2009 ²	Share in total capacity additions
	(MW)	(MW)	(MW)	(MW)	(MW)	
	A	B	C	D	E	
Thermal power	164,800	179,040	196,600	39,270	21,422	81.46%
Hydro power	4,510	5,260	6,350	1,849	1,090	3.84%
Nuclear power	0	0	0	0	0	0.00%
Wind power and Other	1,719	3,370	8,810	7,091	5,440	14.71%
Total	171,029	187,670	211,760	48,210	27,952	100.00%
Share in total installed capacity of 2008	80.77%	88.62%	100%	22.77%	13.20%	

1,2 with consideration of installed capacity, capacity of units under shutdown, the pumped-storage power generating capacity

$$EF_{BM,y} = 0.7888 \times 81.46\% = 0.6426 \text{ tCO}_2/\text{MWh}$$

Calculating the baseline emission factor (EF_y)

According to formula (14) in section B.6.1, the baseline emission factor of the NCPG is calculated as:

$$EF_y = 0.9803 \times 0.75 + 0.6426 \times 0.25 = 0.8959 \text{ tCO}_2/\text{MWh}$$

The EF_y applied in this report is fixed for a crediting period and may be revised at the renewal of the crediting period.



Annex 4

MONITORING INFORMATION
