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

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

>>
Goldwind Damao Wind Farm Project
PDD version 3.3
Completed on 28 May 2008

A.2. Description of the project activity:

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The proposed Goldwind Damao Wind Farm Project (hereinafter referred to as the Project) is to generate renewable electricity using wind power resources and to sell the generated output to the North China Power Grid (NCPG) on the basis of a Power Purchase Agreement (PPA). The project activity will generate greenhouse gas (GHG) emission reductions by avoiding CO_2 emissions from electricity generation by fossil fuel power plants that is supplied to the NCPG.

The Goldwind Damao Wind Farm Project is located in the Baotou City, Inner Mongolia Autonomous Region. A decision has been made to install a total of 66 wind turbines, each of which has the capacity of 750 kW to best suit the local conditions. The total power capacity, therefore, of the proposed project activity is 49.5 MW. The expected net supplied power to the grid is 120,136 MWh per year. It is ex-ante estimated that the project will generate average annual emission reduction of about 127,104 tCO2e.

The project will assist China in stimulating and accelerating the commercialisation of grid-connected renewable energy technologies and markets which is an important objective of the Chinese government. The project will therefore help reduce GHG emissions versus the high-growth, coal-dominated business-as-usual scenario. Furthermore, the project will improve air quality and local livelihoods and promote sustainable renewable energy industry development. The specific goals of the project are to:

- generate electricity;
- reduce greenhouse gas emissions in China compared to a business-as-usual scenario;
- help to stimulate the growth of the wind power industry in China;
- create local employment opportunity during the assembly and installation of wind turbines, and for operation of the wind farm;
- reduce other pollutants resulting from the power generation industry, compared to a business-as-usual approach, such as SO_2 and soot.

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	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
P.R. China (host)	Damaoqi Tianrun Wind Power Co., Ltd.	No
United Kingdom of Great Britain and Northern Ireland	Carbon Resource Management Ltd.	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:

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A.4.1.1. Host Party(ies):

>>
People's Republic of China

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

>>
Inner Mongolia Autonomous Region

A.4.1.3. City/Town/Community etc:

>>
Damao County, Baotou 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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Goldwind Damao Wind Farm lies in Damao County, Baotou City of Inner Mongolia in the People's Republic of China. It is located at longitude 109°43′ 48″ East and latitude 41°46′ 12″ North. The average altitude of the project site is 1,630m above see level. Figure 1 shows the location of the wind farm in Inner Mongolia.

Figure 1 Map showing the location of the Project.

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

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Sector scope (1): Energy industries

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

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The 66 sets of 750kW Goldwind turbines (S48) were selected. Some of the advanced technology used is transferred from Germany to the host country[1]. During the equipment warranty period, there will be on-the-job-training provided by the manufacturer for staff who will operate the Goldwind Damao Wind Farm[2]. The technical design of the wind turbines is advanced and is deemed to reflect current good practice, and key technology parameters are listed in Table 1.

Table 1. Key technology parameters of the turbine

Key Technology Parameter	Value
Manufacture	Goldwind Science and Technology Co., Ltd.
Rotor diameter (m)	48.4
Swept area(m^2)	1839.8

1 http://www.repower.de/index.php?id=75&backPID=75&tt_news=112&L=1
http://www.goldwind.cn/cn/about_dsj.asp

2 Evidence Provided to the DOE

Rotate speed (rpm)	22.3
Cut-in wind speed (m/s)	4
Rated wind speed (m/s)	15
Cut-out wind speed (m/s)	25
Hub height of the wind turbines (m)	50
Capacity(kW)	750
Rated voltage(V)	690

The net supplied power to the grid is expected to be 120,136MWh. The electricity generated from the project will be transmitted to Wanghai substation of NCPG via an 220kV transmission line. A transformer and 220kV transmission line from the wind farm to Wanghai Substation will be installed.

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

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Applying the proposed methodology to the project, operating in NCPG, the project will achieve an ex-ante estimated average annual emission reduction of 127,104 tCO_2 /year, and 889,728 tCO_2 over the first seven-year crediting period of the project (see Table 2). A renewable crediting period is adopted.

Table 2. Estimated amount of emission reductions over the chosen crediting period

Years*	Annual estimation of emission reductions (in tonnes of CO_2e)
2008	127,104
2009	127,104
2010	127,104
2011	127,104
2012	127,104
2013	127,104
2014	127,104
Total estimated reductions	889,728
Total number of first crediting years	7 years
Annual average over the crediting period of estimated reductions	127,104

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

The baseline emissions factor has been fixed for the first 7-year crediting period. In each year the amount of CERs actually generated by the project will vary depending on the monitored net supplied power by the proposed project to the grid.

A.4.5. Public funding of the project activity:

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There is no pubic funding from Annex 1 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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- Baseline methodology: ACM0002 (version 06, 19 May 2006) “Consolidated baseline methodology for grid-connected electricity generation from renewable sources”
- Monitoring methodology: ACM0002 (version 06, 19 May 2006) “Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources”
- Additionality tool (version 4, 30 November, 2007) “Tool for the demonstration and assessment of additionality”

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 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 how the sources and gases included in the project boundary

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Emission sources:

For the baseline determination only CO_2 emissions from electricity generation by fossil fuel fired power plant that is displaced due to the project activity are taken into account.

Spatial boundary:

The spatial extent of the proposed project boundary includes proposed project site and all power plants connected to NCPG. The project site includes the wind farm and auxiliary installations that are used to support the project operation. North China Power Grid (NCPG) is the project electricity system, which is defined by the spatial extent of the power plants that can be dispatched without significant transmission constrains.

Using the boundary definitions of the Chinese DNA[3], NCPG consists of Beijing, Tianjin, Hebei, Shanxi, Shandong and Inner Mongolia power grids. The electricity transmission between different provinces in NCPG is very large and it is reasonable for the proposed project to regard NCPG as the project boundary.

The project electricity system is connected to Northeast Power Grid (NEPG) and electricity transfers from NEPG are taken into account.

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

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[3] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1364.pdf.

Table 3. Emission sources and GHG included in the project boundary

	Source	Gas	Included?	Justification / Explanation
Baseline	Grid	CO_2	Yes	Following ACM0002
		CH_4	No	Conservative/according to ACM0002
		N_2O	No	Conservative/according to ACM0002
Project Activity	Fossil fuel use	CO_2	No	According to ACM0002, the project emission of renewable energy project activity is not considered.
		CH_4	No	
		N_2O	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 does not modify or retrofit an existing electricity generation facility. According to ACM0002, the baseline scenario is identified as follows:

Based on the "Tools for demonstration and assessment additionality", the alternatives to the proposed project which can provide outputs or services comparable with the proposed project are listed 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.*

Alternative (a) is in compliance with all applicable legal and regulatory requirements. But according to the detailed analysis in section B.5, this scenario is financially less attractive and faces barriers and therefore is not realistic and feasible.

According to Chinese regulations, thermal power plants of less than 135MW are prohibited for construction in areas covered by the large grids such as provincial grids[4]. Therefore, for the alternative b), a fossil fuel fired power plant with the same capacity as the proposed project activity, or with a capacity with comparable electricity generation, which would be 20MW[5], conflicts with Chinese regulations and practice. Alternative b), therefore, is not a realistic alternative.

Besides wind energy, other kinds of energy like solar PV, geothermal, biomass and hydro are the possible grid-connected renewable energy technologies that could be applied in China. Due to the technology development status and the high cost for power generation, solar PV, geothermal and biomass of the similar installed capacity as the proposed project are alternatives far from being attractive investment in the grid in China[6]. Only hydropower projects have an investment return that can compete over that of wind power

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

[5] According to the *China Electric Power Yearbook, Page 559 (2006 Edition)*, the average annual utilisation rate of thermal power units in China in 2005 was 5865 hours. A 20MW unit with average utilisation rate could generate the same electricity as the proposed wind farm.

[6] http://www.newenergy.org.cn/Html/0084/4100816608.html Biomass is ruled out due to its lack of R&D competence, undeveloped market and bad management, etc.

projects in China. However, there is no exploitable hydro power resource in the area of the proposed project activity[7]. So alternative c) is not a realistic alternative.

In conclusion, alternative d) is realistic and credible alternative to the project that can be the baseline scenario. Thus, to the proposed project, according to ACM0002, the baseline scenario is as follows:

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

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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The approved methodology ACM0002 requires the use the latest version of the "Tool for the demonstration and assessment of additionality (Version 4)" agreed by the Executive Board to demonstrate and assess the additionality of the proposed project. The Tool consists of steps as described below.

After the FSR was finished, the on-grid tariff of the proposed project was approved to be regulated to the tariff of concessional bidding wind farm projects by Inner Mongolia Development and Reform Commission[8]. Among the concessional bidding wind farm projects in Inner Mongolia, the highest tariff[9] is lower than the tariff expected in the FSR. Thus, the project IRR is lower than the benchmark due to the lower tariff and the project is financially unattractive without CER revenues. Therefore, the developer decided to apply for CDM registration and seek for CERs buyer. On this basis, an Emission Reduction Purchase Agreement (ERPA) with Carbon Resource Management Ltd. had been signed in May 2007[10]. Only after ERPA was signed, the construction of the project was started on August 2007. The incentive from the CDM had been seriously taken into account prior to the starting date of the project activity, aiming to obtain the addition funding to secure the project financially.

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:

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http://www.newenergy.org.cn/html/0067/2006710_10767.html The solar PV is hardly to be developed and applied due to its lack of policy-encouragement, poor technical innovation and experts, lack of financial support, and so on.

[7] There is no hydro energy resource available in the Baotou city: http://www.cnr.cn/2004news/society/200603/t20060331_504187582.html

[8] Approval of FSR issued by Inner Mongolia Development and Reform Commission to the proposed project (No. NeiFaGaiNengYuanZi [2006] 1678, dated in August 2006.

[9] This on-grid tariff was released on 16 August 2006, referring to page 8-18, in A Study on the Pricing Policy of Wind Power in China.

[10] The Emission Reduction Purchase Agreement (ERPA) was signed between the developer and Carbon Resource Management Ltd. in May 2007 and the agreement has come into force since the signing date. In this agreement, the developer agreed to sell to and deliver to Carbon Resource Management Ltd. the certified emission reductions arose from the proposed project, so that the revenue from CERs can help the proposed project to overcome financial difficulty and make the project financially attractive.

Sub-step1a. 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.

- The proposed project will face many barriers, as demonstrated below, and the proposed project activity undertaken without being registered as a CDM project activity is not a realistic alternative.

b) A fossil fuel-fired power plant with the comparable capacity or electricity power generation.

- If taking the capacity with the same annual generation, according to the current laws and regulations, it is not realistic alternative (please refer to the analysis in sub-step 1b).

c) A power plant using other source of renewable energy with the comparable capacity or electricity generation, such as PV, biomass and hydro, etc.

- Besides wind energy, other kinds of energy like solar PV, geothermal, biomass and hydro are the possible grid-connected renewable energy technologies that could be applied in China. Due to the technology development status and the high cost for power generation, solar PV, geothermal and biomass of the similar installed capacity as the proposed project are alternatives far from being attractive investment in the grid in China[11]. Only hydropower projects have an investment return that can compete over that of wind power projects in China. However, there is no exploitable hydro power resource in the area of the proposed project activity[12]. Therefore they are not realistic alternatives.

d) Comparable capacity or electricity generation addition provided by the NCPG.

- To satisfy the increase of the electricity demand, the power grid company can either increase the output generation from operating units or build some new power plants, therefore comparable capacity or electricity generation addition provided by NCPG can be taken as a realistic alternative for the project activity.

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

According to Chinese regulations, thermal power plants of less than 135MW are prohibited for construction in the areas covered by the large grids such as provincial grids[13]. Therefore, a fossil fuel fired power plant with the same capacity as the proposed project activity, or with a capacity with comparable electricity generation, which would be 20MW[14], alternative b described in sub-step 1a, conflicts with Chinese laws and regulations.

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[11] http://www.newenergy.org.cn/Html/0084/4100816608.html Biomass is ruled out due to its lack of R&D competence, undeveloped market and bad management, etc.
http://www.newenergy.org.cn/html/0067/2006710_10767.html The solar PV is hardly to be developed and applied due to its lack of policy-encouragement, poor technical innovation and experts, lack of financial support, and so on.

[12] There is no hydro energy resource available in the Baotou city: http://www.cnr.cn/2004news/society/200603/t20060331_504187582.html

[13] Notice on Strictly Prohibiting the Installation of Thermal Generators with the Capacity of 135MW or below issued by the General Office of the State Council, Decree No. 2002-6.

[14] According to the *China Electric Power Yearbook, Page 559 (2006 Edition)*, the average annual utilisation rate of thermal power units in China in 2005 was 5865 hours. A 20MW unit with average utilisation rate could generate the same electricity as the proposed wind farm.

To conclude from the sub-step 1a and 1b, comparable capacity or electricity addition provided by NCPG is the realistic alternative compliance with mandatory laws and regulations.

→ Proceed to Step 2 (Investment analysis) or Step 3 (Barrier analysis). (Project participants may also select to complete steps 2.)

The project participants chose to complete 2, as demonstrated below.

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 alternative, identified in step 1, without the revenue from the sale of certified emission reductions (CERs). To conduct the investment analysis, use the following sub-steps:

Sub-step 2a. Determine appropriate analysis method

Determine 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. The investment comparison analysis (Option II) is suitable for a project which has a similar type alternative project. The alternative of the proposed project is comparable capacity or electricity generation addition provided by the NCPG, not a concrete project, so Option II is not suitable, either.

Therefore, the benchmark analysis (Option III) is adopted.

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

Identify the relevant benchmark value which represents standard returns in the market, and compare the financial indicators of the proposed CDM project with the benchmark value.

According to the *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects* issued by former 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. Thus, 8% is adopted as the benchmark of the proposed project.

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

The data for the financial estimation is presented in Table 4.

Table 4 Relevant indicators for financial assessment

Item	Value
Net supplied power to the grid	120,136 MWh
Static Investment	416.61 million RMB Yuan
Expected On-grid tariff (incl. VAT)	0.4656 RMB Yuan/kWh
Value added tax	8.5%

Income tax	33%
Education tax	3%
City building tax	5%
Assumed CER price	8.0 €/t CO_2e

Table 5 shows the result of the IRR calculations of the proposed project activity without and with CER revenue from CDM registration. It can be seen that the IRR without CER revenue is below the benchmark 8% and that revenue from the CDM makes the proposed project more financially attractive.

Table 5. IRR analysis of the proposed project

IRR	
without CDM	**with CDM**
6.54%	**9.83%**

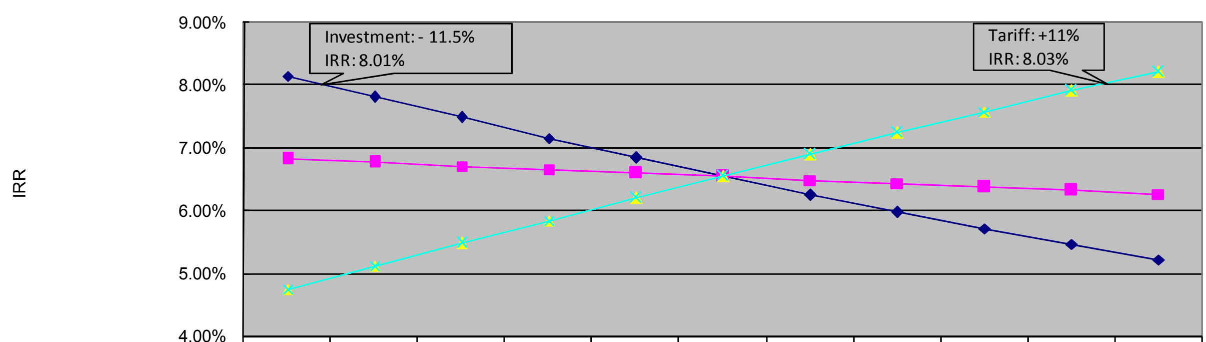
Sub-step 2d. Sensitivity analysis

A sensitivity analysis is used to assess the perceived uncertainties of key elements such as static investments, costs, prices, and potential impacts of such changes on the economic performance of the proposed project.

For a wind farm project the factors that influences the IRR of total investment mainly includes:
1) Static Investment;
2) Annual O&M cost;
3) On-grid tariff;
4) Net supplied power.

The outcome of the sensitivity analysis is presented in Figure 2.

Figure 2: IRR sensitivity analysis for the proposed project



	-12.5%	-10.0%	-7.5%	-5.0%	-2.5%	0.0%	2.5%	5.0%	7.5%	10.0%	12.5%
Static Investment	8.14%	7.81%	7.48%	7.15%	6.84%	6.54%	6.25%	5.98%	5.72%	5.46%	5.22%
Annual O&M cost	6.82%	6.76%	6.71%	6.65%	6.60%	6.54%	6.48%	6.43%	6.37%	6.32%	6.26%
On-grid tariff	4.75%	5.12%	5.48%	5.84%	6.19%	6.54%	6.89%	7.23%	7.57%	7.90%	8.21%
net supplied power	4.75%	5.12%	5.48%	5.84%	6.19%	6.54%	6.89%	7.23%	7.57%	7.90%	8.21%

As shown in Figure 2, the IRR is mainly impacted by variations in the static investment, tariff and net generation. The impact of annual O&M cost on IRR is less significant. The sensitivity analysis shows that without CER revenue, the IRR of the project reaches the benchmark 8% if the investment decreases by about 11.5%, or either the tariff or net generation increases by about 11% or the annual O&M cost decreases by about 68%. None of these scenarios are likely.

For the wind farm project, the cost of turbine, engineering construction and related accessories consist main budget of the investment. As prices, including those of the requirement equipment and commodities, have been increasing in recent years, a significant reduction in the level of investment is unlikely, in particular a reduction of 11.5%[15].

Similarly, it's not realistic that the annual O&M cost decreases by 68%.

In the approval letter from Inner Mongolia Development and Reform Commission to the proposed project, the tariff refers to the tariff of concessional bidding wind farm projects. Among the latest concessional bidding wind farm projects in Inner Mongolia, the highest tariff is 0.4656 Yuan/kWh (incl. VAT)[16], which is quoted to calculate a conservative (i.e. high) IRR in the PDD for the proposed project. While China government is gradually lowering down the on-grid tariff of the wind farm projects[17], this optimistically expected highest tariff (0.4656 Yuan/kWh incl. VAT) still needs to be agreed with related department. Therefore it will be impossible that the actual tariff for the proposed project will be higher than 0.4656 Yuan/kWh even increases by 11%.

The expected net supplied power from the FSR is based on the long-term average wind measurements. This value has also been cross-checked with 34 data from weather stations or so nearby. Therefore the net supplied power is calculated from the long-term average wind data, and it is not credible to assume that the average wind speeds would be higher during the lifetime of the project, leading to higher PLF over the lifetime of the project than that estimated.

However, the revenue from the CERs will greatly improve the financial feasibility of the proposed project, and it will also improve the ability to anti-risk caused by the adverse influence of other factors to some extent.

Step 4. Common practice analysis

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

In line with the guidance from the additionality tool the common practice analysis is carried out on the basis of similar projects in the same region and take place in a comparable environment with regards to regulatory framework, investment climate etc.

In China, the general environment of projects of this type of wind farm such as the wind resources[18], on-grid

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[15] http://finance.sina.com.cn/chanjing/b/20080717/02175101177.shtml

[16] page 8-18, A Study on the Pricing Policy of Wind Power in China. This report is composed by Chinese Renewable Energy Industries Association (CREIA), GREENPEACE and Global Wind Energy Council (GWEC), and is widely quoted as authoritative reference with respect to wind farm tariff in China. In addition, the same information about tariff of concessional bidding wind farms can also be evidenced at: http://www.windpower.org.cn/rule/fd4.jsp

[17] http://www.newenergy.org.cn/html/0068/200689_11379_1.html.

[18] http://cwera.cma.gov.cn/upload/b_2_left_02.jpg

tariff, investment climate[19] are only similar and comparable in the same province (Autonomous Region). On this basis, wind farms are approved by the provincial (Autonomous Region) governments, the common practice region and comparable framework is provincial. In this case the project is compared to other projects in the Inner Mongolia Autonomous Region, as the Inner Mongolia DRC approves the FSR and tariff structure, and Inner Mongolia EPB approves the EIA.

Taking note of that the proposed project is a large scale project, the small scale projects less than 15MW are excluded. Using the statistics of installed capacity of wind power in China in 2006, by Professor Shi Pengfei[20], the wind farm projects listed are in the same region (Inner Mongolia) and are of similar scale (large scale). CDM project activities are not included in this analysis. Only the non-CDM wind farms that have been commissioned with similar scale are listed in Table 6.

Table 6. Similar-scale non-CDM wind farm projects located in Inner Mongolia

Name	Commissioning date	Capacity (MW)	Note
Huitengxile Wind Farm	Oct, 1997	19.8	Supported as Shuangjia Demonstration Project and received financial support from government of China[21].
Dali phase III Wind Farm	Mar, 2004	30.0	Demonstration Project Supported by national debt fund[22]

Sources: http://www.cwea.org.cn/download/display_info.asp?id=2

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

From the table above it can be found that there are only two earliest projects constructed not under CDM. Huitengxile (19.8MW) wind project was supported as Shuangjia Demonstration Project by State Economic and Trade Commission and received financial support from government of China, and Dali phase III wind project was also Demonstration Project supported by national debt fund. However, such kind of support is no longer given in Inner Mongolia.

In addition to the two earliest governmental-supporting projects listed in Table6, the other wind farms are all applying for or have already received CDM registration. Many project developers have been encouraged by the positive news on the CDM registration of the first projects, and are now taking CDM revenue into account in their decision before construction and are applying for CDM registration.

→ 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.

[19] http://www.ndrc.gov.cn/nyjt/nyzywx/t20050810_41378.htm

[20] http://www.cwea.org.cn/download/display_info.asp?cid=&sid=&id=19

[21] http://www.nwtc.cn/Article/ShowArticle.asp?ArticleID=814.

[22] http://www.chifeng.gov.cn/article/ReadNews.asp?NewsID=4141&BigClassID=1&SmallClassID=2&SpecialID=0

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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1. Baseline Emission Calculation

The emission reductions (ER_y) by the project activity during a given year y is the difference between baseline emissions (BE_y), project emissions (PE_y) and emissions due to leakage (L_y), where baseline emissions (BE_y in tCO_2e) are the product of the baseline emissions factor (EF_y in tCO_2e/MWh) calculated in step 3, times the electricity supplied by the project activity to the grid (EG_y in MWh), as follows:

$$BE_y = EG_y \cdot * EF_y \qquad (1)$$

Following ACM0002, the baseline emission factor (*EF*) is calculated as a combined margin (*CM*), consisting of the combination of operating margin (*OM*) and build margin (*BM*) factors according to the three steps below. Data for the calculations are based on official national statistics books: China Energy Statistical Yearbook and China Electric Power Yearbook.

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

Under ACM0002, four methods are provided for calculating the Operating Margin, including:

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

Detailed information to carry out a dispatch data analysis is not publicly available; therefore the dispatch data analysis OM is not suitable for the proposed project.

According to ACM0002, 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 normals for hydroelectric production.

The share of low-cost/must-run generation does not exceed 1% in the most recent 5 years, with the average being 0.8% (see Annex 3 for details). The Simple OM method, therefore, 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) the full generation-weighted average for the most recent 3 years for which data are available at the time of PDD submission, if or,
- the year in which project generation occurs, if $EF_{OM,y}$ is updated based on ex-post monitoring.

Here ex-ante vintage is chosen, and EF_{OM} is fixed during the first crediting period.

The Simple Operating Margin emission factor $EF_{OM,y}$ is defined as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants, based on the latest years for which statistical data is available. In any given year the following equation is used:

$$EF_{OM,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{j} GEN_{j,y}} \qquad (2)$$

Where:
$F_{i,j,y}$ and $COEF_{i,j}$ are the amount and associated CO_2 emission coefficient of the fossil fuel *i* consumed by relevant power sources *j* in year *y*, not including low-operation cost and must run power plants, and including imports to the grid. $GEN_{j,y}$ is the electricity (MWh) delivered to the grid by source *j.*

The fuel consumption and the total electricity generation of thermal plants connected to the North China Power Grid can be obtained from China Energy Statistical Yearbook and China Electric Power Yearbook. More than 10 types of fuel are used in the power plants in the North China Power Grid; tables with consumption figures for each fuel for each of the three years are presented in Annex 3.

The CO_2 emission coefficient $COEF_i$ for each fuel i is obtained as (and presented in Annex 3):

$$COEF_i = NCV_i \bullet EF_{CO2,i} \bullet OXID_i \qquad (3)$$

Where:
NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel *i.* This value can be obtained from China Energy Statistical Yearbook.

$EF_{CO2,i}$ is the CO_2 emission factor per unit of energy of the fuel *i,* and it can be calculated by multiplying the carbon emission factor (carbon content) by 44/12. The carbon emission factor can be obtained from page 1.21 in Volume 2 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

$OXID_i$ is the oxidation factor of the fuel, and it can be obtained from page 1.23 in Volume 2 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. The 2006 IPCC Guidelines suggest that default oxidation factors are 1.00 for each fuel.

According to ACM0002, if net imports do not exceed 20% of total generation in the project electricity system, the average emission rate of the exporting grid is adopted. Imports into the project electricity system of the proposed project activity (the North China Power Grid) from the connected electricity system (the Northeast Power Grid) were less than 1% over the last three years.(see Annex 3), so the average emission rate of Northeast Power Grid is taken as the emission factor of the import electricity.

As the most recent year for which data is available at time of PDD submission is the year 2005, the Simple OM for North China Power Grid has been calculated ex-ante using a 3-year weighted average, based on the statistics from 2003 to 2005. This allows the Simple OM to be fixed for the first crediting period.

Based on these data, the simple OM emission factor of North China Power Grid is calculated as 1.120 tCO_2/MWh (see Annex 3 for details).

Step 2. Calculate the Build Margin emission factor ($EF_{BM,y}$)

The Build Margin is calculated as the generation-weighted average emission factor (tCO_2/MWh) of a sample of power plants *m*, as follows:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m}}{\sum_{m} GEN_{m,y}} \qquad (4)$$

Where:
$F_{i,m,y}$ and $COEF_{i,m}$ are analogous to the variables used for the Simple OM calculation above, for all plant *m,* including the must-run and low-operating cost plant which were excluded for the OM calculation. The sample group *m* consists of either the five power plants that have been built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently, and if 20% falls on part capacity of a plant, that plant is fully included in the calculation. Given the size of the North China Power Grid, the most recent 20% of additional units is chosen as this would represent a larger, more representative of annual generation.

ACM0002 allows project participants to choose between two given options for calculating the Build Margin for the project, one is *ex-ante* calculation, and the other is annual *ex-post* updating in the first crediting period. For this project the first option is chosen. The Build Margin Emission Factor therefore is based ex-ante on the most recent information available on plants already built at the time of PDD submission. The EF_{BM} therefore is fixed for the first crediting period.

However, because of the limited information that is publicly available, at present it is impossible to know how much generation of NCPG was from the new-built power plant and it is also impossible to find the exact new-built plants which comprise the 20% of the system generation. Considering this situation, this proposed project uses the EB guidance[23] to calculate $EF_{BM,y}$, for projects in China:

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

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

The percentage is calculated as follows:

---

[23] http://cdm.unfccc.int/Projects/Deviations (application of approved methodology AM0005)-DNV on 07 Oct 05. The request for deviation was submitted relating to AM0005 and AMS-I.D, however, the deviation also clearly applies to ACM0002 and the proposed project due to the following:

- AM0005 was valid from 14 April 2004 to 2 March 2006 and after this period, it was replaced by ACM0002.
- The calculation procedure of OM and BM in ACM0002 is the same as described in AM0005.

$m = [(C_{2005} - C_n)/ C_{2005}]* 100\%$

Where:
C_{2005} is the capacity in 2005 (most recent year for which published data are available); and
C_n is the capacity in the reference year n.
The power plants in North China Power Grid consists of thermal power plants, hydro power plants and other type of power plants, and only the thermal power plants (including the coal, the oil and the gas fired) emit CO_2. But the exact capacity of each fuel type such as the coal, the oil and the gas fired in recent years can not be found in the statistical data available, only capacity of the thermal power plant (the sum of the coal, the oil and the gas fired power plant), the hydro and the other type power plant can be obtained in every recent year book. The only feasible method to calculate BM is to use the capacity of the thermal power, the CO_2 emission factor of the thermal power plant ($EF_{Thermal}$) with the best technology commercially available in China needs to be calculated, and then the following equation can be used:

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

Where:

$C_{Thermal}$ is the thermal power plant capacity amongst the sample group with the capacity ($C_{2005} - C_n$); and
$EF_{Thermal}$ is the CO_2 emissions factors of the thermal power plant with the best available technology, rather than to the average of operating power.

In conclusion, the procedure to be used for calculating the build margin using the most recent additional capacity follows steps below:

- 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 capacity of the latest statistic year 2005. The year selected is 2003, since which about 23.8% of capacity has been added (15.4% since 2004).
- Of the added capacity since 2003, 99.26% is thermal capacity.
- The best commercially available thermal power plant, according to the National Study on China Climate Change, is expected to have an efficiency of 320 gram of standard coal consumption per kWh electricity generation in the year 2010.
- The best available technology emissions factor is calculated from this efficiency and the NCV of standard coal. EF_BAT is calculated as 0.886 tCO_2e/MWh.
- This value is discounted for the coal share in total thermal plant emissions of 99.18%, i.e. assuming oil and gas emissions are zero. The resulting emissions factor $EF_{Thermal}$ is 0.879 tCO_2e/MWh.
- The Build Margin emissions factor is now calculated as the percentage of thermal plant additions and thermal plant emissions factor.

Based on the formulae above, and presented in detail in Annex 3, the BM emission factor of NCPG for the proposed project in the first 7-year crediting period is calculated as:

$EF_{BM} = 0.872\ tCO2/MWh$.

Step 3. Calculate the baseline emission factor (EF_y)

The baseline emissions factor (EF_y) is calculated as the weighted average of the Operating Margin emission factor and Build Margin emission factors following ACM0002. For wind projects, the default weights are as follows: w_{OM} = 0.75 and w_{BM} = 0.25:

$$EF_y = w_{OM} \bullet EF_{OM,y} + w_{BM} \bullet EF_{BM,y} \qquad (5)$$
$$EF_y = 0.75 \bullet 1.120 + 0.25 \bullet 0.872 = 1.058 \text{ tCO}_2\text{/MWh}$$

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 1-3 in the baseline methodology and the latest data available at that time.

Baseline emissions (BE_y) now can be calculated as the baseline emissions factor (EF_y) multiplied by the annual net generation of the Proposed Project (EG_y).

Table 7 gives an overview of EF.

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

Variable	Value	Weighting
Operating Margin Emissions Factor (EF_{OM} in tCO_2/MWh)	1.120	0.75
Build Margin Emissions Factor (EF_{BM} in tCO_2/MWh)	0.872	0.25
Baseline Emissions Factor (EF in tCO_2/MWh)	1.058	

Baseline emissions (BE_y) now can be calculated as the baseline emissions factor (EF_y) multiplied by the annual net electricity supplied by the Proposed Project (EG_y).

2. Project emission

According to ACM0002, the proposed project is a wind farm, belongs to renewable energy activity, and PE_y of the proposed project is zero.

3. Leakage

No leakage is identified as the project is a wind energy project, and any electricity usage is taken into account in the net electricity generation from the project, Ly=0.

4. Emission Reductions

The emission reduction ER_y of 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:

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

With both project emissions and leakage being zero, emission reductions from the project can now be direct from the baseline emissions (BE_y) as the baseline emissions factor (EF_y) multiplied by the annual net electricity supplied by the proposed wind farm project (EG_y).

$$ER_y = BE_y = EG_y \cdot EF_y \qquad (7)$$

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

Data / Parameter:	$F_{i,j,y}$ and $F_{i,m,y}$
Data unit:	Tonne or m^3
Description:	OM: Fuel use of type i in plant j (only included plant) in year y BM: Fuel use of type i in plant m (includes all generating plant) in year y
Source of data used:	China Energy Statistical Yearbook (edition: page)
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:	$\boldsymbol{COEF_{i,j}}$ and $\boldsymbol{COEF_{i,m}}$
Data unit:	tCO_2/tonne or tCO_2/m^3
Description:	OM: CO_2 emission coefficient of fuel i in plant type j BM: CO_2 emission coefficient of fuel i in plant type m
Source of data used:	Calculation
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Each fuel type used has its own CO_2 emission coefficient.
Any comment:	Calculated from *NCV*, *EF* and *OXID*.

Data / Paramter:	$\boldsymbol{GEN_{j,y}}$
Data unit:	MWh
Description:	OM: Electricity generation by plant type j in year y
Source of data used:	China Electric Power Yearbook (edition, page)
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	This is the most accurate data presenting electricity generation by fuel type for each province. Generation is presented as gross generation, a self-use (own consumption) percentage is also given. Total net generation is calculated from gross generation and self-use share.
Any comment:	Calculated from gross generation and self use listed in the Yearbook

Data / Parameter:	$\boldsymbol{NCV_i}$
Data unit:	kJ/kg or kJ/m^3
Description:	Net caloric value (energy content) per mass or volume unit of fuel i
Source of data used:	China Energy Statistic Yearbook (2005), p366
Value applied:	See Annex 3.
Justification of the choice	ACM0002 states that, where available, local values of NCV_i should be used.

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

Data / Parameter:	CEF_i
Data unit:	tC/TJ
Description:	Carbon emission factor per unit of energy for fuel i
Source of data used:	2006 IPCC Guidelines, Volume 2, page 1.20-24
Value applied:	See Annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to ACM0002, if the local or national value is not available, the IPCC value can be applied.
Any comment:	To be conservative, *EF* for the undefined category “other fuels” is considered zero, thus emissions from this source is also zero.

Data / Parameter:	$OXID_i$
Data unit:	Fraction
Description:	Oxidation factor of the fuel i
Source of data used:	2006 IPCC Guidelines, Volume 2, page 1.20-24
Value applied:	100%
Justification of the choice of data or description of measurement methods and procedures actually applied :	ACM0002 refer to IPCC default values. The 2006 IPCC Guidelines are the most up to date version.
Any comment:	

Data / Parameter:	C_n, $C_{thermal}$
Data unit:	MW
Description:	Installed capacity of NCPG (in year n)
Source of data used:	China Electric Power Yearbook
Value applied:	See Annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	To determine the year since when newly added capacity in NCPG constituting 20% or more of the currently installed capacity.
Any comment:	The year selected is 2003. The share of added thermal capacity is 99.26% of total added capacity during this period.

Data / Parameter:	**Efficiency of newly installed thermal plant**
Data unit:	Grammes of standard coal equivalents per kWh
Description:	the projected best commercially available thermal power plant in China

Source of data used:	National Study of China Climate Change (published by Tsinghua University Publication House)
Value applied:	320
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to this national study, the standard coal consumption of thermal power plant in 2000 was 350 gce/kWh, and if various measures aimed at improving energy efficiency could be carried out, the value of 350gce /kWh is expected to reduce to 320g/kWh by 2010
Any comment:	320g/kWh is adopted to be more conservative.

Data / Parameter:	**NCV**
Data unit:	TJ/ton ce
Description:	Net caloric value (energy content) per mass or volume unit of standard coal
Source of data used:	General Code for Comprehensive Energy Consumption Calculation (GB2589-81)
Value applied:	0.02927
Justification of the choice of data or description of measurement methods and procedures actually applied :	Definition in GB2589-81.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

>>
The Baseline Emissions (BE_y, in t CO_2), for each year y, are calculated by multiplying the baseline emissions factor (EF_y, in tCO_2/MWh) by the net supplied power of the project (EG_y, in MWh), as follows:

$$BE_y = EG_y \bullet EF_y$$

With the baseline emissions factor (EF_y) calculated using operating and build margins as described in detail in sector B.6.1.

$$EF_y = w_{OM} \bullet EF_{OM,y} + w_{BM} \bullet EF_{BM,y} = 1.058tCO_2/MWh$$

Based on the Feasible Study Report, the annual net supplied power of the proposed project is 120,136MWh. Thus, baseline emission are:

$$BE_y = EG_y \times EF_y = 120{,}136MWh \times 1.058\ tCO_2/MWh = 127{,}104\ tCO_2$$

Both project emissions (PE_y) and leakage emissions (L_y) are zero, therefore total emissions from the project activity are zero.

The emission reduction ER_y by the project activity during a giving year y is 127,104 tCO_2 and the total estimated emission reduction in the first crediting period is 889,728 tCO_2.

$$ER_y = BE_y - PE_y - L_y = 127104 - 0 - 0 = 127{,}104\ tCO_2$$

The baseline emissions factor has been fixed for the first 7-year crediting period. In each year the amount of CERs actually generated by the project will vary depending on the monitored net supplied power by the proposed project to the grid.

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

>>
Emission reduction of the proposed project in the first crediting period is as follows:

Year*	Estimated value of emission of the proposed project activity(tCO_2e)	Estimated value of emission of the baseline (tCO_2e)	Estimated value of emission of leakage (tCO_2e)	Estimated value of total emission (tCO_2e)
2008	0	127,104	0	127,104
2009	0	127,104	0	127,104
2010	0	127,104	0	127,104
2011	0	127,104	0	127,104
2012	0	127,104	0	127,104
2013	0	127,104	0	127,104
2014	0	127,104	0	127,104
Total (tCO_2e)	**0**	**889,728**	**0**	**889,728**

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

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

B.7.1 Data and parameters monitored:

Data / Parameter:	**EG_y**
Data unit:	MWh
Description:	Net electricity supplied to the grid by the project in period y
Source of data to be used:	Electricity Meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Net supplied power is expected to be 120,136MWh/y once fully operational.
Description of measurement methods and procedures to be applied:	The net electricity supplied to the grid will be monitored hourly through the main meter installed at the Wanghai substation of the power grid. This main meter is bidirectional and has two-way metering, recording both exports to the grid (Gen) and imports from the grid (Cons); net electricity supplied to the grid (EG) is calculated as exports minus imports. The results from the main meter will be supplied by the Grid Company to the Developer on a monthly basis.
QA/QC procedures to be applied:	The meter for monitoring of the emission reductions will be the same as used for electricity sales to the grid and the metering data will be cross-checked with receipt of sales or relevant commercial data.

	Back-up meter will be installed at the Wanghai Substation. The main and back-up metering equipments at the substation are calibrated and checked annually by qualified third party for accuracy so that the metering equipment shall have sufficient accuracy, and any error resulting from such equipment shall not exceed 0.5% of full-scale rating. The metering data will be double checked by receipt of sales or relevant commercial data.
Any comment:	

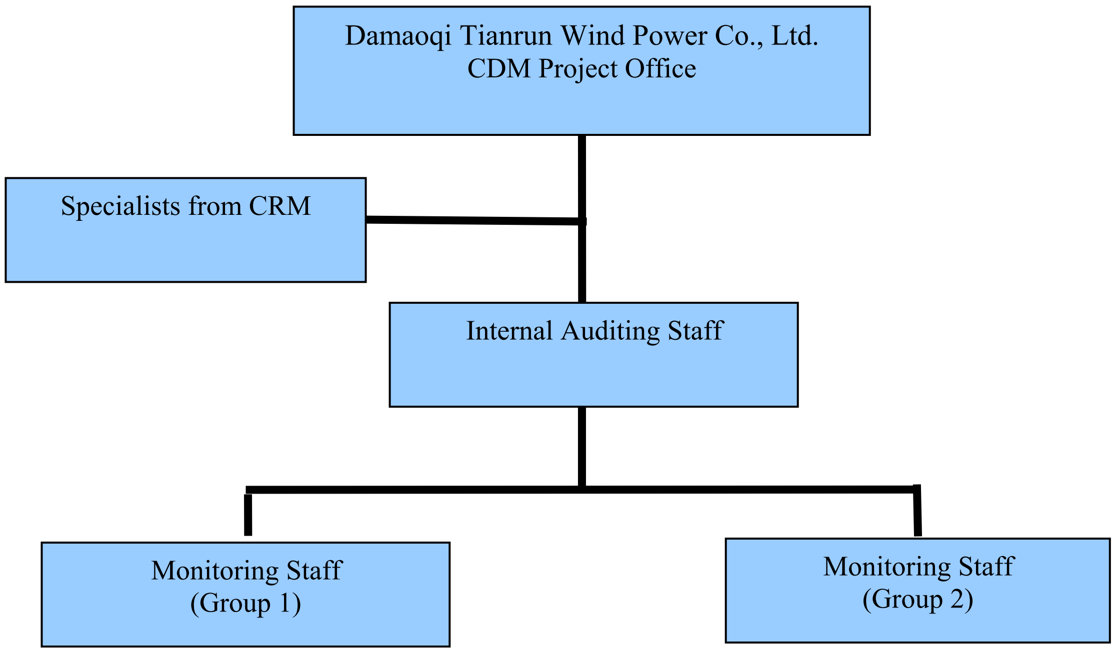
B.7.2 Description of the monitoring plan:

>>

Overall responsibility for monitoring and carrying out the monitoring following this monitoring plan lies with Damaoqi Tianrun Wind Power Co., Ltd.

Goldwind Damao Wind Power Co., Ltd. will establish a CDM project management office and assign dedicated people responsible for the monitoring and report the emission reduction due to the project activity.

The operating and management structure of monitoring is illustrated as follows:



The monitoring plan is presented 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: 12/10/2007.

Contact information of the person(s)/entity(ies) responsible:

Entity(ies)	Contact details	Project participant
Carbon Resource Management Ltd.	In China: Ms Li Ning Ms Qian Yiwen ln@carbonresource.com +86 10 844 75248	Yes
	In the UK: Mr Christiaan Vrolijk cv@carbonresource.com +44 20 7016 1426	
	For postal address: see Annex 1	
Damaoqi Tianrun Wind Power Co., Ltd.	Ms. Liu Zhe family.lz@163.com +86 10-62161305	Yes
	For postal address: see Annex 1	

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

>>
28/08/2007 (construction launch date)

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

>>
20y

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:

>>
01/11/2008 (or date of registration, whichever is later)

C.2.1.2. Length of the first crediting period:

>>
7y-0m

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
Not applicable.

C.2.2.2. Length:

>>
Not applicable.

SECTION D. Environmental impacts

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

>>
Environmental Impact Assessment (EIA) for the Goldwind Damao Wind Farm has been completed by Baotou Environmental Protection Science Institute of Inner Mongolia Autonomous Region assigned by the Project owner, and has been approved by the Environmental Protection Bureau of Inner Mongolia Autonomous Region. Here is a summary of the EIA.

1 The analysis of the environment impact in the construction period

- Construction machinery and construction activity will generate noise. Since the local residential area is far away from the wind farm site, the impact of construction noise to the local region is light.
- The small amount of waste water from construction will evaporate after deposition treatment. The amount of life sewage during construction is also small and will have no impact on the local environment.
- The solid wastes in the construction period include waste soil and stone, construction wastes, as well as household garbage. To reduce the temporary land use the construction plan will be reasonably arranged, and the working spot will be cleared up in time and watered to avoid the dust blowing.
- The Project temporarily uses and disturbs the grass for construction use. The occupied land will be restored according to its characteristics after construction and will ensure its reutilization. Overall, land use impact on the local residents arising from the Project is considered to be insignificant.

2 The analysis of the environment impact in operation period

- The wind turbines and power substation will generate noise during operation period. Noise superposition calculations show that the noise at a distance of 200 m from wind farm at daytime and 600 m at night time, satisfies the Class 1 requirement of Standard of Environmental Noise of Urban Area (GB 3096-1993). The nearest residential area is more than 2km away from the wind farm, so the nearby residents will not be influenced by the noise.
- There will no electromagnetic impact to the local residents after attenuation and shield.
- The amount of waste water from the site office during operation period is small. The waste water will be treated and will not have impact on water environment.

3. Conclusion

The Wind Farm does not put the much pressure on the local environment when generating renewable power. However it will bring great environmental benefit as well as the social benefit.

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:

>>

Environmental impacts are not considered significant. The Environmental Protection Bureau of Inner Mongolia Autonomous Region has approved the EIA.

SECTION E. Stakeholders' comments

>>

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

>>

In July 2007, staff from Damaoqi Tianrun Wind Power Co., Ltd. carried out consultations with the local community and the local government. A survey of the local villagers and residents in the area indicated the support to the project. A summary of the survey—see E.2.

E.2. Summary of the comments received:

>>

Following is a translation of the letter received from the local government.

Comments from Local Government about the Goldwind Damao Wind Farm Project

Goldwind Damao Wind Farm is located in Damao County, Baotou city, Inner Mongolia Autonomous Region. We believe the construction and operation of the Wind Farm will promote the development of related industries. Using local wind resources, the project will contribute to the sustainable development of this underdeveloped region. And as green electricity, this project will be an environment-friendly one.

As the local government, we fully support the development of Goldwind Damao Wind Farm project.

The People's Government of Damao Qi
30 July 2007
Stamp

Following is a summary of the local survey. The survey forms are available from the project owner.

A 1 page questionnaire was designed to be easy to fill in and has the following sections:

Project introduction
Respondent's basic information and education level
Questions on:

1. Do you agree with the development of the Project?
2. Will the Project raise effects on your environment of living, studying and working?
3. Will construction, operation or decommissioning of the Project affect natural resources or ecosystems, such as water, habitats, etc?
4. Will the Project cause noise, vibration or release of electromagnetic radiation that could adversely affect your health?
5. Do you think the proposed project will have promotion in local economic development?

6. Do you have any suggestion about the project?

The survey had a 96% response rate and the following is a summary of the key findings (The questionnaires were sent to 50 households):

The people being surveyed

Item	Content	Vote	Proportion
Gender	Male	22	46%
	Female	26	54%
Education	Elementary school	2	5%
	Junior high school	17	35%
	Senior high school	17	35%
	University or above	12	25%
Occupation	Officer	10	21%
	Worker	7	15%
	Farmer	11	23%
	Merchant	5	10%
	Others	15	31%

Their opinions

1. Will the Project raise effects on your environment of living, studying and working?	Yes	No	Not Sure
	0	100%	0
2. Will construction, operation or decommissioning of the Project affect natural resources or ecosystems, such as water, habitats, etc?	Yes	No	Not Sure
	0	98%	2%
3. Will the Project cause noise, vibration or release of electromagnetic radiation that could adversely affect your health?	Yes	No	Not Sure
	0	94%	6%
4. Do you think the proposed project will have promotion in local economic development?	Yes	No	Unclear
	100%	0	0
5. Do you agree with the development of the Project?	Yes	No	No Concern
	100%	0	0

Conclusions from the survey:

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 villagers and local government 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.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding from Annex I Parties for the Goldwind Damao Wind Farm Project.

Annex 3

BASELINE INFORMATION

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

Confirmation of eligibility of Simple OM method

According to ACM0002, 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 normals 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 0.8% 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 under 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	0.8%	2002/p617
2002	36.25	4,075.45	0.9%	2003/p585
2003	39.79	4,616.53	0.9%	2004/p709
2004	40.32	5,308.04	0.8%	2005/p474
2005	45.51	6,077.82	0.7%	2006/p568
Total	191.14	23,689.03	0.8%	
Average	*38.23*	*4,737.81*	*0.8%*	

Note: * China Electric Power Yearbook (edition/page)

CO_2 emission coefficients for fuels used in the NCPG

The operating margin emissions factor is calculated from the fuel consumption, generation and fuel emission coefficients. Fuel consumption and generation are reported in the yearbooks and presented below. The CO_2 emission coefficient $COEF_i$ for each fuel i is calculated as:

$$COEF_i = NCV_i \bullet EF_{CO2,i} \bullet OXID_i$$

Where:

NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel *i.* This value can be obtained from China Energy Statistical Yearbook.

$EF_{CO2,i}$ is the CO_2 emission factor per unit of energy of the fuel *i,* and it can be calculated by multiplying the carbon emission factor (carbon content) by 44/12. The carbon emission factor can be obtained from page 1.21 in Volume 2 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

$OXID_i$ is the oxidation factor of the fuel, and it can be obtained from page 1.23 in Volume 2 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. The 2006 IPCC Guidelines suggest that default oxidation factors are 1.00 for each fuel.

The calculated COEF values are presented in Table A2 below.

Table A2 CO_2 emission factors of fuels

Fuel types	Unit	Net Caloric value (MJ/unit)	Oxidation rate (%)	Carbon Emission Factor (tC/TJ)	COEF (tCO_2e/unit)
Raw coal	tonne	20,908	100	25.8	1.98
Cleaned coal	tonne	26,344	100	25.8	2.49
Other washed coal	tonne	8,363	100	25.8	0.79
Coke	tonne	28,435	100	29.2	3.04
Coke oven gas	1000 m3	16,726	100	12.1	0.74
Other coal gas	1000 m3	5,227	100	12.1	0.23
Crude oil	tonne	41,816	100	20.0	3.07
Gasoline	tonne	43,070	100	18.9	2.98
Diesel	tonne	42,652	100	20.2	3.16
Fuel oil	tonne	41,816	100	21.1	3.24
LPG	tonne	50,179	100	17.2	3.16
Refinery gas	tonne	46,055	100	15.7	2.65
Natural gas	1000 m3	38,931	100	15.3	2.18
Other petroleum products	tonne	38,369	100	20.0	2.81
Other coking products*	tonne	28,435	100	0.0	0.00
Other fuel*	tonne#	0	100	0.0	0.00

Note: * not defined exactly, conservative emission factor: 0; # coal equivalents
Sources: NCV from China Energy Statistical Yearbook (2005) p 366, CEF and OXID from IPCC 2006

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 Fuel consumption and CO_2 emissions in NCPG

2003

Fuel types	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	NCPG total	Emissions ($MtCO_2e$)	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	
Other washed coal	million tonnes	0.0631	-	0.6728	2.0821	-	4.5090	7.3270	5.80	99.2%
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	$MtCO_2e$								455.56	

2004

Fuel types	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	NCPG total	Emissions ($MtCO_2e$)	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	
Other washed coal	million tonnes	0.0648	-	1.0104	3.5417	-	2.8422	7.4591	5.90	99.3%
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	$MtCO_2e$								549.02	

2005

Fuel types	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	NCPG total	Emissions ($MtCO_2e$)	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	
Other washed coal	million tonnes	0.0657	-	1.6745	3.7365	-	1.0869	6.5636	5.19	99.2%
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	-	-	0.6931	0.0727	1.1890	2.0406	-	
Total emission	$MtCO_2e$								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.

In addition, the yearbooks present own consumption of plant from the three different generator categories. 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

Imports

According to ACM0002, if net imports do not exceed 20% of total generation in the project electricity system, the average emission rate of the exporting grid is adopted. Imports into the project electricity system of the proposed project activity (the North China Power Grid) from the connected electricity system (Northeast Power Grid) were less than 1% over the last three years. Following the delineation of the Chinese DNA, NEPG consists of Liaoning, Jilin, and Heilongjiang (as well as the eastern part of Inner Mongolia which is not part of NCPG).

As imports are below 20% the average emission rate of Northeast Power Grid is taken as the emission factor of the import electricity. 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.

Table A5 Fuel consumption and CO_2 emissions in NEPG (connected system)

2003

Fuel types	Unit	Liaoning	Jilin	Heilongjiang	NEPG total	Emissions ($MtCO_2e$)
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	$MtCO_2e$					174.13

2004

Fuel types	Unit	Liaoning	Jilin	Heilongjiang	NEPG total	Emissions ($MtCO_2e$)
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	$MtCO_2e$					199.71

2005

Fuel types	Unit	Liaoning	Jilin	Heilongjiang	NEPG total	Emissions ($MtCO_2e$)
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#	0.0210			0.0210	-
Total emission	$MtCO_2e$					207.25

Note: # coal equivalent

Sources:

China Energy Statistical Yearbook (2005) p166-177, p301-302

China Energy Statistical Yearbook (2005) p222-233, p365-366

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	$MtCO_2e$	174.13	199.71	207.25
Generation	10^8 kWh	1,532.3	1,700.9	1,790.3
Emissions factor	tCO_2e/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.

$$EF_{OM,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{j} GEN_{j,y}}$$

Table A8 Operating margin emission factor calculation

	Unit	2003	2004	2005	3-year total/average
NCPG					
Emissions	$MtCO_2e$	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	4.52	3.93	12.69
EF NEPG	tCO_2e/MWh	1.136	1.174	1.158	
Emissions from imports	$MtCO_2e$	4.82	5.30	4.55	14.67
Total					
Emissions	$MtCO_2e$	460.38	554.33	652.20	1,666.90
Supply	TWh	429.61	493.69	564.68	1,487.98
Operating Margin Emissions Factor	tCO_2e/MWh				1.120

Based on above data, the simple OM emission factor of NCPG is calculated ex-ante using a 3-year generation-weighed average is 1.120 tCO_2e/MWh

Step 2. Calculate the Build Margin emission factor (*$EF_{BM,y}$*)

The Build Margin is calculated as the generation-weighted average emission factor (tCO_2/MWh) of a sample of power plants *m*, as follows:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m}}{\sum_{m} GEN_{m,y}}$$

Where:
$F_{i,m,y}$, $COEF_{i,m}$ and $GEN_{i,m}$ are analogous to the variables used for the Simple OM calculation above, for all plant *m,* including the must-run and low-operating cost plant which were excluded for the OM calculation.

Determination of the sample group

The sample group *m* consists of either the five power plants that have been built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently, and if 20% falls on part capacity of a plant, that plant is fully included in the calculation. Due to the size of the electricity system the latter sample group is used.

Using the latest statistical data available (from the China Electric Power Yearbook) the year from which the added generation capacity is equal to or just exceeds 20% of the capacity of the latest statistic year 2005 is determined. The year selected is 2003, since which about 23.82% of generating capacity has been added. See Table A9 below.

The percentage is calculated as follows:

$m = [(C_{2005} - C_n)/ C_{2005}] * 100\%$

Where:
C_{2005} is the capacity in 2005 (most recent year for which published data are available); and
C_n is the capacity in the reference year *n*.

Table A9 Installed capacity development of NCPG

Year	Installed capacity (MW)	Added capacity (MW)	Growth	Selected
2005	114,675			
2004	96,983	17,691	15%	No
2003	87,363	27,312	24%	Yes

Source
China Electric Power Yearbook (2004) p709
China Electric Power Yearbook (2005) p473
China Electric Power Yearbook (2006) p571, p345

Determining capacity additions by technology

Following EB guidance, the Build Margin emissions factor is calculated using weights based on the capacity additions per technology and the emissions from the best available technology for each category.

Added capacity by technology is calculated using the data presented in Tables A10 below. Of the added capacity since 2003, 99.26% is thermal capacity.

Table A10 Installed capacity of NCPG (MW)

2005

Source	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	NCPG total	Added since 2003	Added* (%)
Thermal	3,834	6,150	22,333	22,247	19,244	37,332	111,140	27,133.05	99.26%
Hydro	1,025	5	785	783	594	51	3,243	-23.45	0.00%
Nuclear	-	-	-	-	-	-	-	-	0.00%
Other	24	24	48	-	166	31	292	202.24	0.74%
Total	4,883	6,179	23,166	23,030	20,004	37,413	114,675	27,311.84	100%

2003

Source	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Shandong	NCPG total
Thermal	3,348	6,009	17,699	15,036	11,422	30,494	84,007
Hydro	1,058	5	764	796	592	51	3,266
Nuclear	-	-	-	-	-	-	-
Other	-	-	14	-	77	-	90
Total	4,406	6,014	18,477	15,832	12,090	30,545	87,363

Note: * ignoring the capacity reduction in hydro
Source:
China Electric Power Yearbook (2004) p709
China Electric Power Yearbook (2006) p571, p345

Best available technology emissions factor

As more than 99% of all emissions in NCPG in 2005 came from coal-fired power plants (the remainder mostly used for start up), see Table A3 above, the appropriate best commercially available technology is new coal-fired power plant.

The efficiency of the best commercially available technology for coal-fired power plants in China is calculated from the projected efficiency of thermal power plant in the authoritative National Study of China

Climate Change.[24] This study estimates that the efficiency in the year 2010 will be 320 grammes of standard coal equivalents per kilowatt-hour (gce/kWh). The China Electricity Year Book (2006, page 559) shows that the lowest coal consumption in the NCPG region currently is 343 gce/kWh. The estimated value of 320 gce/kWh therefore is a conservative estimate and reflects an efficiency greater than that currently found in NCPG. The CO_2 emissions factor of the best commercially available technology, EF_{BAT}, is calculated in Table A11 as 0.886 tCO_2e/MWh.

Table A11 Best available technology emission factor

	Fuel efficiency gce/kWh	CEF tC/TJ	OXID	NCV MJ/tce	EF tCO_2e/MWh
Best available technology (BAT) coal	320	25.8	100%	29,270	0.886

Source: The net caloric value of standard coal is from General Code for Comprehensive Energy Consumption Calculation (GB2589-81); the carbon emission factor is from page 1.21 in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories; Oxidation rate is from page 1.23 in 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

To be conservative, this value is discounted for the lower emissions from the very small share of other fossil fuels used (mainly for start ups). The EF_{BAT}, therefore, is multiplied by the coal share in emissions (Table 10), i.e. assuming oil and gas emissions are zero. The resulting emissions factor is 0.879 tCO_2e/MWh.

Table A12 Discount for added conservativeness

	EF tCO_2e/MWh	Share
BAT Coal	0.886	99.18%
Other fuels	-	0.82%
Thermal	0.879	

Build margin emission factor calculation

The Build Margin emissions factor is now calculated as the percentage of capacity additions by technology and the emissions factor for each technology.

Table A13 Build margin emission factor calculation

Source	Added since 2003 (MW	Added*	CEF	BM
Thermal	27,133.05	99.26%	0.879	
Hydro	-23.45	0.00%	-	
Nuclear	-	0.00%	-	
Other	202.24	0.74%	-	
Total	27,311.84	100%		0.872

Note: * ignoring the capacity reduction in hydro

Based on the formula above, the BM emission factor of NCPG for the proposed project in the first 7-year crediting period is calculated as:

$EF_{BM} = 0.872\ tCO_2e/MWh.$

[24] *National Study of China Climate Change*, Tsinghua University Publication House.

Step 3. Calculate the baseline emission factor EF_y

The baseline emissions factor (EF_y) is calculated as the weighted average of the Operating Margin emission factor and Build Margin emission factors following ACM0002. For wind projects, the default weights are as follows: w_{OM} = 0.75 and w_{BM} = 0.25:

Table A14 Combined margin baseline emission factor calculation

	EF (tCO_2e/MWh)	weight
OM	1.120	75%
BM	0.872	25%
Combined margin	1.058	

Annex 4

MONITORING PLAN

1. Introduction

The Goldwind Damao Wind Farm Project adopts the approved consolidated monitoring methodology ACM0002 "Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources" (version 06, 19 May 2006) to determine the emission reductions from the net electricity supplied by the wind farm.

2. Responsibility

Overall responsibility for monitoring and carrying out the monitoring following this monitoring plan lies with Damaoqi Tianrun Wind Power Co., Ltd.

CDM manager of Damaoqi Tianrun Wind Power Co., Ltd. is responsible for the monitoring and reporting of the wind farm.

3. Installation of meters

The net electricity supplied to the grid will be monitored through the main meter installed at the Wanghai substation of the power grid. This main meter is bidirectional and has two-way metering, recording both exports to the grid (Gen) and imports from the grid (Cons); net electricity supplied to the grid (EG) is calculated as exports minus imports. The back-up meter will be installed at the Wanghai Substation.

Every month the Wind Farm will obtain the net on-grid electricity supplied from the substation. The net generation monitored by the main meter will suffice for the purpose of billing and emission reductions, as long as the error in the meters is within the agreed limits. The primary meter used for billing (at the substation) will also be the primary meter used for emission reduction calculations.

In addition, at the project site, there are meters installed at the transmission lines connected to the turbines, and electricity from the turbines and the transmission lines are monitored. These data will be the references to the net power supplied to the grid for the proposed project.

Should any additional generating capacity be installed, sharing transmission and transformer facilities as well as the metering equipments at the substation with the proposed project activity, net generation recorded by the main meters at the substation will be allocated between the proposed project activity and any such added capacity on the basis of generation as recorded by meters onsite.

4. Calibration and maintenance

Both the main meter and the backup meter will be owned, operated and maintained by Inner Mongolia Power Grid Company. The main and back-up metering equipments are calibrated and checked annually by qualified third party for accuracy so that the metering equipment shall have sufficient accuracy. The net output registered will suffice for the purpose of billing and emission reduction verification as long as the error in the meters is within the agreed limits.

The main and back-up 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.

All the meters installed shall be tested by qualified entity 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.

5. Monitored data

During the first seven operating years, the net electricity supplied to the grid (EG_y) will be monitored and recorded following the procedures above. Data variables to be monitored are presented in Section B.7.1 of the PDD.

5.1 Meter failure

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 within acceptable limits of accuracy or operation is performed improperly Goldwind Damao Wind Farm and the North China Power Grid shall jointly prepare an 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 North China Power Grid and Goldwind Damao Wind Farm fail to agree then the matter will be referred for arbitration according to agreed procedures.

6. Quality control

Net electricity supplied to the grid will be double checked with receipt of sales and purchases and relevant commercial data and will be approved and signed off by CDM manager before it is accepted and stored.

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. Data management system

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 Goldwind Damao Wind Farm project, the project material and monitoring results will be indexed. All paper-based information will be stored by the technology department of Goldwind Damao 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.

8. Reporting and verification

The steps required to meet the requirements for emissions reduction monitoring include:

- Inner Mongolia Power Grid Company supplies reading to Goldwind Damao Wind Farm monthly.
- Goldwind Damao Wind Farm records readings from the back up meter monthly and other relevant separate meters if needed.
- Goldwind Damao Wind Farm carries out an internal audit and reports the readings to the DOE before the verification is requested.

10. Verification

Goldwind Damao Wind Farm will facilitate the verification through providing the DOE with all required necessary information at any stage.