CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 02 - in effect as of: 1 July 2004)

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

>>

Zhangbei Manjing Windfarm Project

Document version 3.3, 8 December 2005

A.2. Description of the project activity:

>>

The objective of the Zhangbei Manjing Windfarm Project is to generate renewable electricity using wind power resources and to sell the generated output to the North China Power Grid 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 supply the North China Power Grid.

The proposed Zhangbei Manjing Windfarm Project is located near Manjing village, in the west of Zhangbei county, Hebei Province, in the People's Republic of China. The project involves the installation of 30 turbines, each of which has a capacity of 1,500kW, providing a total of 45MW. The Zhangbei Manjing Windfarm Project site has an excellent wind resource, which has been measured extensively. The site also benefits from a strong transmission system nearby, as it is close to several power generation bases for the North China Power Grid. The proposed project is expected to generate approximately 108GWh per year[1], which will be exported to the grid.

The project will assist China in stimulating and accelerating the commercialisation of grid-connected renewable energy technologies and markets. It will therefore help reduce GHG emissions versus the high-growth, coal-dominated business-as-usual scenario. Furthermore, the project will demonstrate the viability of larger grid-connected wind farms which can support improved energy security, improved air quality, alternative sustainable energy futures, improved local livelihoods and sustainable renewable energy industry development. The specific goals of the project are to:

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

[1] At a loadfactor of 27.6%, and own consumption of 0.2%.

A.3. Project participants:

>>

Name of Party involved	Private and/or public entity(ies) project participants (as applicable)	Project participant
P.R. China (host)	▪ Project proponent: Beijing Guotou Energy Conservation Company (BJGT)	No
United Kingdom of Great Britain and Northern Ireland	▪ CER buyer: First Carbon Fund Ltd	No

The National Development and Reform Commission of the People's Republic of China has given approval for the project on behalf of the host country. The letter of approval is attached in Annex 5.

The Secretary of State for Environment, Food and Rural Affaris acting as the UK's DNA has also given approval for the project on behalf of the UK. The letter of approval is attached in Annex 5.

The CDM consultant for the Zhangbei Manjing Windfarm Project is IT Power. The transaction advisor is Natsource Europe.

Please see Annex 1 for detailed contact information.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

>>

A.4.1.1. Host Party(ies):

>>

People's Republic of China

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

>>

Hebei Province

A.4.1.3. City/Town/Community etc:

>>

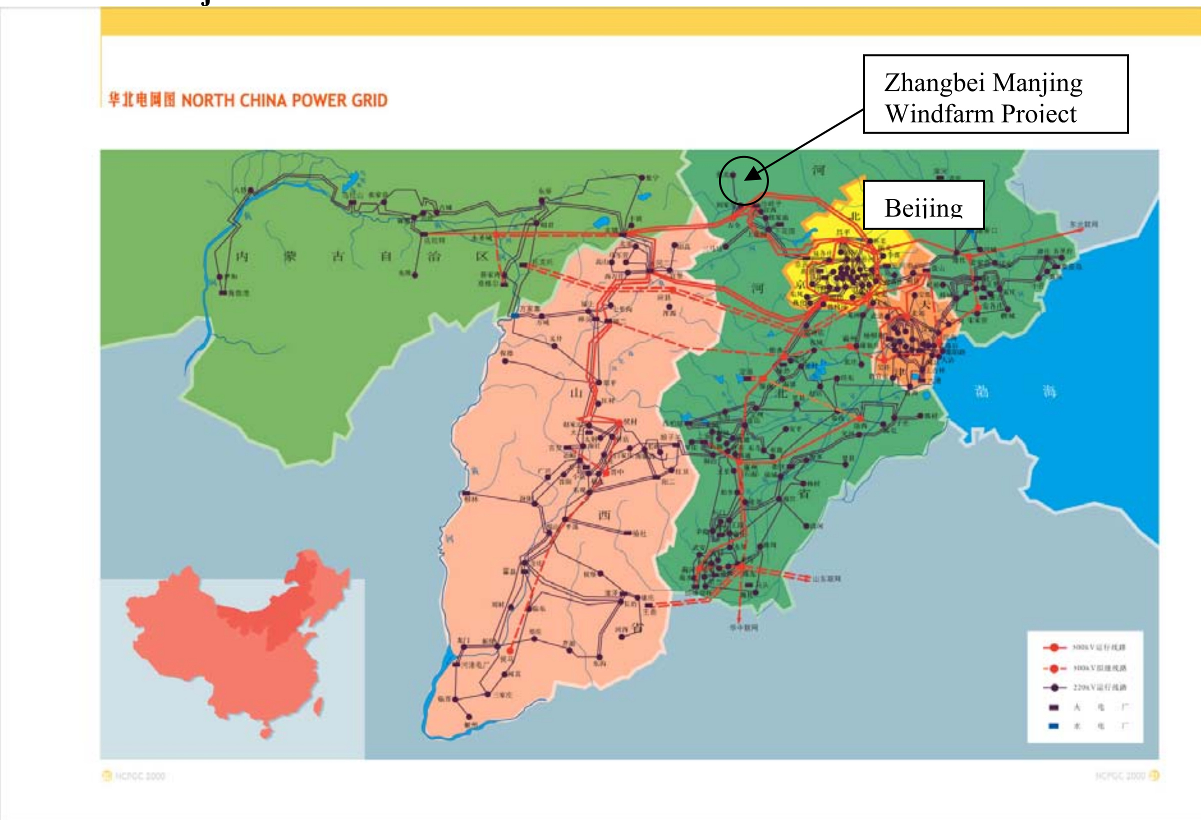
Zhangbei County

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

>>

The windfarm is sited near Manjing village, in the west of Zhangbei County, Hebei Province, in the People's Republic of China. Zhangbei lies in northeast of Hebei Province, southeast of Mongolia Plateau and outside the original Great Wall. The elevation at the site is 1,400–1,800m. The geographical co-ordinates are: longitude 114º32', and northern latitude 41º08'. The site is 220km from Beijing. Figure 1 shows the location of Zhangbei Manjing Windfarm Project in relation to the North China Power Grid. Hebei Province is represented by the darker green area.

Figure 1 Map of the North China Power Grid showing the location of Zhangbei Manjing Windfarm Project



The site will be linked to the 220kV Zhangbei substation via a 110kV transmission line and a 110kV substation which will be newly-built to support the windfarm development. Each turbine will have a 690V to 35kV transformer, which will be linked to a newly built on-site 110kV substation.

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

>>

Using the agreed methodology AM0005 the category of the project activity is:

- Sectoral scope 1: Energy industries

- Category: Renewable electricity generation in grid connected applications

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

>>

The 1,500kW turbine supplier (GE 1.5sle) was selected through competitive bidding, following the invitation to tender that was released in October 2004. The purchase contract has been signed in March of 2005. Site preparation started in anticipation of CDM registration and entry into force of the Kyoto Protocol in early 2005. The 1,500kW turbines are significantly larger than the average turbines currently used in China, which was 544 kW at the end of 2003.[2]

Construction will be managed by the Zhangbei Guotou Windfarm Company in conjunction with GE, the wind turbine manufacturer. Operation of the windfarm during the first two years will be undertaken by the wind turbine manufacturers, during which time there will be on-the-job-training for staff of the Zhangbei Guotou Windfarm Company. The company will then take over responsibility for operation and management of the wind farm. It is planned that the Zhangbei Manjing Windfarm Project will be operational for a minimum of 21 years.

Completion of the project will significantly improve the capacity of Zhangbei Guotou Windfarm Company to install, operate and maintain state-of-the-art wind turbine technology in China. This project will be one of the first projects utilising turbines with a capacity exceeding 1MW in China.

A.4.4. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed CDM project activity, including why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances:

>>

The project activity mainly reduces carbon dioxide (CO_2) through substitution of the grid electricity generated by fossil fuel power plant by renewable electricity. Grid electricity in the North China Power Grid is largely generated by coal-fired power plants, while the Zhangbei Manjing Windfarm Project generates electricity with no emissions. It is estimated that the project would generate about 108GWh(net) each year.

The project participants propose to use the approved baseline methodology AM0005 “baseline methodology (barrier analysis, baseline scenario development and baseline emission rate, using combined margin) for small grid-connected zero-emissions renewable electricity generation”, which is based on the El Gallo Hydroelectric Project (Mexico). The application of this methodology is described in detail in Section B.

The project is additional and therefore not the baseline scenario, because:

1) The project faces financial and technical barriers to its implementation.

---

[2] Personal communication, Mr Shi Pengfei, VicePresident of the Chinese Wind Energy Association.

2) The project faces barriers as the costs per kW installed for the windfarm are higher than the typical fossil fuel fired power stations which are being considered for the North China Power Grid.
3) The transaction costs are significantly higher for a relatively small renewables project as compared to conventional fossil fuel projects.
4) Wind power currently provides less than 0.1% of the generation capacity of the North China Power Grid, with conventional generation still being responsible for the majority of new capacity installation.

A.4.4.1. Estimated amount of emission reductions over the chosen crediting period:

>>

Applying the proposed methodology to the Zhangbei Manjing Windfarm Project, operating in the North China Power Grid, will generate an ex-ante estimated average annual emission reduction of 94,095 tCO_2e/year, and 658,662 tCO_2e over the first seven-year crediting period of the project 2006–2012, and 2,028,534 tCO_2e over a 21-year crediting period. However, the methodology prescribes monitoring of the variables determining the emissions factor ex-post, which is likely to influence the total emission reductions achieved.

Table 1 Zhangbei Manjing Windfarm Project estimated emission reductions

Period*	Estimated net generation (GWh)	Estimated emissions factor (tCO_2e/MWh)	Estimated emission reductions (tCO_2e)
2006	79	0.906	71,574
2007	108	0.906	97,848
2008	108	0.906	97,848
2009	108	0.906	97,848
2010	108	0.906	97,848
2011	108	0.906	97,848
2012	108	0.906	97,848
Total first 7-year period (2006-2012)	727	0.906	658,662
Total number of crediting years in the first crediting period (years)			7
Annual average over the 7-year crediting period	104	0.906	94,095

*Notes: * Using calendar years from 1 January to 31 December.*

In each year the amount of CERs actually generated by the project will vary depending on the metered net generation of the Zhangbei Manjing Windfarm Project and the appropriate CO_2 emission factor. This emission factor is computed ex-post from the latest official information on the North China Power Grid as outlined in Section B, as per AM0005.

A.4.5. Public funding of the project activity:

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

SECTION B. Application of a baseline methodology

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

>>
The project participants propose to use the approved baseline methodology AM0005 (version 1) "baseline methodology (barrier analysis, baseline scenario development and baseline emission rate, using combined margin) for small grid-connected zero-emissions renewable electricity generation", which is based on the El Gallo Hydroelectric Project (Mexico).

B.1.1. Justification of the choice of the methodology and why it is applicable to the project activity:

>>
Applying AM0005 to the Zhangbei Manjing Windfarm Project is justified because:

- The Zhangbei Manjing Windfarm Project matches the applicability criteria defined in the AM0005.
- There is sufficient proof that renewable energy projects in China are similarly disadvantaged to the El Gallo project because of the barriers and lack of effective support policies when compared with traditional energy sources, despite China's recent (after the decision to start this project was made) adoption of new renewable promotion policies.
- The Zhangbei project has also faced financial and investment barriers for which the project developer has sought a variety of means to overcome.
- The Zhangbei project faces additional technological, operational and institutional barriers that need to be overcome.

Using the applicability criteria of AM0005, including the additional conditions defined by the EB, the methodology is applicable to the Zhangbei Manjing Windfarm Project because:

A. Sufficient information exists to demonstrate in a transparent and conservative manner that the Zhangbei Manjing Windfarm Project faces barriers and its registration as a CDM project – and the expected additional income from the CERs – is helping it to overcome these barriers.

B. Sufficient information exists to demonstrate in a transparent and conservative manner that the type of activity undertaken in the Zhangbei Manjing Windfarm Project is not common practice in China at the present time.

C. Zhangbei Manjing Windfarm Project will displace grid electricity that would otherwise be provided by the operation and expansion of the generating plant connected to the grid. Data on the North China Power Grid is available and regularly updated.

D. The North China Power Grid is dominated by coal-fired power generation. Generating sources with zero or low operating costs such hydro, geothermal, wind, solar, nuclear, and low cost biomass only account 6.1% of the 53.80 GW capacity of the North China Power Grid.

E. Electricity imports are included in electricity generation data used for calculating and monitoring the baseline emission rate to avoid potential leakage. Currently the imports to the North China Power Grid are very small, representing less than 2% of power consumed on the grid[3] and therefore such imports have a negligible effect on the baseline emission rate. Furthermore the imports are within China and from grids with very similar grid emissions factors.

F. The Zhangbei Manjing Windfarm Project will only lead to a small capacity addition, 45MW, below the EB limit of 60MW for AM0005. The project will have a very small impact on the build and operating margins.

B.2. Description of how the methodology is applied in the context of the project activity:

>>

Approved methodology AM0005 describes the additionality of the project in two steps:
Step 1: Analyse prohibitive barriers to the proposed project

- (a) Identify the relevant barriers to the proposed project activity
- (b) Explain how only the approval and registration of the proposed project as a CDM activity would enable the project to overcome the identified barriers and thus be undertaken

Step 2: Analyse other activities similar to the proposed project

These steps are very similar to the steps described in the Executive Board's "Tool for the demonstration and assessment of additionailty" in Annex 1 to the EB 16 Report. Below we will follow AM0005.

The additionality of the Zhangbei Manjing Windfarm Project is established based on a barrier analysis. Relevant arguments are presented both in the specific context of the Zhangbei Manjing Windfarm Project (Step 1) and in the general context of the North China Power Grid in which the Zhangbei Manjing Windfarm Project will be operating (Step 2).

The second part of the approved methodology AM0005, is the calculation of the baseline emissions. This is presented here as Step 3, and further justified in Section B.3

The initial works for the project will start imminently, and the tender for the actual wind turbines was completed in December 2004, after initial CDM work, including the first drafts of this

[3] China Electric power Yearbook 2003 p122 gives the imports as only 1.17%.

document, had started. The windfarm is expected to be commissioned on 1 January 2006, which is also the proposed start of the crediting period. However, on this day only half of the windfarm will be commissioned, with the second set of 15 turbines commissioned on 1 July 2006.

Step 1: Analyse prohibitive barriers to the proposed project

This methodology establishes that barriers would have prevented the project from being undertaken or completed (Sub-step 1(a)), and to demonstrate that by registering the project as a CDM activity these barriers are alleviated and the project enabled (Sub-step 1(b)). Being a registered CDM project activity, and by negotiating a CER purchase agreement, has both financial and institutional benefits that affect the viability of the project.

Sub-step 1(a): Identify the relevant barriers to the proposed project activity

The primary relevant barriers to the project are:
- Investment barriers
- Technological barriers
- Tariff barriers
- Transaction cost barriers

Investment barriers

Wind power development in China has been supported by government preferential tariff policies. However, even with such support, the developer of Zhangbei Manjing Windfarm Project realised CDM funds would be needed to make the project an attractive investment due to difficulty of the investment environment for renewables in China. Therefore the developer started the CDM process aiming to obtain the additional CDM funding to secure the project.

The feasibility study for a windfarm at Manjing, the Zhangbei Manjing Windfarm Project, was approved by the Development and Reform Commission of Hebei Province on 3 August 2004. The Commission's official review documentation of this project highlights the role of CDM in securing the smooth implementation and operation of Zhangbei Manjing Windfarm Project. Other inter-company documentation also exists which highlights the role of CDM in securing additional income.

The CDM will also allow the company to mitigate foreign exchange risks associated with the purchase of equipment from abroad. Furthermore the CDM revenues would help the company finance the local elements of site works as commodity prices in China have increased dramatically in recent years.

Technology Barriers

The technology risks associated with wind power in China are high due to the fact that this technology is foreign made and highly advanced. Therefore, windfarm operators would need to maintain larger operation and maintenance reserves for such eventualities. The seriousness of this problem is also evidenced by several significant donor programmes to improve capacity factors at windfarms in China. All of these problems lead to an increased perception of risk from financiers and makes it more difficult to attract financing.

Additionally, the developer is facing the barrier that this is the first in Hebei Province, and one of the first projects in the whole of China to use state-of-the-art wind turbines with a capacity exceeding 1MW. This increases the risks of the project inherent in it being such a "first".

Tariff Barriers

The windfarm project is not the least cost option for capacity expansion in the North China Power Grid. There is an abundance of large supplies of cheap coal and considerable new coal fired generation being constructed. As a result, the generation tariffs are low. Even though the feed-in tariff that the windfarm receives is higher than the generation tariffs, it is capped at a relatively low level. Because the gap between the low generation tariff and feed-in tariff is relatively big, it is difficult and costly for the local pricing bureaux and local grids to approve wind powered generation projects. This, therefore, creates considerable financing risk as the feed-in tariff could be declined, despite the recently adopted Renewable Energy Law. Thus the CDM will assist the project activity to overcome these tariff barriers and further spur the development of wind power in China.

Transaction Costs

Being a small facility with a maximum output of 45MW and intermittent dispatch, Zhangbei Manjing Windfarm Project faces the barrier of project development costs and transaction costs for financing that are disproportionately high, as is often the case for low-capacity renewable projects.

Sub-step 1 (b): Explain how only the approval and registration of the proposed project as a CDM activity would enable the project to overcome the identified barriers and thus be undertaken

Carrying out the Zhangbei Manjing Windfarm Project as a CDM project will clearly help the project developer overcome the barriers listed in Sub-step 1(a). Firstly, provided the project is registered and approved by the Executive Board, a CER purchase contract will greatly improve the cash flow and debt service ratio of the project. The hard-currency income will lower the considerable foreign exchange risks for the purchase of the wind turbines and help overcome the high development costs of the windfarm, which have been further increased by the rise in commodity prices in China recently (e.g. for steel and concrete for the site preparation). If the

project is not formally approved and registered as a CDM activity, then the project developer foresees the following impacts:

- The investment criterion of Beijing Guotou Energy Conservation Company is that the whole investment IRR is no less than 8.5%. According to the feasibility study of the Zhangbei Manjing wind farm project, if the project would received the tariff now being discussed, 0.653 RMB/kWh (including tax), for the full project lifetime the investment IRR would be 7.39%. However, according to BJGT and the local price bureau who are discussing the tariff, to get 0.653 RMB/kWh approved again, every year is difficult. Furthermore, other projects of BJGT have higher IRR, for instance, container inspection system project has the whole investment IRR about 15%. However, BJGT chose to proceed with Zhangbei Manjing wind farm project as one of their first two wind farm projects because the potential additional income from the CDM would increase the IRR significantly to 8.76% and this will meet the investment hurdle rate of BJGT. This indicates that, without support from CER revenue, the project will not meet their investment principle.

- The CER revenue represents a significant source of revenue for the project. Without this revenue the debt service coverage ratio of the project will be impaired, potentially leading to a cash flow crisis in the company and the closing of the project, with the resulting loss in emission reductions. Indeed, when the developer secured the loan from the Construction Bank of China, securing carbon finance was important in assisting the loan application.

- The Project Developer will use the CDM revenues as a reserve for the operation and maintenance of the new 1.5MW turbines, one of the first 1MW-plus turbines to be installed in the North China Power Grid service area and the largest such installation in China. This will help to ensure their maximum availability, and maximise their operation and contribution of CERs.

- The CDM revenues are the only income the Project Developers will receive in ‘hard currency’ and are the only hedge for the foreign exchange risks that are being incurred for the purchase of the foreign equipment. Failure to secure the CDM money will place a strain on the company’s finances, which may adversely affect the subsequent operation of the turbines.

Step 2: Analyse other activities similar to the proposed project

In order to test whether a credible claim can be made that there are real, prohibitive barriers to development of projects such as Zhangbei Manjing Windfarm Project, it is necessary to investigate the current state of wind farm development in Hebei Province, the North China Power Grid and China in general.

International development aid, e.g. from the World Bank, Asian Development Bank, and KfW, as well as government tariff support have been used in China since 1993 to stimulate the wind power industry in the country and demonstrate the feasibility of windfarms. However, despite ten years of support, the industry is still in a nascent stage and only a tiny percentage of the

potential has been successfully developed. Indeed, since 2001, new large windfarms or large extensions[4] have effectively stalled. Table 2 below shows the installed wind power capacity in the whole of China, and shows that capacity is growing slowly. Table 3 below lists the additions in 2003 by windfarm and shows that additions have nearly all been small.

Table 2 Installed capacity of windfarms in China (1993–2003)

Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Installed (MW)	10.5	14.8	6.8	21.4	109.2	56.9	44.7	77.7	57.2	66.9	98.3
Cumulative (MW)	14.5	29	36	58	167	224	268	346	403	469	567

Source: Website of Chinese Wind Energy Association, see www.cwea.org.cn/tech/price.htm.

Table 3 Windfarm Development in China in 2003

Name	Province	Installed (MW)	Turbine size (MW)	Total size (MW)
Dabancheng No.1	Xinjiang	6.3	0.63	18.4
Dabancheng No.2	Xinjiang	7.5	0.75	82.8
Yumen	Gansu	5.4	0.60	21.6
Helan	Ningxia	10.2	0.85	10.2
Shanwei	Guangdong	6.6	0.66	16.5
Fengxian	Shanghai	3.4	0.85	3.4
Kangping	Liaoning	10.2	0.85	10.2
Zhangwu	Liaoning	10.2	0.85	10.2
Dachangshan	Liaoning	3.6	0.60	3.6
Changdao	Shandong	2.7	0.68	8.1
Jimo	Shandong	16.1	1.15	16.4
Qixia	Shandong	0.5	0.25	0.5
Mulan	Heilongjiang	3.6	0.60	3.6
Keshiketeng	Inner Mongolia	10.2	0.60	30.6
Xilin	Inner Mongolia	1.8	0.60	4.8
Total		**98.3**	**0.75**	**240.9**

Note: Some of these projects are also applying for CDM registration.
Source: Website of Chinese Wind Energy Association, see www.cwea.org.cn/tech/price.htm.

As Table 3 shows, only fifteen projects added windfarm capacity in the year 2003 in the whole of China, none in the province of Hebei. The Jimo project in the Shandong Province is the only project utilising 1MW-plus capacity turbines, and is the only project (extension) exceeding 15MW capacity additions in 2003 – but only just. So it is clear that significant barriers to the development of large-scale wind farms in China, and to projects in the North China Power Grid, exist. The average size of the 2003 projects was 6.7MW, and the average size of the turbines

[4] Using "large" as meaning over the CDM limit for small-scale projects: 15MWe.

used was only 750kW. Some of the projects mentioned above are also applying for CDM registration to overcome the various barriers faced.

The Zhangbei Manjing Windfarm Project is nearly 3 times as big as the largest windfarm capacity addition in China in 2003, and it will use larger size, imported turbines (1.5MW per unit). This is a marked contrast to the other windfarm developments in China in 2003, which tended to be small extensions using locally made equipment.

Additionally, the windfarm at Zhangbei is also being developed in an area of lower capacity to pay and a high generating capacity relative to other provinces. Hebei Province does not currently have to import electricity. This is a crucial factor considering the current policy environment where local grids must be able to afford the delivered electricity.

The reasons for the stalling of new windfarm development are twofold:

- Firstly, up to 2000-1, the tariff burden of the increased cost of wind power generation had been placed on the local grid which had to foot the bill for the acceptance of local RE generation under a 1996 Ministry of Electric Power guideline. However, with the corporatisation of the Ministry of Electric Power and the provincial power bureaux from 1998 to 2000 there was increasing pressure to pass the cost of renewables on to the end user. The local pricing bureaux, including in Hebei Province, resisted this and preferred only a relatively small amount of renewables as there are plentiful supplies of cheap coal and associated coal fired generation plant which also supports significant local employment and keeps energy costs to industry and residential users low.

- Secondly, the power sector is under reform. This has meant that long-term Power Purchase Agreements do not include long-term agreed prices. The Power Purchase Agreements rely on tariff setting by the local pricing bureau and grid company, with the tariff being adjusted when the circumstances change. Without long-term agreed prices and with the technology risk it is difficult for financial institutions to extend project finance loans for projects and renewables pioneers therefore need to resort to balance sheet financing which limits their ability to develop projects without securing acceptable tariffs or additional funding from CDM. For example, in 1998, World Bank planned to build 50 MW wind farm in Zhangbei. But the project failed to be implemented finally because the feed-in tariff could not be agreed.

Wind power is not the least cost option for electricity generation in China. This is unlikely to change for the foreseeable future and this will pose significant barriers to investment for wind power projects in China. Renewable Energy Law was approved on 28 February 2005. It *may* give support to wind power development from 2006 onwards. However, generally speaking, the Law only provides principles and guidance but lack of detailed regulation, according to the Law, relevant government departments need to formulate related measures to make the Law can be carried out. Renewable Energy Law enforcement in China may still have many difficulties.

Additionally, a concession programme exists for windfarms with a capacity of more than 100MW. The contracts under this concession provide long-term guaranteed prices. However,

these prices are very low and these projects may require additional financing, for example through the CDM, to become feasible.

In view of the uncertainty with respect to stable and long-term feed in tariffs, as well as how these costs are allocated amongst stakeholders the development of wind power projects in Hebei is uncertain. As the project is relatively small compared to the fossil fuel-fired grid additions, and it generates only a modest amount of electricity, the immediate impact on the development of the Hebei power sector is negligible. However, the project's technology diffusing benefits may have a positive influence on further large-scale windfarm developments.

The above additionality analysis provides clear evidence that the registration and approval as a CDM project activity allows the Zhangbei Manjing Windfarm Project to overcome barriers that are currently proving prohibitive to the development of large windfarms (>15MW) in China, and in particular the North China Power Grid, while these barriers do not exist for conventional coal-fired power plants.

Step 3: Calculation of the baseline emissions for the proposed project activity

The project activity mainly reduces carbon dioxide (CO_2) through substitution of the grid electricity generated by fossil fuel power plant by renewable electricity. The project activity, being a renewable energy project does not cause methane (CH_4) and nitrous oxide (N_2O) emissions. Emissions of CH_4 and N_2O will be relatively small for the generating plant on the grid, as compared with the CO_2 emissions. It is therefore conservative not to add emission reductions associated with these gasses to the total reductions achieved by the project.

The emission reductions ERy by the project activity during a given year y is

ERy = EGy * EFy

where EGy is the net electricity supplied to the grid, EFy is the CO_2 emission factor of the grid as calculated below.

The emission factor EFy of the grid is represented as a combination of the Operating Margin and the Build Margin. If we set the emission factor of associated method as EF_OMy and EF_BMy, the EFy is given by

EFy = wOM * EF_OMy + wBM * EF_BMy

with respective weight factors wOM and wBM (where wOM + wBM = 1), and by default, are weighted equally (wOM = wBM = 0.5).

The Operating Margin emission factor EF_OMy is defined as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, excluding zero- or low-operating cost power plants (hydro, geothermal, wind, low-cost biomass,

nuclear and solar generation), based on the latest year for which statistics data is available . In any given year y the following equation is used:

$EF\_OMy = TEMy / TGENy = [\Sigma_i Fi,y*COEFi] / [\Sigma_j GENj,y]$

Where TEMy and TGENy is the total GHG emissions and electricity generation supplied to the grid by the power plants connected to the grid excluding zero- or low-operating cost sources. Fi,y and COEFi are the fuel consumption and associated carbon coefficient of the fossil fuel i consumed in the grid. GENj,y is the electricity generation at the plant j connected to the grid excluding zero- or low-operating cost sources. The calculation can also be made from the share of generation from each fuel multiplied by the emissions coefficient for that fuel. The China Energy Statistical Yearbook and China Electric Power Yearbook present these data annually.

The Build Margin emission factor EF_BMy is given as the weighted average emission factor of the selected representative set of recent power plants represented by the 5 most recent plants or the most recent 20% of the generating units built. Given the size of the North China Power Grid and the rate of plant additions to the grid (significantly more than 5 per year), the most recent 20% of additional units is chosen as this would represent a greater, more representative sub-set of generation.

However, because of the limited availability of publicly available data, the most recent 20% of additions is calculated from the China Electric Power Yearbook by comparing installed capacity in historic years. Given high electricity demand growth and frequent supply shortages in China, it is reasonably accurate to assume that the additional generation will be derived from newly added plant. This is of course not absolutely accurate, but the large number of plants on the North China Power Grid any annual variations on a plant level are smoothed out and will have an insignificant effect on the build margin calculated.

The procedure to be used for calculating the conservative build margin using the most recent additional capacity follows the three steps below:

- Using the latest statistical data available (from the China Electric Power Yearbook) determine the two years with added generation capacity closest to 20% (below and above 20%).
- Calculate the Build Margin for both these years.
- Adopt the lowest, i.e. most conservative, BM.

For the latest year available, the build margin is calculated from the additional generation capacity in the last 4 years:

$EF\_BMy = \Sigma i\ Si,y*CEFi$

Where Si is the share in added generation from technology/fuel i for year y, and CEFi the CO2 emission factor for technology/fuel i. The CEF represents the best available technology in the North China Power Grid. The calculation is made for the two years closest to 20% additional capacity.

According to AM0005 if the grid imports or exports electricity from/to other grids, a correction of the emissions factor made be required. However, with regards to the North China Power Grid, such corrections for imports and exports would be negligible, as the other grids surrounding the North China Power Grid have very similar emissions factors, and power flows between these interconnected grids are very limited, less than 2% in the latest year for which data is available in the China Electric Power Yearbook.

Table 4. Data variables for the baseline determination

Description	Value	Unit	Source
Projected coal consumption for power generation in 2010	320	Grammes of standard coal per kWh	Tsinghua University published on the NC4 website
Energy content of standard coal	29.27	MJ per tonne of standard coal	General Code for Comprehensive Energy Consumption Calculation (GB2589-81)
Carbon emission factor	0.0258	tC/MJ	IPCC
Oxidation rate coal	98	%	IPCC
Oxidation rate oil	99	%	IPCC
Oxidation rate gas	99.5	%	IPCC

B.3. 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:

>>

The project activity mainly reduces carbon dioxide (CO_2) through substitution of the grid electricity generated by fossil fuel power plant by renewable electricity. It is conservative not to add emission reductions associated with other greenhouse gasses to the total reductions achieved by the project.

In absence of the registered project activity, electricity would have been generated using existing and newly build capacity, which is highly-coal intensive. The appropriate emissions factor, explained in detail in Step 3 in Section B.2, is calculated from the operating margin and the build margin in the North China Power Grid. The operating margin represents the average emissions all fossil fuel-fired generation, which is displaced. The build margin represents the emissions from average new build capacity, and thus represent what would have been build in stead of the windfarm.

The Operating Margin emission factor EF_OMy is defined as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, excluding zero- or low-operating cost power plants (hydro, geothermal, wind, low-cost biomass, nuclear and solar generation), based on the latest year statistics data. The calculation can also be made from the share of generation from each fuel multiplied by the emissions coefficient for that fuel. The China Energy Statistical Yearbook and China Electric Power Yearbook present these data annually.

The Build Margin emission factor EF_BMy is given as the weighted average emission factor of the selected representative set of recent power plants represented by the 5 most recent plants or the most recent 20% of the generating units built. Given the size of the North China Power Grid and the rate of plant additions to the grid (significantly more than 5 per year), the most recent 20% of additional units is chosen as this would represent a greater, more representative sub-set of generation. The Build Margin is calculated from annual statistical data using the procedure as presented in the previous section B.2, arriving at a conservative Build Margin.

Emission reductions are calculated from the net electricity supplied to the grid, and the appropriate CO_2 emissions factor of the grid to which the windfarm is connected in emissions per unit of electricity output. By monitoring the exact electricity generation by the project, the reductions achieved are also calculated accurately.

According to AM0005 if the grid imports or exports electricity from/to other grids, a correction of the emissions factor made be required. However, with regards to the North China Power Grid, such corrections for imports and exports would be negligible, as the other grids surrounding the North China Power Grid have very similar emissions factors, and power flows between these interconnected grids are very limited, less than 2% in the latest year for which data is available in the China Electric Power Yearbook.

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the project activity:

>>

The project boundary is the Zhangbei Manjing Windfarm Project site and the North China Power Grid. The North China Power Grid is connected to the North East China Grid, but the power flow between these interconnected grids on this line is less than 2% of power consumption and the emissions factors on the grids are very similar, so any corrections are negligible. Imports and exports are monitored, and the grid emission factors will be corrected when net exchanges exceed 5%. The project site includes the turbines themselves and a small amount of auxiliary power that is used to support the turbines operation. In the baseline calculations, the net generation of electricity will be used.

B.5. Details of baseline information, including the date of completion of the baseline study and the name of person (s)/entity (ies) determining the baseline:

>>

Date of completion of the baseline information and submission to DNA and DOE for approval: 04/04/2005. Final version completed: 08/12/2005.

Name of persons determining the baseline:

- Dr John Green, john.green@itpowergroup.com. IT Power Limited, Grove House, Lutyens Close, Chineham, Hampshire, RG24 8AG, UK, Tel: +44 1256 392700.
- Mr Christiaan Vrolijk, christiaan.vrolijk@itpower.co.uk. IT Power Limited, Grove House, Lutyens Close, Chineham, Hampshire, RG24 8AG, UK, Tel: +44 1256 392700.

- Mr.Huang Gengxin, hgx@bjgtec.com. Project Manager of Beijing Guotou Energy Conservation Company, Project Participant, Tel: +86 10 65134431
- Ms Qian Yiwen, qian.yiwen@itpowergroup.com. IT Power China Representative Office, Suite 1211, Air China Plaza, No 36 XiaoYun Lu, Chaoyang District, Beijing, 100027, China, Tel: +86 10 844 75848/9.

Neither IT Power, nor its employees are project participants.

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:

>>
28/07/2004 start of construction

On June 16, 2004, contract with IT Power to develop the project as a CDM project was signed. On August 3, 2004, The Feasibility Study of Zhangbei Manjing Windfarm Project was approved by Government of China (Hebei Provincial DRC).

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

>>
At least 21y-0m.

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:

>>
01/01/2006

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. Application of a monitoring methodology and plan

D.1. Name and reference of approved monitoring methodology applied to the project activity:

>>
The project participants propose to use the approved monitoring methodology AM0005 (version 1) "monitoring methodology for small grid-connected zero-emissions renewable electricity generation", which is based on the El Gallo Hydroelectric Project (Mexico).

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

>>
This methodology is applicable to renewable power generation project activities displacing grid electricity with the conditions as follows:

- The grid to which the project activity is connected is clearly identifiable;
- The grid is not dominated by zero or low-operating cost generating sources, and this fuel mix is expected to persist for the duration of the crediting period;
- The ex-post monitoring of the build margin (in addition to an ex ante estimation) may be used for the calculation of emission reductions for build margin only if the project activity is small compared with the total additions to the grid.

Applying the approved monitoring methodology AM0005 to the Zhangbei Manjing Windfarm Project is justified because:

A. The approved baseline methodology AM0005 is also used.

B. The grid to which the Zhangbei Manjing Windfarm Project is connected is clearly identifiable as the North China Power Grid.

C. The grid is not dominated by zero or low-operating cost generating sources, indeed these sources generate less than 2% of the electricity on this grid. This fuel mix is expected to persist for the duration of the crediting period.

D. The Zhangbei Manjing Windfarm Project is small compared to the total additions to the grid.

D.2. 1. Option 1: Monitoring of the emissions in the project scenario and the baseline scenario

Being a windfarm project, no emissions from the Project Activity were identified, There are therefore no entries in the following Table.

D.2.1.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

D.2.1.2. Description of formulae used to estimate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

>>

Being a windfarm project, no emissions from the Project Activity were identified, there are therefore no formulae included here.

D.2.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

1	*EG: net electricity supplied to the grid by the project*	*Electricity meter*	*MWh*	*m*	*continuous*	*100%*	*electronic*	*Electricity supplied to the grid by the project. The grid company reports its measuring data monthly to the project operator, who can also access the readings remotely. There is a back-up meter which also records electricity supply to the grid and allows readings to be taken remotely.*
2	*EF: CO_2 emissions factor of the grid*	*Calculated*	*tCO_2e/ MWh*	*c*	*yearly*	*100%*	*electronic*	*Calculated as the average of operating margin and build margin (50:50).*
3	*EF_OM: CO_2 emissions factor of the grid (operating margin)*	*Calculated*	*tCO_2e/ MWh*	*c*	*yearly*	*100%*	*electronic*	*Calculated as TEM divided by TGEN, excluding the zero and low operating cost generating sources.*
4	*EF_BM: CO_2 emissions factor of the grid (build margin)*	*Calculated*	*tCO_2e/ MWh*	*c*	*yearly*	*100%*	*electronic*	*Calculated as the build margin in the last few years, which is about 20% additions and the most conservative. First the build margin is calculated for the two years nearest 20% additions (above and below), then the most conservative (lowest) is chosen.*

5	*TEM: total CO_2 emissions of the grid*	*Calculated*	*tCO_2e/y*	*c*	*yearly*	*100%*	*electronic*	*Calculated as the sum of GHG emissions of each plant, using the China Energy Statistical Yearbook.*
6	*TGEN: total electricity generation of the grid excluding zero- or low-operating cost sources*	*Calculated*	*MWh/y*	*c*	*yearly*	*100%*	*electronic*	*Calculated as the sum of generation of each plant, excluding zero- or low-operating cost sources, using the China Electric Power Yearbook.*
7	*F_i: amount of fuel consumed*	*China Energy Statistical Yearbook*	*Physical unit*	*m*	*yearly*	*100%*	*electronic*	*Obtained from the China Energy Statistical Yearbook.*
8	*$COEF_i$: GHG emissions coefficient for fuel*	*China Energy Statistical Yearbook and IPCC*	*tCO_2e/physical unit*	*m*	*yearly*	*100%*	*electronic*	*Obtained from the China Energy StastisticalYearbook and IPCC.*

9	*Si,y: the share in added generation capacity for fuel/technology i*	*China Electric Power Yearbook*	*%*	*m*	*yearly*	*100%*	*electronic*	*Obtained from the latest official statistics. Calculated as share of additions in the years closest to 20% additional capacity.*
10	*CEFi: the CO2 emissions factor of the best available technology in the region for each technology/fuel i*	*Official documents and statistics*	*tCO2e/MWh*	*c*	*yearly*	*100%*	*electronic*	*Calculated from the latest official documents and statistics showing the best available technology available in the various regions in China. If annual updates are not available, the default number as used in the calculations in this document, referring to estimates and projections for 2010 will be used.*
11	*-*	*Documented evidences*	*-*	*-*	*Once at the renewal time of the crediting period*	*100%*	*-*	*Document evidences of the prohibitive barriers to the proposed project activity*

12	*-*	*Documented evidences*	*-*	*-*	*Once at the renewal time of the crediting period*	*100%*	*-*	*Document information related to the alternatives to the project, especially the diffusion data*

D.2.1.4. Description of formulae used to estimate baseline emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

>>

Baseline emissions will be estimated using the formulae provided in the monitoring methodology (AM0005) and listed below.

Baseline emissions are equal to EGy * EFy

where EGy is the net electricity supplied to the grid, EFy is the CO_2 emission factor of the grid as calculated below. The load factor is estimated to be 27.6%, and auxiliary power consumption of the project is estimated ex-ante as 0.2% of projected generation. Net electricity generation is monitored for determining emission reductions of the project. Emission reduction of other greenhouse gases is not estimated, which is more conservative.

The emission factor EFy of the grid is represented as a combination of the Operating Margin and the Build Margin. If we set the emission factor of associated method as EF_OMy and EF_BMy, the EFy is given by

EFy = wOM * EF_OMy + wBM * EF_BMy

with respective weight factors wOM and wBM (where wOM + wBM = 1), and by default, are weighted equally (wOM = wBM = 0.5).

The Operating Margin emission factor EF_OMy is defined as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, excluding zero- or low-operating cost power plants (hydro, geothermal, wind, low-cost biomass, nuclear and solar generation), based on the latest year statistics data and are derived from the following equation:

$EF\_OMy = TEMy / TGENy = [\Sigma_i Fi,y*COEFi] / [\Sigma_j GENj,y]$

Where TEMy and TGENy is the total GHG emissions and electricity generation supplied to the grid by the power plants connected to the grid excluding zero- or low-operating cost sources. Fi,y and COEFi are the fuel consumption and associated carbon coefficient of the fossil fuel i consumed in the grid. GENj,y is the electricity generation at the plant j connected to the grid excluding zero- or low-operating cost sources. The calculation can also be made from the share of generation from each fuel multiplied by the emissions coefficient for that fuel. The China Energy Statistical Yearbook and China Electric Power Yearbook present these data annually.

The Build Margin emission factor EF_BMy is given as the weighted average emission factor of the selected representative set of recent power plants represented by the 5 most recent plants or the most recent 20% of the generating units built. Given the size of the North China Power Grid and the rate of plant additions to the grid (significantly more than 5 per year), the most recent 20% of additional units is chosen as this would represent a greater, more representative sub-set of generation.

However, because of the limited availability of publicly available data, the most recent 20% of additions is calculated from the China Electric Power Yearbook by comparing installed capacity in historic years. Given high electricity demand growth and frequent supply shortages in China, it is reasonably accurate to assume that the additional generation will be derived from newly added plant. This is of course not absolutely accurate, but the large number of plants on the North China Power Grid any annual variations on a plant level are smoothed out and will have an insignificant effect on the build margin calculated.

The procedure to be used for calculating the conservative build margin using the most recent additional capacity follows the three steps described in section B.2 above:

- Using the latest statistical data available (from the China Electric Power Yearbook) determine the two years with added generation closest to 20% (below and above 20%).
  - It can be determined that with regards to the North China Power Grid 17.2% of generation in 2003 was added since 2000; and 20.9% was added since 1999.
- Calculate the Build Margin for both these years.
  - The BM for 2000 to 2003 is 0.862 tCO_2/MWh.
  - The BM for 1999 to 2003 is 0.819 tCO_2/MWh.
- Adopt the lowest, i.e. most conservative, BM.
  - The BM corresponding to exactly most recent 20% of the additions to North China Power Grid will be between 0.819 and 0.862 tCO_2/MWh. To adapt 0.819 tCO_2/MWh as BM will be more conservative.

For the latest year available, the build margin is calculated from the additional generation in the last 4 years:

$EF\_BM_y = \Sigma_i S_{i,y} * CEF_i$

Where S_i is the share in added generation from technology/fuel i for year y, and CEF_i the CO_2 emission factor for technology/fuel i. The CEF represents the best available technology in the North China Power Grid. The calculation is made for the two years closest to 20% additional capacity.

According to AM0005 if the grid imports or exports electricity from/to other grids, a correction of the emissions factor made be required. However, with regards to the North China Power Grid, such corrections for imports and exports would be negligible, as the other grids surrounding the North China Power Grid have very similar emissions factors, and power flows between these interconnected grids are very limited, less than 2% in the latest year for which data is available in the China Electric Power Yearbook. Corrections will be made when net exchanges with other grids exceed 5% of generation ($TGEN_y$) on the North China Power Grid.

D. 2.2. Option 2: Direct monitoring of emission reductions from the project activity (values should be consistent with those in section E).

Not applicable.

D.2.2.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

D.2.2.2. Description of formulae used to calculate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.):

>>

Not applicable.

D.2.3. Treatment of leakage in the monitoring plan

D.2.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project activity

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
13	*ELy: net electricity import and export from/to other grids*	*Calculated*	*MWh*	*c*	*yearly*	*100%*	*Electronic*	*Calculated from 12 and 13.*
14	*ELiny: net electricity import from other grids*	*China Electric Power Yearbook*	*MWh*	*m*	*yearly*	*100%*	*electronic*	*Total imports*
15	*ELouty: net electricit*	*China Electric Power*	*MWh*	*m*	*yearly*	*100%*	*electronic*	*Total exports*

	y export to other grids	*Yearbook*						
16	*EFiny: emissions factor of the grid from which imports take place*	*Calculated*	*tCO2e/ MWh*	*c*	*yearly*	*100%*	*electronic*	*Calculated as 3, using the China Electric Power Yearbook. But only if ELnety exceeds 5% of TGENy, i.e. only if net imports and exports to/from other grids exceed 5% of generation in the North China Power Grid.*
17	*EFouty: emissions factor of the grid to which exports take place*	*Calculated*	*tCO2e/ MWh*	*c*	*yearly*	*100%*	*electronic*	*Calculated as 3, using the China Electric Power Yearbook. But only if ELnety exceeds 5% of TGENy, i.e. only if net imports and exports to/from other grids exceed 5% of generation in the North China Power Grid.*

D.2.3.2. Description of formulae used to estimate leakage (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

>>

Indirect emissions can result from project construction, transportation of materials and other upstream activities. In the case of the proposed Project, these emissions are thought to be comparable or less to the life cycle emissions, which would result from the eventual construction and operation of alternative capacity. The life cycle emissions of alternative power generation plants, in particular fossil fuel plants, are typically higher than from wind power plants, certainly when including emissions due to mining, refining and transportation of fossil fuel. The project does not claim emissions reductions from these activities. Therefore no leakage is identified and no data will be collected.

The project targets only CO_2 emissions and will not claim the reductions of other GHGs included in Annex A of the Kyoto Protocol. The Project has also not been identified as a source of emissions of any of these GHGs.

D.2.4. Description of formulae used to estimate emission reductions for the project activity (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

>>

The emission reductions ERy by the project activity during a given year y is

ERy = EGy * EFy

where EGy is the net electricity supplied to the grid, EFy is the CO_2 emission factor of the grid as calculated above.

D.3. Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored		
Data *(Indicate table and ID number e.g. 3.-1.; 3.2.)*	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
1	*Low*	*These data will be directly used for calculation of emission reductions. The same meter readings will be used for sales to the grid; this main meter is owned by the grid company. The back-up meter is owned by the project developer, and if disparity exist between the two meters the cause needs to be identified and rectified. Procedures are further described in Annex 4.*
Other	*Low*	*Official government statistics from the China Electric Power Yearbook are used.*

D.4 Please describe the operational and management structure that the project operator will implement in order to monitor emission reductions and any leakage effects, generated by the project activity

>>

The net output from Zhangbei Manjing Windfarm Project is monitored and recorded using two meters. These meters are used for both CDM purposes and sales of the electricity generated to the grid company. The main meter is owned by the grid company, the back-up meter is owned by the project proponent. Meter readings are available remotely to both the grid company and the wind farm operator, and are presented monthly by the grid company to the operator.

The monitoring protocol is presented in Annex 4.

D.5 Name of person/entity determining the monitoring methodology:

>>
Date of completion of the monitoring information and submission to DNA and DOE: 04/04/2005.
Final version completed: 08/12/2005.

Name of persons determining the baseline:

- Dr John Green, john.green@itpowergroup.com. IT Power Limited, Grove House, Lutyens Close, Chineham, Hampshire, RG24 8AG, UK, Tel: +44 1256 392700.
- Mr Christiaan Vrolijk, christiaan.vrolijk@itpower.co.uk. IT Power Limited, Grove House, Lutyens Close, Chineham, Hampshire, RG24 8AG, UK, Tel: +44 1256 392700.
- Mr.Huang Gengxin, hgx@bjgtec.com. Project Manager of Beijing Guotou Energy Conservation Company, Project Participant, Tel: +86 10 65134431
- Ms Qian Yiwen, qian.yiwen@itpowergroup.com. IT Power China Representative Office, Suite 1211, Air China Plaza, No 36 XiaoYun Lu, Chaoyang District, Beijing, 100027, China, Tel: +86 10 844 75848/9.

Neither IT Power, nor its employees are project participants.

SECTION E. Estimation of GHG emissions by sources

E.1. Estimate of GHG emissions by sources:

>>

There are no emissions from the Zhangbei Manjing Windfarm Project, which is a renewable energy project. Auxiliary energy use for the operation of the plant is netted out from the generation of the electricity from the plant itself.

Therefore, Option 2 was chosen in Section D: direct monitoring of the emission reductions.

E.2. Estimated leakage:

>>

As explained in section D2.3.3 the leakage from the project is considered zero.

Indirect emissions can result from project construction, transportation of materials and other upstream activities. In the case of the proposed Project, these emissions are thought to be comparable or less to the life cycle emissions which would result from the eventual construction and operation of alternative capacity. The life cycle emissions of alternative power generation plants, in particular fossil fuel plants, are typically higher than from wind power plants, certainly when including emissions due to mining, refining and transportation of fossil fuel. The project does not claim emissions reductions from these activities. Therefore no leakage is identified and no data will be collected.

The project targets only CO_2 emissions and will not claim the reductions of other GHGs included in Annex A of the Kyoto Protocol. The Project has also not been identified as a source of emissions of any of these GHGs.

E.3. The sum of E.1 and E.2 representing the project activity emissions:

>>

The sum of E1 and E2 is zero.

E.4. Estimated anthropogenic emissions by sources of greenhouse gases of the baseline:

>>

The baseline emissions are calculated using the formulae from AM0005, and are equivalent to the resulting emission reductions as the emissions from the project itself are zero. Option 2 was chosen in Section D, to monitor the emission reductions directly.

The baseline emissions (BE) are equivalent to the net electricity generated (EG) by the project activity, multiplied by the appropriate emissions factor (EF) for the project. The emissions factor is the equally weighted combination of the operating margin and build margin.

The baseline emissions BEy by the project activity during a given year y is

BEy = EGy * EFy

where EGy is the net electricity supplied to the grid, EFy is the CO_2 emission factor of the grid as calculated below. Emission reduction of other greenhouse gases is not estimated, which is more conservative.

The project site has an excellent wind resource, which has been monitored prior to the initiation of the project. From the wind data gathered it is estimated that a load factor of 27.6% will be achieved. This would lead to a gross electricity generation by the 45MWe windfarm project of 108.8 GWh annually. Auxiliary power consumption of the project is estimated ex-ante as about 0.2%. Annual net generation, therefore, is estimated at 108.0 GWh. Net electricity generation is monitored for determining emission reductions of the project.

The emission factor EFy of the grid is the equally weighted average of the Operating Margin and the Build Margin. The Operating Margin emission factor EF_OMy is defined as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, excluding zero- or low-operating cost power plants (hydro, geothermal, wind, low-cost biomass, nuclear and solar generation), based on the latest year statistics data and are derived from the following equation:

$$EF\_OMy = TEMy / TGENy = [\Sigma_i Fi,y*COEFi] / [\Sigma_j GENj,y]$$

Where TEMy and TGENy is the total GHG emissions and electricity generation supplied to the grid by the power plants connected to the grid excluding zero- or low-operating cost sources. Fi,y and COEFi are the fuel consumption and associated carbon coefficient of the fossil fuel i consumed in the grid. GENj,y is the electricity generation at the plant j connected to the grid excluding zero- or low-operating cost sources. The calculation can also be made from the share of generation from each fuel multiplied by the emissions coefficient for that fuel. The China Energy Statistical Yearbook and China Electric Power Yearbook present these data annually. Table 5 below presents the data for the latest year available.

Table 5 Operating margin data for the North China Power Grid

Fuel types	Unit	Fuel consumption in the NCPG*	Emission factor** (tc/TJ)	Oxidation rate*** (%)	Average net caloric value**** (MJ/t,m3,tce)	CO2 emission (tCO2e)	Generation in the NCPG***** (MWh)	**OM emission factor (tCO2e/MWh)**
		A	B	C	D	E=A*B*C*D*44/12/100	F	*G*
Raw coal	Mtons	157.2794	26.8	98	20908	316677083		
Cleaned coal	Mtons	0	26.8	98	26344	0		
Other washed coal	Mtons	2.818	26.8	98	8363	2269527		
Coke oven gas	$10^{10}m^3$	0.0306	13	99.5	16726	24275		
Other coal	$10^{10}m^3$	0.3787	13	99.5	5227	93883		

gas								
Crude oil	Mtons	0	20	99	41816	0		
Diesel	Mtons	0.0855	20.2	99	42652	267401		
Fuel oil	Mtons	0.1573	21.1	99	41816	503802		
LPG	Mtons	0	17.2	99.5	50179	0		
Refinery gas	Mtons	0.0027	18.2	99.5	46055	8257		
Natural gas	$10^{10}m^3$	0.005	15.3	99.5	38931	10866		
Other energy	Mtons-sce	0.0983	0		29271.2	0		
Coke	Mtons	0.028	25.8	98	28435	73812		
					Total	319928905	322088000	0.993

Source: China Energy Statistical Yearbook 2004, page 146-165.
*Note: * Fuel consumption for thermal power generation in the North China Power Grid is obtained from page 146-165, China Energy Statistical Yearbook 2004. ** Emission factors for various fuels are obtained from the Revised 1996 IPCC Guidelines. *** Oxidation rate for various fuels are obtained from the Revised 1996 IPCC Guidelines. **** Average net caloric values for various fuels are obtained from page 302, China Energy Statistical Yearbook 2004. ***** Generation in the North China Power Grid is obtained from page 709, China Electric Power Yearbook 2004.*

The operating margin is thus equivalent to the emissions coefficient of coal-fired power plant, 0.993tCO_2e/MWh.

The Build Margin emission factor EF_BMy is given as the weighted average emission factor of the selected representative set of recent power plants represented by the 5 most recent plants or the most recent 20% of the generating units built. Given the size of the North China Power Grid and the rate of plant additions to the grid (significantly more than 5 per year), the most recent 20% of additional units is chosen as this would represent a greater, more representative sub-set of generation.

However, because of the limited availability of publicly available data, the most recent 20% of additions is calculated from the China Electric Power Yearbook by comparing installed capacity in historic years. Given high electricity demand growth and frequent supply shortages in China, it is reasonably accurate to assume that the additional generation will be derived from newly added plant. This is of course not absolutely accurate, but the large number of plants on the North China Power Grid any annual variations on a plant level are smoothed out and will have an insignificant effect on the build margin calculated.

The procedure to be used for calculating the conservative build margin using the most recent additional capacity follows the three steps below:

- Using the latest statistical data available (from the China Electric Power Yearbook) determine the two years with added generation closest to 20% (below and above 20%).
  - It can be determined that with regards to the North China Power Grid 17.2% of generation in 2003 was added since 2000; and 20.9% was added since 1999.
- Calculate the Build Margin for both these years.

- — The BM for 2000 to 2003 is 0.862 tCO_2/MWh.
- — The BM for 1999 to 2003 is 0.819 tCO_2/MWh.
- Adopt the lowest, i.e. most conservative, BM.
  - — The BM corresponding to exactly most recent 20% of the additions to North China Power Grid will be between 0.819 and 0.862 tCO_2/MWh. To adapt 0.819 tCO_2/MWh as BM will be more conservative.

For the latest year available, the build margin is calculated from the additional generation in the last 4 years:

$EF\_BMy = \Sigma_i$ Si,y*CEFi

Where Si is the share in added generation from technology/fuel I for year y, and CEFi the CO2 emission factor for technology/fuel i. The CEF represents the best available technology in the North China Power Grid. The calculation is made for the two years closest to 20% additional capacity. All generation capacity additions include new build zero- and low-operating cost sources. Table 6 below presents the data for the latest year available.

Table 6 Build margin data for the North China Power Grid

	A	B	C	D	E	F
Source	Installed capacity in 1999 (MW)	Installed capacity in 2003 (MW)	Added capacity (MW)	Share of added capacity (%)	Emissions coefficient (tCO2e/MWh)	D * E
Hydro	2,631	3,215	584	4.9	0	0
Coal	42,329	53,512	11,183	94.3	0.868*	0.819
Nuclear	0	0	0		0	0
Gas	0	0	0		0.333**	0
Other (wind)	0	90.1	90.1	0.8	0	0
Total	**44,960**	**56,818**	**11,858**	**100**		**0.819**

Source: China Electric Power Yearbook, pages 666 (2000 edition) and 709 (2004 edition).
Note: The emissions coefficients are calculated from standard coal consumption of power generation in National Study of China Climate Change (published by Tsinghua University Publication House) which gives the coal consumption trend in 2010 as 320 grams of standard coal per kWh（from latest China Electricity Year Book 2004 edition, gives standard coal consumption of power generation as 350g/kwh in North China Power Grid, so to adopt the value of 320g/kWh is more conservative）. General Code for Comprehensive Energy Consumption Calculation (GB2589-81) gives the net caloric value of national standard coal as 0.02927 TJ/tonne of coal. The carbon emission factor for coal is taken from the Revised 1996 IPCC Guidelines giving 25.8 tC/TJ. Multiplying these gives a carbon content as 0.241tC/MWh. Considering oxidation factor as 98% (conservative value),carbon content of 0.868 tCO_2e per MWh can be got. ** The gas CO_2 emissions coefficient is not currently given in the China Electric Power Yearbook as little gas is used for electricity generation in this region, which can*

be seen from Table 4. The coefficient therefore is calculated in this table from the China Energy Website, www.china5e.com, which gives the electricity generated from gas as 5.37 kWh/m^3. At a mass of 0.65kgCH_4/m^3, this would result in 0.333 tCO_2e/MWh. The gas-fired electricity generation data from the China Electric Power Yearbook will be used whenever available.

The build margin is thus equivalent to the emissions coefficient of coal-fired power plant which has the emission factor as low as 320gsce/kWh, times the share of coal in the added generation, giving the build margin emissions efficient as 0.819tCO_2e/MWh.

According to AM0005 if the grid imports or exports electricity from/to other grids, a correction of the emissions factor made be required. However, with regards to the North China Power Grid, such corrections for imports and exports would be negligible, as the other grids surrounding the North China Power Grid have very similar emissions factors, and power flows between these interconnected grids are very limited, less than 2% in the latest year for which data is available in the China Electric Power Yearbook.

The emissions factor EF for the current year can now be calculated using the formula above:

EFy = 0.5 * EF_OM + 0.5 * EF_BM = 0.5 * 0.993 + 0.5 * 0.819 = 0.906

The estimated baseline emissions, therefore, are:

BEy = EGy * FEy = 108GWh/y * 0.906tCO_2e/MWh = 97,848 tCO_2e/y

E.5. Difference between E.4 and E.3 representing the emission reductions of the project activity:

>>

Because project emissions are zero, the estimated emission reductions (ER) are equal to the baseline emissions as presented above. Thus:

ERy = EGy * EFy

with the emissions factor calculated using the formulae above.

With net generation and the emissions factor verified each year, annual emission reductions are estimated – ex-ante – to be: 97,848 tCO_2e.

The total emission reductions achieved over the first 7-year credit period are estimated to be: 658,662 tCO_2e. Average annual emission reductions in the first 7-year crediting period are 94,095 tCO_2e/year.

E.6. Table providing values obtained when applying formulae above:

>>

Table 7 Zhangbei Manjing Windfarm Project estimated emission values (tCO_2e)

Period	Estimation of project activity emissions	Estimation of baseline emissions	Estimation of leakage	Estimation of emission reductions
2006	0	71,574	0	71,574
2007	0	97,848	0	97,848
2008	0	97,848	0	97,848
2009	0	97,848	0	97,848
2010	0	97,848	0	97,848
2011	0	97,848	0	97,848
2012	0	97,848	0	97,848
Total first 7-year period (2006-2012)	0	658,662	0	658,662
Annual average for the first 7-year period	0	94,095	0	94,095
Second 7-year period (2013-2019)	0	684,936	0	684,936
Third 7-year period (2020-2026)	0	684,936	0	684,936
Total 21-year period	0	2,028,534	0	2,028,534

In each year the amount of CERs actually generated by the project will vary depending on the metered net generation of the Zhangbei Manjing Windfarm Project and the appropriate CO_2 emission factor. This emission factor is computed from the latest official information on the North China Power Grid as outlined in Section B, as per AM0005.

SECTION F. Environmental impacts

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

>>

An Environmental impact Assessment as required by Chinese law is available, and has been approved by the local government. A short summary of the environmental impacts is presented below.

Environment Impact Assessment Report

Rationality analysis of site choice and the layout

After the project commissions, it will effectively make use of local rich wind resources, supplement the power source at the end of the grid, improve the energy structure, promote the local economy development effectively. The project will realize the consolidation of social, economic and environmental benefits. The plane layout of the project meets the demand for power generation and transmission and leaves the areas for later expansion. The site choice and the layout are reasonable.

Land Use Impacts

Land acquired for turbine foundations (and water pump station and transformer station) will be permanently removed from its current use. However, the amount of land is minimal (291,050m^2). An additional 53,000m^2 will be temporarily occupied during construction of the windfarm. The temporarily and permanently occupied land is primarily used for husbandry and other agricultural purposes.

- Decrease the temporarily occupied land, and restore timely the occupied land due to construction.
- Restore timely the destroyed vegetation during construction, and enforce the ecological environment protection during the project operation.

The analysis of the environment impact in the construction period and the environment pollution protection measurements to be taken

- The major pollutant produced in the construction period is dust, noise, discarded stones. The impact on ecological environment can be neglected.
- Considerable technical measurements for pollution prevention will be taken to ensure that TSP concentration maximum outside the construction boundary is below 1.0mg/m3 and avoids the dust impact onto the environment.
- The low noise equipments will be chosen as the construction equipments, and the construction period will avoid to conflict with the sensitive period. After the above measurements are taken, the noise during the construction will not have obvious impact on the surrounding environment, especially the animal activities.

The environment impact analysis in the operation period

- At the location 1,500 m distant from the sound source, the operation noise of the wind turbines drops down to first class zone standard value in The Urban Area Environment Noise Standard (GB3096-93), and will not impact the surrounding environment evidently.
- The daily life sewage is little and will be disposed properly.
- The daily life waste will be moved away by the local farmers and used as feed stuff and fertilizer, and will almost have no impact on the surrounding environment.

- Interference with communication. Working turbines may cause interference with television and radio broadcasting, microwave and cellular radio communications, but experience at other sites shows no effect on communication systems. No interference is expected.

Noise

- Major sources of noise pollution include construction vehicles and aerodynamic interaction between the wind and turbine blades. During construction, all equipment will be operated during daytime hours. It has been determined that noise levels will be in compliance with the standards set forth in the Chinese environmental guidelines. Sound levels produced by turbine operation will be naturally attenuated by ambient conditions and were determined to be within Chinese Standards (GB3096-93, GB12348-90, and GB12523-90).

Impacts on Birds

- Birds can collide with wind turbines as well as other structures that they have trouble seeing, including road traffic. Studies on existing wind power facilities in Europe and North America indicate that raptors and migratory waders are the most susceptible species. These species are less common near the windfarm site. All sites have been selected with due consideration for avoiding migratory bird routes as well as areas with large bird populations. The sites were determined to pose no significant impacts for birds. Turbines will be erected on tubular towers (i.e., not lattice towers) to reduce perching sites for birds.

Visual Impacts

- In several countries (most notably the United Kingdom), development of windfarms has met local opposition due to the visual effect of the turbines on the landscape. However in China, wind turbines are considered an attraction, and the wind turbines are expected to serve as the basis for a small tourism industry at the Zhangbei site in Hebei Province.

Interference with Communications

- Turbine blades are capable of deflecting radio and microwaves used for communication purposes and can cause interference with television and radio broadcasting, microwave and cellular radio communications and various navigational and air traffic control systems. Blades made from metallic materials present the greatest potential for interference; fiberglass blades and wood blades (presently the most common blade materials) have lesser effects. Experience at other sites shows no effect on communication systems. If effects do surface, they can generally be corrected using inexpensive, directional receivers/transmitters.
- Corona noise from electrical conductors interferes primarily with lower frequency signals normally associated with AM radio broadcasting. This noise is more problematic during rainstorms. The layouts for all transmission and distribution lines have been designed with due consideration for maintaining minimum distances between the lines and broadcasting and receiving stations, households, etc. In addition, the electric field strength from all

transmission/distribution lines and substations has been investigated and compared to applicable Chinese standards. The calculated field strength values fall within the Chinese guidelines. No interference is expected.

Air Quality

- Air quality impacts are limited to increased level of dust from use and movement of construction equipment. Increased dust levels are short-lived and localised. No significant impacts are expected.

F.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:

>>

Impacts are not considered significant.

SECTION G. Stakeholders' comments

>>

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

>>

In December 2004, there were consultations carried out by staff from Beijing Guotou Energy Conservation Company with the local community and the local government, which represents the local community. The consultations resulted in a clear support letter for the Project from the local government – see G.2. below.

And also, in December 2004, staff from Beijing Guotou Energy Conservation Company carried out a survey of the local villagers and residents in the area, the result of the survey indicated the support to the project. A summary of the survey—see G.2.2.

G.2. Summary of the comments received:

>>

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

Comments from Local Government about the Zhangbei Manjing Wind Farm Project

Zhangbei Manjing Windfarm locates at Zhangbei County, Hebei Province. We believe the construction and operation of the windfarm will increase the local taxation contribution, and promote the development of related industries e.g. tourism and will create jobs for the county. Using local wind resources, the project will contribute to the sustainable development of this underdeveloped region. And as green electricity, this project will be a environment-friendly one. As the local government, we fully support the development of Zhangbei Manjing Windfarm.

The People's Government of Zhangbei County *Dec.17, 2004* *Stamp*

Following is a summary of the Local Survey. The survey forms are available from the developer.

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

1) Project introduction
2) Respondent's basic information and education level
3) Questions on:

- What is their opinion on their current environment?
- Currently is there interference with the TV and other reception?
- Will the project have a negative impact on their livelihood?
- Will the project bring improvements to their livelihood?
- What are the concerns they have with respect to the project—interference, noise or daily life waste/ sewage from the Project?
- Do they agree with the development of the Project?
- What environment protection methods should be considered during the Project
- construction and operation?
- What other comments and suggestions do they have for the developer regarding the Project?

The survey had a 60% response rate and the following is a summary of the key findings (The questionnaires were sent to 50 households):

1) 100% of respondents agreed with the development of the Project.
2) 95% respondents believed they currently lived in a pleasant environment.
3) 95% believed that that the project construction will not have impact on their livelihoods.
4) 95% believed there would be positive benefits from the Project.
5) The three main concerns were TV interference (47.6%), noise (28%) and daily life sewage (14%).
6) 28% of respondents suggested to accelerate the construction of the Project.

Conclusions from the survey

The survey shows that the Project has strong local support amongst the local people, as further evidenced by the local government support letter. The main issues seem to be noise, interference with communication signal (e.g. TV and radio) and daily life waste. The EIA shows that the noise levels would be within China national standards and no interference is expected. And daily life waste will be disposed properly, so all these concerns maybe perceived problems rather than real ones. However the developer will enforce all measurements to keep a pleasant environment for local people and if any problems occur, they will find a best way to solved it.

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

>>
The villagers and local government are all supportive of the Project and to date there has been no need to modify the due to the comments received.

The project developer has a overall environment- friendly plan during the project construction and operation (see above EIA)

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Beijing Guotou Energy Conserviation Company
Street/P.O.Box:	Qihelou Street, Dongcheng District, Beijing
Building:	No. 33
City:	Beijing
State/Region:	Beijing
Postfix/ZIP:	100006
Country:	People's Republic of China
Telephone:	+ 86 10 65134431
FAX:	+ 86 10 65275524
E-Mail:	hgx@bjgtec.com
URL:	
Represented by:	Huang Gengxin
Title:	Project Manager
Salutation:	Mr.
Last Name:	Huang
Middle Name:	
First Name:	Gengxin
Department:	Development Department
Mobile:	+ 86 13501370866
Direct FAX:	+ 86 10 65275524
Direct tel:	+ 86 10 65134431
Personal E-Mail:	hgx@bjgtec.com

For any information please contact:

- Mr Christiaan Vrolijk, christiaan.vrolijk@itpower.co.uk. IT Power Limited, Grove House, Lutyens Close, Chineham, Hampshire, RG24 8AG, UK, Tel: +44 1256 392700.
- Ms Qian Yiwen, qian.yiwen@itpowergroup.com. IT Power China Representative Office, Suite 1211, Air China Plaza, No 36 XiaoYun Lu, Chaoyang District, Beijing, 100027, China, Tel: +86 10 844 75848/9.

Organization:	First Carbon Fund Ltd
Street/P.O.Box:	Cranwood Street
Building:	Finsgate 5-7
City:	London
State/Region:	
Postfix/ZIP:	EC1V 9EE
Country:	The United Kingdom
Telephone:	+44 20 77939161
FAX:	+44 20 77939161
E-Mail:	n.clarke@netcomuk.co.uk

URL:	
Represented by:	
Title:	General Manager
Salutation:	Mr.
Last Name:	Clarke
Middle Name:	
First Name:	Nick
Department:	
Mobile:	+44 7768 742 087
Direct FAX:	+44 20 77939161
Direct tel:	+44 20 77939161
Personal E-Mail:	n.clarke@netcomuk.co.uk

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding for the Zhangbei Manjing Windfarm Project.

Annex 3

BASELINE INFORMATION

Table A1 Operating margin data for the North China Power Grid

Fuel types	Unit	Fuel consumption in the NCPG*	Emission factor** (tc/TJ)	Oxidation rate*** (%)	Average net caloric value**** (MJ/t,m3,tce)	CO2 emission (tCO2e)	Generation in the NCPG***** (MWh)	**OM emission factor (tCO2e/MWh)**
		A	B	C	D	E=A*B*C*D*44/12/100	F	G
Raw coal	Mtons	157.2794	26.8	98	20908	316677083		
Cleaned coal	Mtons	0	26.8	98	26344	0		
Other washed coal	Mtons	2.818	26.8	98	8363	2269527		
Coke oven gas	$10^{10}m^3$	0.0306	13	99.5	16726	24275		
Other coal gas	$10^{10}m^3$	0.3787	13	99.5	5227	93883		
Crude oil	Mtons	0	20	99	41816	0		
Diesel	Mtons	0.0855	20.2	99	42652	267401		
Fuel oil	Mtons	0.1573	21.1	99	41816	503802		
LPG	Mtons	0	17.2	99.5	50179	0		
Refinery gas	Mtons	0.0027	18.2	99.5	46055	8257		
Natural gas	$10^{10}m^3$	0.005	15.3	99.5	38931	10866		
Other energy	Mtons-sce	0.0983	0		29271.2	0		
Coke	Mtons	0.028	25.8	98	28435	73812		
					Total	319928905	322088000	0.993

Source: China Energy Statistical Yearbook 2004, page 146-165.
*Note: * Fuel consumption for thermal power generation in the North China Power Grid is obtained from page 146-165, China Energy Statistical Yearbook 2004. ** Emission factors for various fuels are obtained from the Revised 1996 IPCC Guidelines. *** Oxidation rate for various fuels are obtained from the Revised 1996 IPCC Guidelines. **** Average net caloric values for various fuels are obtained from page 302, China Energy Statistical Yearbook 2004. ***** Generation in the North China Power Grid is obtained from page 709, China Electric Power Yearbook 2004.*

Table A2 Added capacity in the North China Power Grid

Year	Installed capacity (MW)	Added capacity (% of most recent year)	Selected years
2003	56,818	–	–
2002	53,802	5.3	No
2001	51,058	10.1	No
2000	47,026	17.2	Yes
1999	44,960	20.9	Yes

Source: China Electric Power Yearbook 2004, 2003, 2002, 2001, 2000.

Table A3 Build margin data for the North China Power Grid (1999)

	A	B	C	D	E	F
Source	Installed capacity in 1999 (MW)	Installed capacity in 2003 (MW)	Added capacity (MW)	Share of added capacity (%)	Emissions coefficient (tCO2e/MWh)	D * E
Hydro	2,631	3,215	584	4.9	0	0
Coal	42,329	53,512	11,183	94.3	0.868*	0.819
Nuclear	0	0	0		0	0
Gas	0	0	0		0.333**	0
Other (wind)	0	90.1	90.1	0.8	0	0
Total	**44,960**	**56,818**	**11,858**	**100**		**0.819**

Source: China Electric Power Yearbook, pages 666 (2000 edition) and 709 (2004 edition).
Note: The emissions coefficients are calculated from standard coal consumption of power generation in National Study of China Climate Change (published by Tsinghua University Publication House) which gives the coal consumption trend in 2010 as 320 grams of standard coal per kWh（from latest China Electricity Year Book 2004 edition, gives standard coal consumption of power generation as 350g/kwh in North China Power Grid, so to adopt the value of 320g/kWh is more conservative）. General Code for Comprehensive Energy Consumption Calculation (GB2589-81) gives the net caloric value of national standard coal as 0.02927 TJ/tonne of coal. The carbon emission factor for coal is taken from the Revised 1996 IPCC Guidelines giving 25.8 tC/TJ. Multiplying these gives a carbon content as 0.241tC/MWh. Considering oxidation factor as 98% (conservative value),carbon content of 0.868 tCO_2e per MWh can be got. ** The gas CO_2 emissions coefficient is not currently given in the China Electric Power Yearbook as little gas is used for electricity generation in this region, which can be seen from Table 4. The coefficient therefore is calculated in this table from the China Energy Website, www.china5e.com, which gives the electricity generated from gas as 5.37 kWh/m^3. At a mass of 0.65$kgCH_4/m^3$, this would result in 0.333 tCO_2e/MWh. The gas-fired electricity generation data from the China Electric Power Yearbook will be used whenever available.*

Table A4 Build margin data for the North China Power Grid (2000)

	A	B	C	D	E	F
Source	Installed capacity in 2000 (MW)	Installed capacity in 2003 (MW)	Added capacity (MW)	Share of added capacity (%)	Emissions coefficient (tCO2e/MWh)	D * E
Hydro	3,179	3,215	37	0.4	0	0
Coal	43,789	53,512	9,723	99.3	0.868*	0.862
Nuclear	0	0	0	0	0	0
Gas	0	0	0	0	0.333**	0
Other	58.4	90.1	31.7	0.3	0	0

(wind)						
Total	**47,026**	**56,818**	**9,792**	**100**		**0.862**

Source: China Electric Power Yearbook, pages 666 (2001 edition) and 709 (2003 edition).
Note: see notes Table A3.

Table A5 Calculations of the emission reductions

Variable	**Amount**	**Source**
Capacity of Zhangbei Manjing Windfarm Project	45 MWe	Project developer
Estimated loadfactor	27.6%	Project developers feasibility study
Estimated auxiliary power consumption/on-site use	0.2%	Estimate
EG (net electricity generation)	108 GWh/year	Calculation/estimation
EF_OM (emissions factor of the operating margin)	0.993 tCO_2e/MWh	Calculated from China Electric Power Yearbook data
EF_BM (emissions factor of the build margin) 1999	*0.819 tCO_2e/MWh*	*Table A3*
EF_BM (emissions factor of the build margin) 2000	*0.862 tCO_2e/MWh*	*Table A4*
EF_BM (emissions factor of the build margin) most conservative year (1999)	0.819 tCO_2e/MWh	Table A3
EF (approximate emissions factor)	0.906 tCO_2e/MWh	Calculated from EF_OM and EF_BM
Emission reductions	97,848 tCO_2e/year	Calculated from EF and EG
Crediting time	7 years (renewable)	Project developer
Total emission reductions (first crediting period)	658,662 tCO_2e/year	Calculated
Annual average emission reductions (first crediting period)	94,095 tCO_2e/year	Calculated

- - - -

Annex 4

MONITORING PLAN

1. Introduction

The Zhangbei Manjing Windfarm Project adopts the approved baseline methodology AM0005 “monitoring methodology for small grid-connected zero-emissions renewable electricity generation” to determine the baseline and calculate the emission reductions from the net electricity generation from the windfarm. The approved monitoring methodology AM0005 is therefore used for developing the monitoring plan. This plan describes in more detail the process as set out in Section D of the Project Design Document.

2. Responsibility

Overall responsibility for monitoring and carrying out the monitoring following this monitoring plan lies with the Zhangbei Manjing Windfarm Administration Office of the Beijing Guotou Energy Conservation Company (BG).

Mr. Liu Bin, Head of the Zhangbei Manjing Windfarm Administration Office, is responsible for the operation and maintenance, which includes the monitoring, of the windfarm.

Mr. Huang Gengxin, CDM Project Manager, is responsible for the daily monitoring and reporting.

BG, in co-operation with IT Power, the North China Power Grid Company,and existing windfarms experienced experts, and with the help of DOEs, will train the staff carrying out the monitoring work.

3. Installation of meters

Project net electricity generation will be monitored through the use of on site metering equipment at the substation. The main metering system equipment will be owned, operated and maintained by North China Power Grid, and the backup metering system equipment will be owned, operated and maintained by Zhangbei Manjing Wind Farm.

Both meters will have the capability to be read remotely through a communication line. Both North China Power Grid and Zhangbei Manjing Wind Farm have the right to read either meter. Both meters record on memory the accumulated kilowatt-hours. The results from the main meter will be supplied by North China Power Grid to Zhangbei Manjing Wind Farm on a monthly basis.

4. Calibration

The Power Interchange Agreement between Hebei Zhangbei Manjing Wind Farm and North China Power Grid Company Limited defines the metering arrangements and the required quality control procedures to ensure accuracy.

The metering equipment are calibrated and checked annually for accuracy. The metering equipment shall have sufficient accuracy so that any error resulting from such equipment shall not exceed 0.5% of full-scale rating. The net energy output registered by the meters alone will suffice for the purpose of billing and emission reduction verification as long as the error in the meters is within the agreed limits.

Calibration is carried out by North China Power Grid with the records being supplied to Zhangbei Manjing Wind Farm, and these records will be maintained by Zhangbei Manjing Wind Farm and the appointed third party.

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

All the meters installed shall be tested by North China Power Grid within 10 days after:
(a) the detection of a difference larger than the allowable error in the readings of both meters;
(b) the repair of all or part of meter caused by the failure of one or more parts to operated in accordance with the specifications; and/or

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

Should any previous months reading of the main meter be inaccurate by more than the allowable error, or otherwise functioned improperly, the net energy output shall be determined by (a) first, by reading backup meter, unless a test by either party reveals it is inaccurate; (b) if the backup system is not with acceptable limits of accuracy or is otherwise performing improperly the Zhangbei Manjing Wind Farm and North China Power Grid shall jointly prepare an estimate of the correct reading; and (c) if North China Power Grid and Zhangbei Manjing Wind Farm fail to agree then the matter will be referred for arbitration according to agreed procedures.

5. Monitored data

On site the net electricity generation (EG) will be monitored and recorded following the procedures above.

Off site, further data that needs to be monitored refers to the displaced grid electricity. Data variables to be monitored are presented in Section D of the PDD and in the table below. This

data is required to accurately calculate the grid CO2 emission factor using the combined operating and build margins.

The main data source is the latest issue of the China Electric Power Yearbook.

- All electricity generation from each fuel in the North China Power Grid on an annual basis
- All electricity generation from each fuel in the North China Power Grid in the last several years earlier to determine the last (approximately) 20% added generation
- Fuel emission factors and carbon contents for each fuel
- Imports and exports from the North China Power Grid, confirming that the amounts that are negligibly small

The data from several historic years is used to calculate the growth in generation, determining the historic years from which added generation is nearest to 20% (below and above 20%). The most conservative build margin of the two is adopted.

For example, electricity generation increase from 2000 to 2002 was 18.5%, while that from 1999 to 2002 was 26.6%. Since build margin obtained from the data from 1999 to 2002 is more conservative, this build margin result is adopted.

6. Quality control

Monthly net generation data will be approved and signed off by Mr. Huang Gengxin before it is accepted and stored.

The additional data required and collected annually from the China Electric Power Yearbook will be approved and signed off by Mr. Huang Gengxin before it is accepted and stored.

This audit will check compliance with operational procedures in this monitoring plan and Section D of the PDD.

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 operationalised 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 Zhangbei Manjing Wind Farm project, the project material and monitoring results will be indexed. All paper-based information will be stored by the technology department of Zhangbei Manjing 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 credit time of the CDM project.

8. Reporting

The steps required to derive at the emissions reductions are:

- North China Power Grid reads main meter and records the result monthly, within 3 working days of month end
- North China Power Grid supplies reading to Zhangbei Manjing Wind Farm
- Zhangbei Manjing Wind Farm records readings from the North China Power Grid main meter and the backup meter
- Zhangbei Manjing Wind Farm records required grid data for the CDM project, and calculates the grid CO2 emissions factor based on the latest grid data available
- Zhangbei Manjing Wind Farm calculates emission reductions, within 3 working days of the year end
- Zhangbei Manjing Wind Farm carries out an internal audit on the readings, grid data and calculations(with the help of IT Power).
- Zhangbei Manjing Wind Farm reports annually the readings, grid data and calculations to the DOE for verification, within 10 working days of the year end.

9. Verification

The contracted DOE will receive the annual emission reduction report 10 working days after year end.

BG will facilitate the verification through providing the DOE with all required necessary information at any stage.

\- - - - -

Annex 5

Letters of approval

THU, 18-AUG-05 11:05 P.03

中华人民共和国国家发展和改革委员会
THE NATIONAL DEVELOPMENT AND REFORM
COMMISSION OF THE PEOPLE'S REPUBLIC OF CHINA
No.38. S. Yuetan Street, Beijing 100824

August 16, 2005

Letter of Approval for Zhangbei Manjing Windfarm Project by National Development and Reform Commission of the People's Republic of China

No. 004

The Chinese Government approves Zhangbei Manjing Windfarm Project as a Clean Development Mechanism project, with the following remarks:

1. China approved the Kyoto Protocol to the United Nations Framework Convention on Climate Change on 30 August 2002, and is a Party to the Kyoto Protocol.
2. The Zhangbei Manjing Windfarm Project complies with the permission requirements provided for in the Interim Measures for Operation and Management of Clean Development Mechanism Project in China, and assists China in achieving sustainable development.
3. Beijing Guotou Energy Conservation Company is hereby authorized as China's participant to voluntarily participate in and carry out the project activity.
4. Beijing Guotou Energy Conservation Company is permitted to transfer to First Carbon Fund Ltd. that is authorized by the Government of United Kingdom no more than 675,000 (tCO_2e) in total Certified Emission Reductions (CERs) for a period of 7 years from the starting date of this project.

Liu Jiang

刘江

Minister, Vice Chairman
National Development and Reform Commission
People's Republic of China

Zone 3/C1 Ashdown House
123 Victoria Street
London SW1E 6DE

Telephone 020 7082 8072
Website www.defra.gov.uk

defra
Department for Environment Food and Rural Affairs

DNA Ref: FCF/1/2005
Date of Issue: 09 September 2005
Company issued to: First Carbon Fund
Project issued for: Zhangbei Manjing Wind Farm Project

ARTICLE 12 KYOTO PROTOCOL TO THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE
WRITTEN APPROVAL OF VOLUNTARY PARTICIPATION FROM UK DNA

First Carbon Fund has confirmed that they are a project participant in a proposed Clean Development Mechanism (CDM) project entitled "Zhangbei Manjing Wind Farm Project" and has requested written approval of the UK's voluntary participation in the CDM from the UK's Designated National Authority in order to submit this project to the CDM Executive Board for registration.

First Carbon Fund has provided us with the attached record of the host Party's confirmation that the project activity assists it in achieving sustainable development and has confirmed that it has submitted all required documents and information to the Designated Operational Entity.

The Secretary of State for Environment, Food and Rural Affairs acting as the UK's DNA confirms that:

1. the United Kingdom ratified the Kyoto Protocol on 31st May 2002;
2. the UK participates voluntarily in the CDM;
3. to the extent that what is mentioned in paragraphs 1 and 2 may constitute authorisation of First Carbon Fund participation in the above named CDM project activity, and to the extent that such authorisation is required, this letter may be taken to constitute that authorisation.

In granting authorisation, the UK's DNA has not considered those matters that fall within the competence of:

- China acting as Host Party in respect of this project;
- Det Norske Veritas, appointed by the project participants as Designated Operational Entity in respect of this project; or
- the CDM Executive Board.

Signed on behalf of the Secretary of State:

Martin Hession pp.

Sarah Hendry,

Head of Global Atmosphere Division