Hebei Kangbao Wolongtushan 30 MW Wind Farm Project

VCS Monitoring Report

Monitoring Period:

Start Date: **Sep. 30th, 2006**

End Date: **Apr. 14th, 2007**

Version Number: **03**

Date: **Aug. 23rd, 2007**

This document reports the emission reductions generated by Hebei Kangbao Wolongtushan 30 MW Wind Farm Project whose CDM registration reference number is 0878 during the following monitoring period: September 30, 2006 to April 14, 2007.

1. Project Category

Hebei Kangbao Wolongtushan 30 MW Wind Farm Project involves the installation of 40 turbines, each of which have a capacity of 750kW, providing a total installed capacity of 30MW.The project is expected to sell 60GWh power to the North China Power Grid annually.

Category 1: Renewable energy (wind).

2. Geographic Location

The Hebei Kangbao Wolongtushan 30 MW Wind Farm Project is sited on the Wolongtu Mountain which is in the Kangbao County, Zhangjiakou City of Hebei province, P.R.China. The Project has geographical coordinates with east longitude of 41º51' and north latitude of 114º28'. The objective of the Project is to utilize the wind power for generating electricity which will be sold into the North China power grid.

3. Eligible GHGs

The project activity is a grid-connected zero-emissions renewable electricity generation plant that would not be implemented otherwise.

The project activity only reduces carbon dioxide (CO2) through substitution of the North China power grid electricity generated by fossil fuel power plant by electricity of wind power generation.

No other GHG reductions such as methane (CH4) and nitrous oxide (N2O), which happen under assistant activities of transportation, storage and extraction from the project activity and/or from the North grid are accounted.

4. Project Start Date

September 30, 2006

5. Emission Reduction Start Date

September 30, 2006

6. Public funding and grants

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

7. Project Boundary/GHG Assessment Boundary

North China power grid covers six provinces–Beijing, Tianjin, Hebei, Shanxi, Inner Mongolia and Shandong Province. The project site is located at Hebei province. The electricity generation of this project will transmit into local grid, and then transmit to North China power grid.[1]

Because of the following reasons, the project boundary is determined as 'North China power grid' in this project activity:

1) The project site is located at Hebei province. Hebei provincial grid is one of the main transmission networks of North China power grid. Its power generation is managed and dispatched by North China power grid.

2) The relationship between North China power grid and other China Power Grid is listed in below table[2].

Year	Electricity output(MW)	Input from other Grid(MW)	(%)
2002	377617637	2905200(from Northeast China power grid)	0.77 %
2003	429609286	4244380(from Northeast China power grid)	0.99 %
2004	493687660	4514550(from China Central Power Grid)	0.91%

It shows North China power grid is a stable and relatively independent regional gird with sample and clear grid system boundary;

3) Since North China power grid has been a stable regional grid for several years, its basic data of electricity generation, electricity dispatch and other grid related information has been recorded historically, and those data was officially published by government so they are public available.

Therefore, North grid is determined as the Project boundary.

[1] Refer to <Feasibility report of Kangbao Wolongtushan wind farm project>
[2] Reference from *China Electric Power Yearbook 2005*

8. Calculation Methodology

The baseline emission (BE) during the monitoring period results from:

$BE = EG \cdot EF$

Where

EG – net power transmitted to the grid during the monitoring period (10^4kWh);

EF - emission factor of the grid (calculated ex-ante and will not be updated during the first crediting period). Detailed calculation method for emission factor (EF) has been indicated in the PDD.

The monitoring period is from Sep 30th, 2006. to Apr 14th, 2007. Meter 114 provides the official monthly record for electricity supplied to and imported from the grid. Therefore, from Sep 30th, 2006 to March 31st, 2007, the exported and imported electricity had been monitored effectively by Meter 114. In addition to that, power loss through 10kV circuitry connected to the standby meters, namely Meter 410 and Meter 420 is taken into account by subtracting the monthly power loss from the exported electricity.

For the period of Apr 1st, 2007 to Apr 14th, 2007, Meter 114 does not provide accurate data for half month. We used the conservative method to make the estimation.

Meter 302 at the project site keeps record of power exported or imported setting aside the power transmission loss between the power plant and the power substation and gives daily number of exported and imported electricity. To calculate the electricity from Apr 1st to Apr 14th, we subtracted the amount of electricity Meter 114 gives for the whole month of April by the amount of electricity provided by Meter 302 from Apr 15th 2007 to Apr 30th 2007. In addition to that, power loss through 10kV circuitry connected to the standby meters, namely Meter 410 and Meter 420 is taken into account by subtracting the power loss for April from the exported electricity.

Period	Exported（10^4kWh）	Power loss connected to the standby meters (10^4kWh)	Imported（10^4kWh）	Net power transmitted to the grid:（10^4kWh）
2006.09.30-2006.10.31	130.02	0.0576	1.584	128.3784
2006.11.01-2006.11.30	434.28	0	2.508	431.772
2006.12.01-2006.12.31	617.232	0.0576	1.188	615.9864
2007.01.01-2007.01.31	537.768	0.0576	3.828	533.8824
2007.02.01-2007.02.28	539.088	0	1.056	538.032
2007.03.01-2007.03.31	684.156	0.0487	2.772	681.3353
2007.04.01-2007.04.14	279.468	0.0487	0.948	278.4713
Total	3222.012	0.2702	13.884	3207.858

$BE = EG \cdot EF$=32078.58MWh*1.0197 tCO2e/MWh

=32,711 tCO2e

As the emissions and leakage from the project activity are zero, emission reduction is equal to baseline emission. Emission reduction during the monitoring period September 30, 2006 to April 14, 2007 is 32,711 tCO2e.

9. Secondary Effects

All CDM methodologies have considered both the primary effects and the secondary effects. As the Project is in full compliance with CDM Methodology ACM0002.ver 06- "Consolidated baseline methodology for grid-connected electricity generation from renewable sources", no additional analysis is needed for secondary effects.

10. Project Additionality

The baseline scenario of the Project is identified and demonstrated by using the Step 1 and Step 2 of the *Tool for the Demonstration and Assessment of Additionality* approved by CDM EB.

Step 0: Preliminary screening of projects started after 1 January 2000 and prior to 31 December 2005.

The Project is not above described type of project that starts before the date of registration and account emission reduction prior to the start of the crediting period.

The Project is not financial attractiveness in feasibility period, the IRR of total investment would not reach benchmark and has barriers to be set up.

CDM was introduced to the Project owner on 22nd, July,2005, in Hebei CDM Conference.

Potential CERs revenue can help the project to be financial attractive. So the project owner had considered CERs revenue to be the project income, and accelerate the beginning of its construction[3].

The construction period started from 16th, Oct., 2005.

The validator did the on site validation on 18th, June, 2006.

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

The objective of the Step 1 is to define realistic and credible alternatives to the project activity(s) that can be the baseline scenario through the following sub-steps:

[3] Source from news published on <Hebei Daily>, 25th, July,2005

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

Plausible and credible alternatives available to the Project that provide outputs or services comparable to the proposed CDM project activity include:

Alternative I: Construction of a fuel-fired power plant with equivalent amount of annual electricity supply;
Alternative II: The Project activity not undertaken as a CDM project activity;
Alternative III: Construction of a power plant using other sources of renewable energy with equivalent amount of annual electricity supply; and
Alternative IV: Provision of an equivalent amount of annual power output by the grid into which the Project is connected.

The terrain of the project site area is flat, which is not suitable for development of hydropower project. In China, biomass power generation technology is still in the demonstration phase and can bring only poor economic benefits, which can not be operated without support from the national policies[4]. Since there exist no economically exploitable hydro or biomass resources with a commensurate scale within the area of the Project. Alternative III is not feasible.

Sub-step 1b. Enforcement of applicable laws and regulation

For Alternative I, considering the same annual electricity supply, the alternative baseline scenario for the Project should be a fuel-fired power plant with installed capacity lower than 15 MW. Further, as the Project is a grid-connected wind power generation project, the alternative baseline scenario must be a grid-connected fuel-fired power generation project. However, according to China's regulations, construction of fuel-fired power plants with the installed unit capacity lower than 135 MW is prohibited in the areas which can be covered by large grids such as provincial grids[5]. For these reasons, the possible alternative baseline scenario of building a fuel-fired power plant with an installed capacity lower than 15 MW conflicts with China's current regulations. Therefore, Alternative I is not feasible.

For Alternative II, the Project activity not undertaken as a CDM project activity satisfies China's regulations.

For Alternative IV, the installed capacity of the North China power grid for both the existing power plants and the power plants to be built in a foreseeable future satisfies China's regulations, which is also economically feasible.

4 *Tentative Management Measures for Price and Sharing of Expenses for Electricity Generation from Renewable Energy*, Document No. NDRC Energy[2006]13.
5 *Notice on Strictly Prohibiting the Installation of Fuel-fired Generators with the Capacity of 135 MW or Below* issued by the General Office of the State Council, decree no. 2002-6.

Therefore Alternative II and Alternative IV are analyzed in Step 2 as potential project alternatives. According to the analysis in below, the project is not financial attractive, so Alternative II is not feasible. According to current policies and regulations in China electric-energy market, providing the same capacity and electricity supply from North China power grid is feasibility, therefore Alternative IV is finally determined to be the baseline scenario.

Step 2. Investment analysis

The purpose of this step is to determine whether the project activity is economically or financially less attractive than Alternative II without an additional revenue/funding, possibly from the sale of certified emission reductions (CERs). The investment analysis was conducted in the following steps:

Sub-step 2a. Determine appropriate analysis method

The *Tool for the Demonstration and Assessment of Additionality* suggests three analysis methods which are simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III). Since the Project will earn revenues not only from the CERs sales but also from electricity sales, the simple cost analysis method is not appropriate. Investment comparison analysis method is only applicable to projects whose alternatives are similar investment projects. The Alternative IV of the Project is the North China power grid rather than new investment projects. Therefore Option II is not appropriate. The Project will use benchmark analysis method (Option III) based on the consideration that benchmark IRR of the power sector is available.

Sub-step 2b. Apply benchmark Analysis (Option III.)

According to the *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects*, the financial benchmark rate of return (after tax) adopted by the Project is 8% for the IRR of total investment. On the basis of above benchmark, calculation and comparison of financial indicators are carried out in sub-step 2c.

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

(1) Basic parameters for calculation of financial indicators

Based on the feasibility study report of the Project, basic parameters for calculation of financial indicators are as follows[6]:

Installed Capacity:	30MW
Estimated annual electricity output:	57,946MWh
Electricity tariff:	0.600 RMB/KWh (with VAT)

[6] Data from <Feasibility report of Kangbao Wolongtushan wind farm project> and <Modification on financial evaluation of Feasibility report of Kangbao Wolongtushan wind farm project>

Crediting period:	7 years
Expected CERs Price:	8 Euro/tCO_2e
Project Lifetime:	21years
Static Total investment:	275,090,000 Yuan RMB
Loan period:	15 years
Interests of the loan:	6.12%
Annual O & M cost:	5,615,000 Yuan RMB
Income tax rate：	33%
Sales tax and surtax：	298300 Yuan RMB

Detail of IRR calculation is provided in Annex 5.

(2) Comparison of the financial benchmark of IRR of total investment for the Project

In accordance with the benchmark analysis (Option III), if the financial indicators (such as IRR) of a project are lower than the benchmark, the project is not considered as financially attractive. Based on the data above, without CERs sales revenues, the IRR of total investment of the Project is 7.47%, which is lower than the benchmark (8%). The Project is not financially attractive.

Sub-step 2d. Sensitivity analysis

For the project, following financial parameters were taken as uncertain factors for sensitive analysis of financial attractiveness:

- Static total investments
- Annual electricity output
- Electricity tariff, (Yuan/KW.h),with VAT
- Annual O&M cost

Since the impact of electricity tariff (with VAT) on total investment is the same to the impact of annual electricity output, only the impacts of static total investment, annual O&M cost and electricity tariff (with VAT) of the Project on IRR of total investment were analyzed. The results of sensitive analysis of three indicators of the Project are shown in Table 1 and Figure 3.

Table 1. IRR of total investment sensitivity to different financial parameters of the Project (without CERs sales revenues)

Range / Parameter	-10%	0	+10%
Static total investment (%)	8.73	7.47	6.33
Annual O&M cost (%)	7.76	7.47	7.18
Electricity tariff (withVAT) (%)	6.12	7.47	8.68

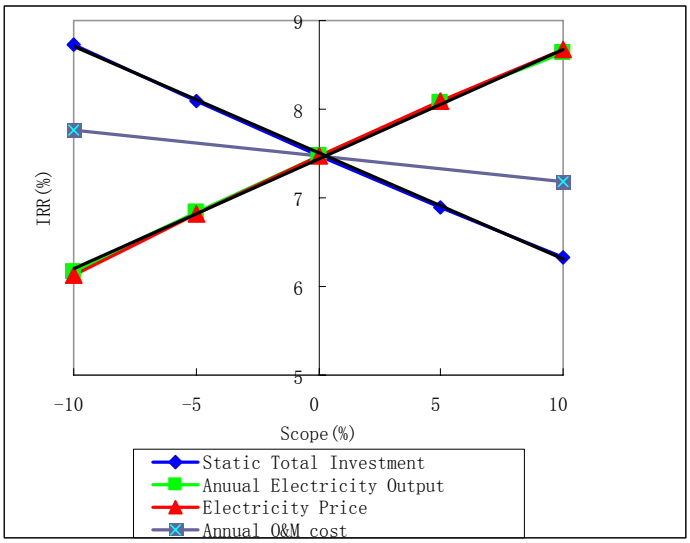

Figure 3. IRR of total investment sensitivity to different financial parameters of the Project (without CERs sales revenues)

Based on the relationship shown in Figure B-1, we can calculation that the IRR can reach the benchmark 8%, in case of the variation range of the *electricity tariff/ annual electricity output* reaches +4.53%, or the *static total investment* reaches -4.51%. However, it could not happen in the project, because:

Since the Project will be finished very soon, its static total investment will not be changed much. Therefore, the Static total investment could not be reduced 4.51%. The detail will be provided in validation and verification time.

The project owner has got an agreement with the Grid Company about the electricity price, which is 0.600 RMB/KWh (with VAT). Thus the Electricity tariff could not be raised by 4.53%. The detail will be provided in validation and verification time.

Based on the agreement signed with the Grid Company, the Electricity output is not only determined by the electricity generation, but also by the requirement of its Grid Company, which means, even if the project's electricity generation raises 4.53%, for some reason, its Grid Company could not allow it to connect to Grid, thus, the electricity output could not raised 4.53%. In addition, the electricity output in feasibility study is a forecast data of accurateness, which according to the average power of wind, the rate of the wind, the data of other wind farm project in same condition[7], thus, the electricity output could not raise 4.53% normally.

Therefore, the IRR of total investment of the Project could not reach the benchmark and the additionality of the Project would not be influenced.

[7] Refer to <Feasibility report of Kangbao Wolongtushan wind farm project>

In conclusion, the practical and feasible baseline scenario is Alternative IV, the provision of equivalent amount of annual electricity supply by the grid into which the Project is connected. Therefore the baseline scenario of the Project is the provision of equivalent amount of annual electricity supply by the North China power grid.

Step 4. Common practice analysis

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

Wind farm projects which were put into operation before 31st Dec. 2005 in Hebei Province are listed in Table2.

Table 2 Wind farm projects put into operation before 31st Dec. 2005 in Hebei Province[8]

Name	Total No. of the wind farm（Tai）	Total capacity of the wind farm(KW)
Zhangbei wind farm project	24	9850
Chengde wind farm project	88	53700
Fengning wind farm project	2	1200
Shangyi Manjing wind farm project fist phase	23	34500
Zhangbei Manjing wind farm project	6	9000

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

Among the wind farm projects listed in Table 2:

The installed capacity of wind farm project takes little proportion in recent three years in Hebei province, which is 0.07% in 2004, 0.07% in 2002, and 0.06% in 2001[9]. Therefore, wind farm project is not a common technique for power generation in Hebei province. Besides:

Zhangbei wind farm project was put into operation before 1999, due to the reformation of China electricity system in 2000[10], project put into operation before 2000 will not impact the additionality of the proposed Project.

Fengning wind farm project, with installation capacity is 1.2MW(2×0.6MW), which capacity is much smaller than the proposed Project. Thus it was faced less technical difficulties and enjoyed less annual O&M cost.

Chengde wind farm project and Shangyi Manjing wind farm project-first phase are all in the process of finding carbon finance help.

[8] Source from<Stat. of domestic wind farm installation capacity in 2005>, Shipengfei. http://www.cses.org.cn/nywzbody.asp?id=9

[9] Data refers to *China Electric Power Yearbook 2005,2003 & 2002*

[10] http://www.bjbusiness.com.cn/20060807/yaowen30.htm

Zhangbei Manjing wind farm project is registered successfully as CDM project in 23rdMar 2006[11].

Hebei Guyuan 30.6 MW Wind farm projects and *Zhangbei Mijiagou Wind Farm Project*, which are put into construction in Hebei Province, are developing as CDM Project[12].

In sum, existing wind farm projects will not impact the additionality of the Project.

Step 5. Impact of CDM registration

If the Project can be successfully registered as a CDM project, the CERs sales revenues will

• guarantee the loan payback, supplement the high investment of the Project and significantly improve the financial indicators of the Project;

• be one of the sources to serve as the maintenance fund for wind turbines therefore to guarantee the successful implementation of the Project.

Considering of the CERs sales revenues (calculated with EURO 8/tCO_2e, 7 yrs×3 crediting period), the IRR of total investment of the Project will be significantly improved to reach benchmark, as shown in Table 3.

Table 3 IRR of the Project[13]

	Project IRR
Without revenue of CERs	7.47%
With revenue of CERs	9.72%

11. Quality of Reductions

The Project's design and implementation has been carried our in compliance with all relevant local and national environmental and social legislation in China. The official EIA done by local environmental bureau proves that it is feasible to set up the Project activity. No significant environmental impacts are considered by the project sectors.

The Project clearly fits into the development priority of China. The Project will not only supply renewable electricity to grid, but also contribute to sustainable development of the local community, the host country and the world by means of:

- reducing greenhouse gas emissions compared to a business-as-usual scenario;

[11] Source from http://cdm.unfccc.int/Projects/registered.html

[12] Source from http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=1322

[13] Data from <Feasibility report of Kangbao Wolongtushan wind farm project> and <Modification on financial evaluation of Feasibility report of Kangbao Wolongtushan wind farm project>, detail of IRR calculation is provided in Annex 5.

- helping to stimulate the growth of the wind power industry in China;
- reducing the emission of other pollutants resulting from the power generation industry in China, compared to a business-as-usual scenario;
- creating local employment opportunities during the project construction and operation period;
- promoting the development of local truism industry.

12. Monitoring Process

The monitoring methodology ACM0002 (version 06) – "Consolidated monitoring methodology for grid-connected electricity generation from renewable sources" is selected for the project. In keeping with the monitoring methodology, the following parameter has been monitored for the project:

Net electricity delivered to the grid

ID	Data type	Data variable	Data unit	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long is archived data kept?
EGy	Electricity	The electricity supplied to the grid by the project	10^4kWh	Recorded on a monthly basis	100 %	Electronic with paper back-up	During the crediting period and two years after

Quality Control (QC) and Quality Assurance (QA) procedures

ID	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
EGy	Low	The kWh output from each wind turbine will be monitored and recorded at the on-site control centre using a computer system. The project operator is responsible for recording this set of data.

		Measurements are being continuously recorded by the on-site computer system, and then the output will be aggregated so that monthly electricity output can be shown. Electricity sales invoices will also be obtained as an additional check. This data set will be provided by the project company from its normal recording system.

The Monitoring Plan has been implemented accordingly. It clearly states the three persons from the QC team of the project owner are responsible for the roles and responsibilities in the monitoring plan of the project.