

Monitoring Report

Version 1.0

Dated: 8 July 2008

Start monitoring period: 1 September 2007

End monitoring period: 30 Jun 2008

Title: Zhangbei Manjing Windfarm Project

UNFCCC Reference Number: 0233

Project developer:

Beijing Guotou Energy Conservation Company

This Monitoring Report is approved:



Mr Liu Bin
Head of the Zhangbei Manjing Windfarm
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Date: 8 July 2008

Project advisor:
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Table of Contents

1	Introduction	3
2	Project description	3
3	Project timeline.....	3
4	Baseline	5
5	Monitoring methodology and plan.....	6
6	Quality assurance and quality control measures.....	11
7	Emission reduction calculations	13

1 Introduction

The purpose of this Monitoring Report is to calculate the emission reductions achieved by the project activity in the period covered by this report, and to serve as the basis for the verification of these reductions and issuance of the CERs.

1.1 Monitoring period

Monitoring report number 3: 1 September 2007 to 30 Jun 2008

2 Project description

2.1 Title

Zhangbei Manjing Windfarm Project

2.2 UNFCCC Reference Number

0233

2.3 Project summary

The Zhangbei Manjing Windfarm Project is located in Hebei Province, China. The project consists of the installation of 30 turbines, each of 1,500 kW capacity, providing a total of 45MW. The project is expected to generate some 108GWh per year once fully operational which will be exported to the North China Power Grid.

A more detailed description is available in the PDD and related documentation.

2.4 Category 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

3 Project timeline

Starting date of the electricity production	30 December 2005
Registration date	23 March 2006
Crediting period	First renewable crediting period
Starting date of crediting period	1 January 2006
End date of crediting period	31 December 2012
Previous monitoring reports	
Volume 1	1 Jan 2006 – 31 Aug 2006

Volume 2	1 September 2006 – 31 August 2007
This monitoring report	(Volume 3)
Start of monitoring period	1 September 2007
End of monitoring period	30 Jun 2008

Table 1 lists the commissioning dates of 30 wind turbines installed in the Zhangbei Manjing Windfarm Project.

Table 1 Commissioning dates of turbines

Turbine number	Commissioning date
11#	2005.12.30
12#	2006.1.7
10#	2006.1.10
9#	2006.1.16
14#	2006.1.19
3#	2006.1.21
8#	2006.4.15
1#	2006.4.22
30#	2006.4.25
2#	2006.4.27
4#	2006.4.27
5#	2006.4.28
6#	2006.4.30
7#	2006.5.3
15#	2006.6.8
13#	2006.6.13
16#	2006.6.22
17#	2006.6.22
18#	2006.6.24
19#	2006.6.30
21#	2006.7.12
22#	2006.7.13
23#	2006.7.14
27#	2006.7.15
20#	2006.7.15
25#	2006.7.19
26#	2006.7.22
28#	2006.8.18
29#	2006.9.1
24#	2006.9.10

4 Baseline

4.1 Methodology

The project participants use the approved baseline and monitoring 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".

Using AM0005, the emission reductions achieved by the project activity can be calculated by multiplying the net electricity supplied to the grid and the appropriate emissions factor of the grid.

4.2 Calculations

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

$$ER_y = EG_y * EF_y$$

where EG_y is the net electricity supplied to the grid, EF_y is the CO₂ emission factor of the grid.

The emission factor EF_y of the grid is represented as a combination 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 (tCO₂/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 accordance with the approved PDD the calculation is 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 most recent 20% of the generating units built. In accordance with the approved PDD, and 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, following 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 2 years:

$$EF_BMy = \sum_i S_{i,y} * CEF_i$$

Where S_i is the share in added generation from technology/fuel i for year y , and CEF_i the CO₂ emission factor for technology/fuel i . The CEF represents the best available power generation technology (with lowest carbon emission level) 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 1% in the latest year for which data is available in the China Electric Power Yearbook.

5 Monitoring methodology and plan

The monitoring is in compliance with the monitoring methodology AM0005, following the revised monitoring plan. The two main variables are the net electricity supplied to the grid, which is calculated from the data monitored with electricity meters, and the appropriate emissions factor of the grid, which is calculated from national statistics and other official sources.

5.1 Monitored data

As the emissions factor is not fixed for the whole period, the monitored data for the project activity includes the variables required to calculate the CO₂ emissions factor of the grid:

ID	Variable	Source of data
1	EG: net electricity supplied to the grid	Calculated
2	EF: CO ₂ emissions factor of the grid	Calculated
3	EF_OM: operating margin	Calculated
4	EF_BM: build margin	Calculated
5	TEM: total CO ₂ emissions of the grid	Calculated
6	TGEN: total electricity generation from included sources	Calculated
7	Fi: amount of fuel consumed	China Energy Statistical Yearbook 2007
8	COEFi: GHG emissions coefficient of fuel	China Energy Statistical Yearbook 2007 and IPCC2006
9	Si: Share in added generation	China Electric Power Yearbook 2007
10	CEFi: CO ₂ emissions factor of best available technology	Tsinghua Univeristy study for NC4
11	EL: net import/export	Calculated from 12 and 13
12	EL_in: imports	China Electric Power Yearbook 2007
13	EL_out: exports	China Electric Power Yearbook 2007

14	EF_in: emissions factor of imports	Calculated if net import > 2%
15	EF_out: emissions factor of exports	Calculated if net export > 2%

5.2 Baseline data

5.2.1 EG: net electricity supplied to the grid

As described in the revised monitoring plan, the electricity supplied to NCPG by the Zhangbei Manjing Windfarm currently shares the main electricity meter at the 220kV substation with the Zhangbei Mijiagou windfarm (CDM project 0845), so the meter at the 220kV level measures the total electricity from the two windfarms delivered to the NCPG. In line with the revised monitoring plan, back-up metering equipment at the project site is used to calculate the share of each of the projects of the generation to the grid at 220kV, as follows:

$$EG_1 = EG_{total} * E1 / (E1 + E2)$$

Where:

EG₁ is the calculated power generation from the project activity;

EG_{total} is the total power generation to the grid at the Zhangbei substation metered by the main meter;

E1 is the electricity generation metered from the Zhangbei Manjing Windfarm Project from the onsite meters; and

E2 is the electricity generation metered from the Zhangbei Mijiagou 49.5MW Windfarm Project from the onsite meters

Zhangjiakou Electric Power Company has the responsibility to operate the 220kV sub-station and read the main meter installed at the 220kV sub-station at 0:00 every day and send this report to the Zhangbei Manjing Windfarm monthly.

To be conservative, the total power consumption of these two projects is considered as the power consumption of Zhangbei Manjing windfarm project.

Table 2 Net electricity generation by the project (MWh)

Month	E1 (MWH)	E2 (MWH)	EG_Total (MWH)	EG1(MWH)	Consumption (MWH)	Net Supply(MWH)
Sep-07	4887.15	4832.3	9662.004	4858.265	101.64	4756.625
Oct-07	13295.92	12514.48	25574.076	13174.181	93.72	13080.461
Nov-07	13626.5	13303.26	26783.988	13552.738	114.84	13437.898
Dec-07	13867.7	11342.1	25012.416	13759.121	105.6	13653.521
Jan-08	9051.68	6705.6	15649.656	8989.856	190.08	8799.776
Feb-08	12712.48	10938.4	23495.604	12629.018	77.88	12551.138
Mar-08	11046.64	9473.2	20245.104	10898.739	62.04	10836.699
Apr-08	15257.44	15276.8	30228.528	15104.681	35.64	15069.041
May-08	15891.7	16215.54	31795.500	15737.402	63.36	15674.042
Jun-08	8050.24	8157.6	16130.664	8011.908	57.552	7954.356

5.2.2 EF: CO₂ emissions factor of the grid

The emissions factor is calculated annually using the latest data available in line with the monitoring plan.

5.2.2.1 EF_OM: Operating margin emission factor

First, the emission coefficient is established for all fuels used in NCPG.

Table 3 COEF calculation

Fuel types	Unit	Net Caloric Value (MJ/unit)	Oxidation rate(%)	Carbon Emission Factor(tc/TJ)	COEF(tCO ₂ e/unit)
Raw coal	tonne	20908	100	25.8	1.98
Clean coal	tonne	26344	100	25.8	2.49
Other washed coal	tonne	8363	100	25.8	0.79
Coke	tonne	28435	100	25.8	2.69
Coke oven gas	1000m ³	16726	100	12.1	0.74
Other coal gas	1000m ³	5227	100	12.1	0.23
Crude oil	tonne	41816	100	20	3.07
Gasoline	tonne	43070	100	18.9	2.98
Diesel	tonne	42652	100	20.2	3.16
Fuel oil	tonne	41816	100	21.1	3.24
PLG	tonne	50179	100	17.2	3.16
Refinery gas	tonne	46055	100	18.2	3.07
Natural gas	1000m ³	38931	100	15.3	2.18
Other petroleum products	tonne	38369	100	20	2.81
Kerosene	tonne	43070	100	19.6	3.10

Source: NCV from China Energy Statistical Yearbook 2007 P287, CEF and OXID from IPCC 2006

Secondly, the fuel use is given and resulting emissions are calculated for the latest year for which data is available.

Table 4 Fuel use and emissions

Fuel types	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner mongolia	Shandong	NCPG total	Emission(MtCO ₂ e)
Raw coal	million tonnes	7.9663	16.3920	68.6799	69.6888	84.04050	109.3066	356.07410	704.277823
Clean coal	million tonnes						0.3977	0.39770	0.991125032
Other washed coal	million tonnes	0.0636		2.1413	3.7114	0.6177	5.4460	11.98000	9.477854804
Coke	million tonnes						0.0323	0.03230	0.086885417
Coke oven gas	billion m ³	0.038	0.063	0.580	2.232	0.064	0.579	3.55600	2.638825338
Other coal gas	billion m ³	2.066	0.658	6.972	1.379	2.276	0.722	14.07300	3.263592967
Crude oil	million tonnes					0.0074		0.00740	0.022692149
Gasoline	million tonnes			0.0001				0.00010	0.000298475

Diesel	million tonnes	0.0021		0.0301		0.0007	0.0632	0.09610	0.30358869
Fuel oil	million tonnes	0.0638		0.0008			0.041	0.10560	0.341633375
PLG	million tonnes						0.0001	0.00010	0.000316462
Refinery gas	million tonnes			0.0243			0.0232	0.04750	0.145986674
Natural gas	billion m3	0.341	0.073		0.053			0.46700	1.01994159
Other petroleum products	million tonnes						0.0028	0.00280	0.007878435
Kerosene	million tonnes								
Total emission	MtCO ₂ e								722.5784424

Source: Fuel consumption for thermal power generation in the North China Power Grid is obtained from page 126-145, page 182-185, China Energy Statistical Yearbook 2007.

Thirdly, generation on the grid is calculated from the data available.

Table 5 Generation and self-use rates in 2006.

	Unit	Beijing	Tianjin	Hebei	Shanxi	Inner mongolia	Shandong	NCPG total
Gross generation	10 ⁸ KWh	211	363	1461	1526	1416	2273	
Self use rate	%	7.51	6.86	6.63	7.45	7.58	7.12	
Net generation	10 ⁸ KWh	195.2	338.1	1,364.1357	1,412.3	1,308.6672	2,111.16	6,729.5304

Source: China Electric Power Yearbook (2007) p626, p627

Finally, the operating margin emissions factor can be calculated

Table 6 Operating margin emissions factor

	Value	Unit
Total emissions	722,578,442.4	tCO ₂ e
Total thermal generation	672,953,040	MWh
EF_OM	1.074	tCO ₂ e/MWh

5.2.2.2 EF_{BM}: Build margin emission factor

To calculate the build margin emissions factor, first the two years since which added generating capacity is closest to 20% are determined from the latest data available.

Table 7 Added capacity in the North China Power Grid

Year	Installed capacity (MW)	Growth to 2006 (%)	Selected
2006	146,479.00	N/a	N/a
2005	114,674.50	21.71%	yes
2004	96,983.20	33.79%	yes

Source: China Electric Power Yearbook (2005, 2006 and 2007 editions)

As per the procedure described in the PDD, the Build Margin Emission Factors since 2004 and 2005 are now calculated in Table 8 and 9 below. In line with the methodology described, the most conservative (i.e. lowest) is chosen.

The CEF for the best available technology is taken from the Tshinghua University Study for NC4.¹

Table 8 Build Margin data for the North China Power Grid (since 2004)

Source	Capacity, 2004 (MW)	Capacity, 2006 (MW)	Added capacity, 2004- 2006 (MW)	Share (%)	CEF (kgCO ₂ e/kWh)	Weighted average EF_BM (kgCO ₂ e/kWh)
Hydro*	3250.7	4004	753.3	1.522%		
Thermal	93594.9	141538	47943.1	96.86%	0.886	0.858
Other (wind)	137.5	937	799.5	1.62%		
Total	96983.1	146479	49495.9	100.00%		

Source: China Electric Power Yearbook (2005, 2007); Tshinghu University for NC4

Table 9 Bild Margin data for the North China Power Grid (since 2005)

Source	Capacity, 2005 (MW)	Capacity, 2006 (MW)	Added capacity, 2005- 2006 (MW)	Share (%)	CEF (kgCO ₂ e/kWh)	Weighted average EF_BM (kgCO ₂ e/kWh)
Hydro*	3242.6	4004	761.4	2.394%		
Thermal	111139.7	141538.0	30398.3	95.579%	0.886	0.847
Other (wind)	292.3	937	644.7	2.027%		
Total	114674.6	146479	31804.4	100.00%		

Source: China Electric Power Yearbook (2006, 2007); Tshinghua University for NC4

To be conservative, the lowest build margin emissions factor, 0.847tCO₂e/MWh, is adopted in line with the procedures set out and approved in the PDD.

5.2.2.3 EF calculation

The emissions factor is now calculated as the average of EF_OM and EF_BM.

¹ “Title”, Tshinghua University for NC4.

Table 10 Actual calculated emissions factors compared to projected values in the PDD

	Actual value	PDD projection
Latest year available	2006	2003
EF_OM	1.074	0.993
Chosen year for BM	2006	1999
EF_BM	0.847	0.819
EF	0.96	0.906

5.2.3 Correction for electricity imports and exports

Table 11 Electricity exchange between grids in 2006 (MWh)

Net exchange	Net exchange (%)
4,410,000	<1%

Source: China Electric Power Yearbook (2007 Page 303).

Total net electricity exchange between the North China Power Grid and other grids is presented in Table 11. With total generation in the North China Power Grid in 2006 being 725,000,000 MWh², this amount is less than 1% and is neglected in the calculations in line with the approved use of the methodology AM0005.

6 Quality assurance and quality control measures

6.1 Roles and responsibilities

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. Deng Hui, Operation Department Manager of Zhangbei Manjing Windfarm, is responsible for the operation and maintenance, which includes the monitoring, of the windfarm.

Mr. Liu Yu, Project Manager of Operation Department Manager, is responsible for the daily monitoring and reporting.

6.2 Training

Carbon Resource Management has advised BG on monitoring work.

The staff who are responsible for electricity meter reading and recording, and who are responsible for auditing these metered data have been trained according to the CDM monitoring and management manual for the Zhangbei Manjing Windfarm Project.

² Source: China Electric Power Yearbook (2007 Page 626).

6.3 Calibrations

The Power Interchange Agreement between the Zhangbei Manjing Wind Farm and the 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 the Zhangbei Manjing Wind Farm, and these records will be maintained by the 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:

- the detection of a difference larger than the allowable error in the readings of both meters; and/or
- the repair of all or part of meter caused by the failure of one or more parts to operated in accordance with the specifications.

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

Should any previous months reading of the main meter be inaccurate by more than the allowable error, or otherwise functioned improperly, the net 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 the North China Power Grid and the Zhangbei Manjing Wind Farm fail to agree then the matter will be referred for arbitration according to agreed procedures.

No meter errors have occurred to-date at the Zhangbei Manjing Windfarm. Calibration took place as per schedule. Calibrations were carried out by staff from the North China Power Grid.

The calibration results show that both meters operate in accordance with the industry standards and are qualified to measure the electricity supplied to the grid and consumed by the windfarm.

6.4 Quality control

Monthly net generation data has been approved and signed off by staffs that are responsible for recording meter reading in the 110kV substation installed on the windfarm side of the sub-station, and cross checked with receipt from North China Power Grid.

The additional data required and collected annually from the China Electric Power Yearbook and China Energy Statistical Yearbook has been approved and signed off by Ms. Chen Dongjuan.

7 Emission reduction calculations

7.1 Project emissions

As a renewable energy project, project emissions are zero.

7.2 Baseline emissions

Table 13 Monthly emission reductions achieved

Month	EG (MWh)	EF (tCO ₂ e/MWh)	BE (tCO ₂ e)
Sep-07	4756.625	0.96	4566.360
Oct-07	13080.461	0.96	12557.242
Nov-07	13437.898	0.96	12900.382
Dec-07	13653.521	0.96	13107.380
Jan-08	8799.776	0.96	8447.785
Feb-08	12551.138	0.96	12049.093
Mar-08	10836.699	0.96	10403.231
Apr-08	15069.041	0.96	14466.279
May-08	15674.042	0.96	15047.080
Jun-08	7954.356	0.96	7636.181
Total	115813.556	0.96	111181.014

7.3 Leakage emissions

As a relatively small renewable energy project, leakage from the project are considered zero.

7.4 Summary of emission reductions during the monitoring period

Table 3 Emission reduction calculation (tCO₂e)

Period	Project emissions	Baseline emissions	Leakage	Emission reduction
1 September to 30 Jun 2008	0	111181.014	0	111181.014