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

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SECTION A. General description of project activity

A.1 Title of the project activity:

Roncheng Wind Power Project, 48.75MW

Version 1

Date of completion: 12/07/06

A.2. Description of the project activity:

The Guohua Rongcheng Wind Farm Project (hereinafter referred to as the "Project") proposes to install and operate a 48.75MW grid-connected wind farm in Rongcheng City in Shandong Province of the People's Republic of China (PRC). The project company is Guohua Resourceful (Rongcheng) Wind Power Generation CO., Ltd.

The project is located in the coastal area of the north of Rongcheng City in eastern Shandong Province along the coastline of the Yellow Sea. For this Phase, Project comprises the following activities:

- ✓ Install 39 wind turbines of 1250 kW rating capacity to reach 48.75MW.
- ✓ Install a control room and substation and local grid for the wind farm
- ✓ Install a new 14.3km long 35KV transmission line to connect to the nearby Chengshanwei set-up substation.
- ✓ Install advanced monitoring and control system to monitor and control the electricity output from the windfarm.

The annual electricity generation at the gate of the windfarm for this phase of 48.75MW is expected to be about 88.31GWh per year which, when using the formula contained in ACM0002 leads to estimated emissions reductions of 82,670 tons of CO_2 equivalent per year.

The Project will contribute to both local and global sustainable development in a number of ways:

- ✓ In line with the long-term strategic development target set by the National Development and Reform Commission (NDRC) as 20GW installed wind capacity by 2020, the Project will improve the general sustainability of power generation in the region and in China as a whole, contributing to national energy security.

- ✓ The project will stimulate the growth of the windpower industry in China, advancing the development of sustainable renewable energy industry.

- ✓ Reduce other pollutants resulting from the power generation industry in China, compared to a business-as-usual approach and thus benefit public health and environmental protection.

- ✓ Create local employment during the assembly and installation of wind turbines, and as part of regular operations of the windfarm.

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Party involved wishes to be considered as project participant (Yes/No)
People's Republic of China (Host)	**Guohua Resourceful (Rongcheng) Wind Power Generation CO., Ltd. (Project owner)**	**No**

(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.

The Contact for the CDM project Activity is CAMCO International. All contact details are included in Section B5.

Further information on the project participants is summarised below.

Project owner
Guohua Resourceful (Rongcheng) Wind Power Generation CO., Ltd. is the constructor, operator and owner of the proposed project.

Guohua Resourceful (Rongcheng) Wind Power Generation CO., Ltd. is a joint-venture set up by Guohua Energy Investment CO., Ltd (51%) - a subsidiary of the state-owned Shenhua Group and Roaring 40s (Shandong) CO., Ltd (49%).

Shenhua Group, is a leading energy group playing a key role in the national economy. It was established in October, 1995 with approval by the State Council. Shenhua Group's total installed power capacity including wind power is 4.76GW. Shenhua's target is to become the biggest wind power group in China with the installed wind power of 4GW by 2020.

Roaring 40s (Shandong) CO., Ltd is a wholly owned subsidiary of Roaring 40s Renewable Energy PPY. Ltd., which is a joint venture set up by Hydro Tasmania (50%) – a public Australian company and CLP Power Asia (50%).

Host Country
The host country is the People's Republic of China. China's Designated National Authority (DNA) is the National Development and Reform Commission (NDRC). The Government of the People's Republic of China ratified the Kyoto Protocol in September 2002.

Purchasing Party
To be determined
Please see Annex I for detailed contact information

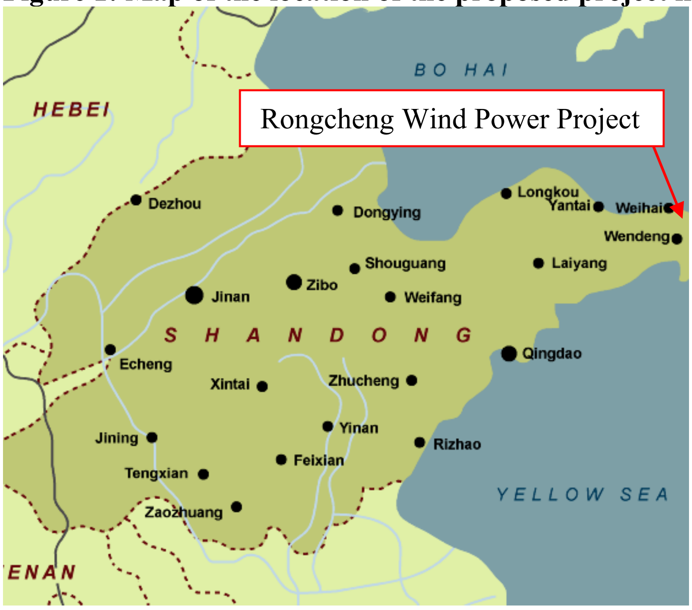
A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

The proposed project is located within 30m of the south side of a coastal road north of Rongcheng city, in Shandong Province, north China.

Figure 1 shows the location of the project in Shandong Province.

Figure 1: Map of the location of the proposed project in Shandong Province



A.4.1.1. Host Party(ies):

People's Republic of China

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

Shandong Province

A.4.1.3. City/Town/Community etc:

Rongcheng City

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

The location of the proposed wind farm is in Rongcheng city, Shandong Province which is located in the easternmost tip of Shandong Peninusla and surrounded by water in the east, north, and south with a coastline stretching 500 kilometers. The geographical coordinates of Rongcheng City are:
Site Longitude: 121° 11' E ~ 122° 42'E;
Site Latitude: 36° 41' N ~ 37°35' N

Rongcheng covers a total land area of 1,392 km^2 consisting of 15 towns, 4 provincial development zones and trading zones, 862 administrative communities, 94 residents' committees with a total population of

674,700. Along the coastline are lined two national first-grade open ports--Shidao Port & Longyan Port. Rongcheng, typical of its monsoon climate in the temperate zone, has a clear distinction among its four seasons with its average annual temperature 12°C, annual sunlight accumulated 2,600 hours, and annual rainfall 800mm.

Figure 2: Picture of the proposed project site

Figure 3: Picture of the proposed project site

Table 1: Site characteristics

Rongcheng Wind Power Project	
Yearly average wind speed (at hub height)	6.25 m/s
Wind power density (at hub height)	290.1 W/m^2
Prevailing wind direction	NW, NNW

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

Category: Renewable electricity generation in grid connected applications

Sectoral Scope: 1 Energy industries

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

With annual mean wind speed of 6.25m/s at the hub height of 74.5m, the wind resource in the region is considered adequate. The proposed project will have an average annual wind power density of 290.1W/m^2. For the proposed project, 39 units of 1250kw wind turbines are planned to be installed, with a total capacity of 48.75MW. The estimated annual operation hours is 1812 and capacity factor is 20.7%, the annual electricity output is expected to be 88.31 GWh. The layout of the gas turbines is planned to be:

- ✓ 33 turbines (#1-#33) will be aligned along the south side of coastal road from east (Chaoyang Harbour) to west (Xianren Bridge) with column spacing of 185 m and the total line width of the 33 units is 6km.

- ✓ 6 turbines (#34-#39) will be distributed from south west to north east in hilly area west eastern side of Xianren Bridge with row spacing of 210 m.

Table 2: Project nominal data

Rongcheng Wind Power Project	
Number of wind turbines	39
Nominal Capacity	1250 kW
Installed Capacity	48.75 MW
Capacity Factor	20.7 %
Yearly on-grid generated electricity	88.31 GWh
Cutting-in wind speed	3 m/s
Cutting-out wind speed	22 m/s

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 electricity generated by the project activity will be connected to the nearby Shandong Power Grid By the end of 2004, the installed power capacity of Shandong Province is 32.92GW, of which coal-fired power accounts for 99.8% as 32.86 GW[1]; the total power generation in Shandong Province is 163.98billion kwh, with coal-fired electricity as 163.92billion kwh, 99.96% of the total provincial power generation[2].Shandong Power Grid is dominated by coal-fired power since coal-fired power remains the most mature and economically competitive technology and will continue to dominate the power market in China. The electricity to be generated by the project will substitute electricity from coal-fired power plants in Shandong Power Grid. Hence the proposed project will save about 30 thousand tons of standard coal consumption and mitigate GHG emissions from coal fired power plants.

Wind resource in the region is considered adequate but not exceptional, with an average annual wind speed of 6.25m/s at the height of 74.5m, an average annual wind power density of 290.1W/m^2. There is no destructive wind, and the prevailing wind is steady and with high quality, which indicates a good prospective for development.

Chinese government formulated a series of policies to promote the development of wind power industry, however currently there are no compulsory rules for GHG emission reduction in the wind power sector.

In the absence of additional revenues, possibly from the CDM project activity, the proposed project will be difficult to operate and thus GHG emission reductions generated by the proposed project is unlikely to occur. Therefore the proposed project is proven to be additional and not the baseline scenario. The major barriers the proposed project faces are as follows:

- ✓ Compared with conventional fossil fuel projects, the proposed project is at disadvantageous position given the local availability of low-cost coal reserves and the resulting relatively low cost of coal-plant building and operation in China. The IRR of the proposed project is 8.31%

[1] Page 472, 2005 China Electrical Power Annual Book

[2] Page 474, 2005 China Electrical Power Annual Book

which is only economically marginal. In addition, the planned location of the proposed project in coastal area itself requires an additional capital cost on a strengthened foundation in civil works, which makes the return on the proposed project even less.

- ✓ Based on the conditions of wind resource it is therefore proposed to use advanced technology to optimise the power generation efficiency at lower wind-speeds. The turbine technology and core equipment for the project will be decided after selection through competitive bidding process, but some key components of the wind turbines need to be imported. Along with this, the proposed project will have technical barriers since wind power generation requires more technological know-how and capacity for maintenance and operation compared with conventional technology existing in China and therefore additional training for employees.

Thus from a technical perspective, a farm power plant is less attractive to Chinese power project developers and grid managers than conventional power plants.

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

The selected crediting period for the Roncheng Wind Power Project is 7 years. The crediting period may be renewed for a maximum of two further periods of 7 years each. The project is expected to generate an estimated annual emission reduction of 82,670 tCO2e and 560,070 tCO2e during the first crediting period - 2007 to 2014 (partial). Estimated emission reductions including detailed first crediting period are shown in the table below.

Year	Annual estimation of emission reductions in Tonnes of CO2 e
2007 (9 months)	62,002
2008	82,670
2009	82,670
2010	82,670
2011	82,670
2012	82,670
2013	82,670
2014 (3 months)	20,668
Estimated reductions during first crediting period	**578,690**
2014 (9 months)	62,002
2015	82,670
2016	82,670
2017	82,670
2018	82,670
2019	82,670
2020	82,670
2021	82,670
2022	82,670
2023	82,670
2024	82,670
2025	82,670
2026	82,670
2027	82,670

2028 (3 months)	20,668
Total estimated reductions (tonnes of CO2e)	**1,736,070**
Total number of crediting years	**21**
Annual average over the crediting period of estimated reductions (tonnes of CO2e)	**82,670**

A.4.5. Public funding of the project activity:

There is no public funding for the proposed project.

SECTION B. Application of a baseline methodology

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

ACM0002: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002/ Version 06, Sectoral Scope: 1, 19 May 2006) [3]

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

ACM0002: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" is applicable to grid-connected renewable power generation project activities under the following conditions:

1. Applies to electricity capacity additions from:
   - Run-of-river hydro power plants; hydro power projects with existing reservoirs where the volume of the reservoir is not increased.
   - New hydro electric power projects with reservoirs having power densities (installed power generation capacity divided by the surface area at full reservoir level) greater than 4 W/m^2.
   - Wind sources;
   - Geothermal sources;
   - Solar sources;
   - Wave and tidal.

The Guohua Wind Power Project involves 48.75 MW electricity capacity additions from wind power.

2. This methodology is not applicable to project activities that involve switching from fossil fuels to renewable energy at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site;

3. The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available.

Applying ACM0002 to the proposed Guohua 48.75MW Wind Power Project is justified because:

- ✓ The proposed project involves the electricity capacity additions from wind sources;

[3] http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

- ✓ The proposed project does not involve switching from fossil fuels to renewable energy at the site of the project activity;
- ✓ The geographic and system boundary of Shandong Power Grid can be clearly identified and information on the characteristics of the grid is available (refer to Section B4).

Therefore, the approved consolidated baseline methodology, ACM0002: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" is applicable to the proposed project. And this baseline methodology is used in conjunction with the approved consolidated monitoring methodology ACM0002: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources".

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

This section first outlines the selection of the baseline methodology and then summarises the steps to be taken to calculate the emissions from the baseline scenario.

Selection of baseline methodology

The baseline methodology ACM0002 only applies to grid connected renewable projects and is only applicable if the most likely baseline scenario is electricity production from other sources feeding into the grid. The methodology requires a detailed barrier analysis to be performed on each one of the plausible alternative scenarios identified in the additionality test. The option with the fewest barriers is taken to be the baseline scenario. These steps are explained below.

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

Under the current circumstances of the Chinese power sector there are four plausible alternatives to the project activity available to Guohua Resourceful (Rongcheng) Wind Power Generation CO., Ltd., which are:

1. No project activity undertaken (continuation of current practice).

Under this scenario the demand on the Shandong Power Grid would continue to be met by existing and new generation capacity according to business as usual, which in this case would mean predominantly coal fired plant.

2. Construction of a fossil fuel power plant of annual output equivalent to the proposed project.

Since wind power generally has a capacity factor of no more than 30%, while fossil plant is much higher (about double), an equivalent investment into a fossil fuel plant would yield 25 MW.

3. The proposed project activity NOT undertaken as a CDM project activity.

The development of a new wind farm with the same capacity (48.75MW) and without CDM support.

4. Commercial renewable power plant of equivalent capacity to the proposed project NOT undertaken as a CDM activity.

Since grid connected hydropower is the only renewable technology with investment returns comparable to those of wind developments, this alternative refers to hydropower plant of equivalent capacity.

2. Conduct a barrier analysis

A detailed barrier analysis is performed in Section B3. Table 3 below presents the summary of the results of the barrier analysis.

Table 3: Results of the barrier analysis

Barriers	Scenario 1: Continuation of current practice	Scenario 2: Fossil fuel plant of equivalent annual output	Scenario 3: Project activity NOT undertaken as a CDM project	Scenario 4: Renewable power plant of equivalent capacity, NO CDM
Current laws and regulations	• *N/A*	• *Fossil fuel power plant with capacity lower than 135 MW cannot be built in areas served by provincial and/or regional grid systems*[4]*. This Scenario is therefore eliminated in Step 1b of the Additionality Test.*	• *N/A*	• *N/A*
Investment barriers	• *N/A*	• *N/A*	• *High cost per MW* • *Decreasing prices in the sector.* • *Difficulties in obtaining loans* • *Additional investment needed to secure foundations and raise tower height*	• *Investment returns are comparable to wind power, but limited available resources in Shandong province.*

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

Technology barriers	• *N/A*	• *N/A*	• *Tidal coastal conditions may cause problems with the construction and foundations* • *Low, intermittent wind* • *Load hours are only 1812, this is below the widely acknowledged minimum of 2000 for commercial viability.* • *Requirement that 70% of equipment is to be produced domestically, this limits the application of tried and tested international technology able to operate at these low wind speeds.*	• *There are no suitable hydropower resources for medium-large scale plant development in the province.*

3. Justify the selection of baseline scenario

As shown in the summary table above and as described in more detail in Section B3, it is clear that one or more of the barriers identified in the barrier analysis affect the project scenario as well as all of the other alternative scenarios apart from **Scenario 1**: continuation of current practice.

Scenario 2 is discounted since it does not comply with prevailing laws and regulations.

Scenario 3: Barriers to the development of wind power in China are well documented, well known and presented in detail in Section B3. It is to some extent in order to address some of these barriers that the Government of China has initiated the National Wind Concessions Programme. In the context of the CDM, the Wind Concession Programme is a *Type E-* policy (national and/or sectoral policy and regulation). The Programme is the principal instrument through which the national Government intends to affect a scaling-up of wind development in China. Because it was approved after the adoption by the COP of the CDM Modalities and Procedures (decision 17/CP.7, 11 November 2001) the Wind Concession Programme is not taken into account when developing the baseline scenario as specified in Paragraph 3 of the EB16 Report; Annex 3[5].

Despite the national focus on the large scale deployment of wind power, individual projects cannot be considered to be business as usual, indeed project economics are generally considered to be marginal and there are a number of factors that act as barriers to wind power development in China. Wind power cannot be considered as the baseline situation in China and specifically for the proposed Project Activity in Shandong.

[5] UNFCCC (November 2005) EB 22 Report; Annex 3; "Clarifications on the consideration of national and/or sectoral policies and circumstances in baseline scenarios" available online at http://cdm.unfccc.int/EB/Meetings/022/eb22_repan3.pdf

Scenario 4 is discounted because of major technology barriers to hydropower development in the region which in turn hinder the financial returns of investments in the sector.

Scenario 1 is therefore selected as the project baseline. As such this project meets the requirements of the proposed methodology for the calculation of a combined margin, which is applied according to the following steps.

Summary of the baseline emissions determination

ACM0002 requires a baseline emission factor which is calculated as a combined margin consisting of the operating margin (OM) and the build margin (BM) factors according to the three steps outlined below. Details of the equations used can be found in Section D and in Annex 3.

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

Four methods are suggested in ACM0002 for the calculation of the Operating Margin:

1. Simple OM;
2. Simple adjusted OM;
3. Dispatch data analysis OM; and
4. Average OM.

ACM0002 methodology suggests that the dispatch data analysis OM should be the first choice where hourly dispatch data is available for all power plants in the top 10% of grid system dispatch order. In China such detailed data is not made publicly available, therefore it is not possible to use either the dispatch data analysis OM or the simple adjusted OM.

The average OM is used when low-cost /must run resources constitute more than 50% of total amount of power generation in the grid. Table 4 shows that zero emissions sources have accounted for less than 50% of the generation on the Shandong Power Grid on average over the last 5 years, therefore this method is not applicable to the project.

The simple OM is applicable where low-cost/must run resources constitute less than 50% of total grid generation based on 5 most recent year's data. Table 4 shows that zero emissions sources have accounted for less than 50% of the generation on the Shandong Power Grid on average over the last 5 years. Therefore the Simple OM is selected for the project and the operating margin $EF_{OM,y}$ is approximated by the generation mix of Shandong, excluding its zero emission sources. Emissions of CO_2 for the generation mix of the Shandong Power Grid can be directly calculated from the data provided in the China Electric Power Yearbook (published annually). This yearbook provides annual data on generation by fuel source and by province. The yearbook also provides information on the efficiency of coal generation plants that can be used to calculate the average emissions from coal-fired power plants. There is very limited generation from other fossil fuels in the generation mix[6] in the region and it is unlikely that there will be due to large coal reserves in the region.[7]

[6] Generation from other fossil fuels in Shandong accounted for less than 1% in 2005 and this is gong down year on year as more coal capacity is added to the grid.

[7] See Section B.4 for a description of the selection of the appropriate project boundary

Table 4: Power generation by sources in the Shandong Power Grid over the past 5 most recent years

	Generation (2000) GWh	%	Generation (2001) GWh	%	Generation (2002) GWh	%	Generation (2003) GWh	%	Generation (2004) GWh	%
	China Electric Power Yearbook 2002, page 573		*China Electric Power Yearbook 2002, page 617*		*China Electric Power Yearbook 2003, page 585*		*China Electric Power Yearbook 2004, page 709*		*China Electric Power Yearbook 2005 page 474*	
Coal	100054	100.0%	110404	100.0%	124162	99.9%	139547	99.8%	163918	99.8%
Gas	-	-	-	-		-	-	-	-	-
Oil	-	-	-	-		-	-	-	-	-
Hydro	30	0.0%	31	0.0%	15	0.0%	19	0.0%	41	0.0%
Nuclear	-	-	-	-		-	-	-	-	-
Other (Wind)	-	-	-	-	123	0.1%	266	0.2%	345	0.2%
Total	**100,085**	**100.0%**	**110,435**	**100.0%**	**124,300**	**100.0%**	**139,832**	**100.0%**	**164,304**	**100.0%**

Following ACM0002, the OM is calculated as the generation weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, excluding low-operating cost and must run power plants using a 3-year average, based on the most recent statistics at the time of PDD submission. The resulting EF_{OM} is constant throughout the selected crediting period.

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

The BM emissions factor ($EF_{BM,y}$) is the generation-weighted average emission factor (tCO_2/MWh) of a sample of power plants *m* excluding power plant capacity additions registered as CDM project activities.

The Build Margin is calculated *ex-ante*, based on the most recent information available on plants already built at the time of PDD submission. As such the Build Margin emission factor will be constant throughout the selected crediting period. According to ACM0002 the sample group *m* could consist of either:

- the five power plants that have been built most recently, or
- the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently; whichever comprises the larger annual generation.

The calculation of the Build Margin for the Rongcheng Wind Power Project makes use of aggregated data to identify the 20% most recent capacity additions (sample group *m*). This is identified by direct comparison of the total installed capacity on the Shandong Power Grid in the most recent year where data is available, in this case 2004, and with historical data from preceding years until the 20% threshold is achieved (refer to Table A3 in Annex3).

The percentage is calculated as follows:

$$\% \text{ Recent Capacity Additions} = [(C_{2004} - C_n)/ C_{2004}]^* 100$$

Where: C_{2004} is the capacity in 2004 (most recent year for which published data are available); and
C_n is the capacity in the reference year *n*.

This provides the percentage of new capacity additions that have been added since year *n*.

It will not always be possible to determine the exact most recent 20% of capacity additions from published sources. Therefore, in the interest of accuracy and of transparency, it is proposed to select the year since which the new capacity additions relative to the current year fall closest to 20% of total current capacity.

Comparing the installed capacity data from the latest China Electric Power Yearbook and from previous editions, it can be seen that the Build Margin is most accurately represented by new capacity added to the system since 2002. The vast majority of this new capacity was coal fired power plant, with the remainder being zero emission sources, principally hydro and wind[8].

Following guidance issued by the CDM Executive Board in response to a request for guidance from an accredited DOE[9] on the determination of the Build Margin in methodology AM0005 in China, $EF_{BM,y}$ is calculated as the capacity weighted average emissions factor of new installed capacity rather than the generation weighted factor. Furthermore, it is suggested in the same guidance note that the efficiency level of the best technology commercially available in the provincial/regional or national grid of China is used as a conservative proxy for each fuel type in estimating the fuel consumption when calculating the Build Margin. The suggested approach is followed in the determination of the Build Margin for the purposes of this project.

Step 3: Calculate the baseline emission factor (EF_y)

The baseline emission factor (tCO_2/MWh) is calculated as the weighted average of the OM emission factor and the BM emission factor where the weights w_{OM} and w_{BM}. The weighting of the OM and BM emissions factors used are the default values suggested by the methodology as follows:

$w_{OM} = 0.75$
$w_{BM} = 0.25$

According to the methodology for wind and solar projects, the default weights are as follows: $w_{OM} = 0.75$ and $w_{BM} = 0.25$ (owing to their intermittent and non-dispatchable nature).

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8 Comparing the installed capacity data for the years 1997 and 2003 from the relevant China Electric Power Yearbooks, it can be seen that 23.6% of new capacity was added to the system during this period. The build margin is currently represented by new coal (99.84%) and hydro plant (0%), with a small contribution from wind (0.16%).

9 **Exhibit C**: DNV letter to the CDM Executive Board; *Request for Guidance: Application of AM0005 and AMS-I-D in China* dated 07/10/2005 available online at http://cdm.unfccc.int/UserManagement/FileStorage/6POIAMGYOEDOTKW25TA20EHEKPR4DM

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:

Additionality argument for the Roncheng Wind Power Project

The consolidated tool for the demonstration and assessment of additionality is applied in ACM0002[10]. The tool provides a set of steps to demonstrate and assess additionality. These steps, with reference to the Rongcheng Wind Power Project, are illustrated in the following paragraphs.

Step 0: Preliminary screening of projects based on the starting date of the project activity
The proposed project does not wish to have the crediting period prior to the registration of their project activity.

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

Sub-step 1a: Define alternatives to the project activity
Under the current circumstances of the Chinese power sector, the plausible alternatives available to the project developer are as follows:
Under the current circumstances of the Chinese power sector there are four plausible alternatives to the project activity available to Guohua Resourceful (Rongcheng) Wind Power Generation CO., Ltd., these are:

1. No project activity undertaken (continuation of current practice).

Under this scenario the demand on the Shandong Power Grid would continue to be met by existing and new generation capacity according to business as usual, which in this case would mean predominantly coal fired plant.

2. Construction of a fossil fuel power plant of annual output equivalent to the proposed project.

Since wind power generally has a capacity factor of no more than 30%, while fossil plant is much higher (at least double), an equivalent fossil fuel plant would be of the order of 25MW.

3. The proposed project activity NOT undertaken as a CDM project activity.

The development of a new wind farm with the same capacity (48.75MW) and without CDM support.

4. Commercial renewable power plant of equivalent capacity to the proposed project NOT undertaken as a CDM activity.

Since grid connected hydropower is the only renewable technology with investment returns comparable to those of wind developments, this alternative refers to hydropower plant of equivalent capacity.

Sub-step 1b: Enforcement of applicable laws and regulations
Scenario 1 is clearly consistent with prevailing laws and regulations. According to the regulation and policies currently governing the Chinese power market, the Shandong Power Grid will have to guarantee power to meet the demand of the growing industrial and commercial sectors of the region.

Scenario 2: The expected capacity factor for the proposed wind project is approximately 21%. Modern coal fired power plants generally reach capacity factors of at least twice as much, whereas oil fired or gas fired power plants have even higher capacity. This means that fossil fuel-fired power plants with annual

[10] http://cdm.unfccc.int/methodologies/PAmethodologies/AdditionalityTools/Additionality_tool.pdf

power output comparable to the proposed project would have half or lower capacity than the Rongcheng Wind Power Project (50 MW or lower). According to Chinese regulations[11], fossil fuel-fired power plants of less than 135MW cannot be built in areas which are served by large grids such as provincial and regional grids like the Shandong Power Grid. Alternative scenario 2 does not comply with this regulation; therefore it cannot be considered to be the project baseline and is therefore eliminated.

Scenario 3 is also consistent with prevailing laws and regulations since the project has been approved by the local grid, pricing bureau and local development and reform commission.

Scenario 4: Renewable energy projects of equivalent size are possible under prevailing laws and regulations as long as the necessary local and national approvals are obtained. It is assumed for the purposes of this exercise that any such development is made respecting the prevailing laws and regulations.

Step 2: Investment analysis

In order to demonstrate the additionality of the proposed CDM project activity, a full investment analysis is not undertaken, nonetheless elements of it are incorporated in **Sub-step 3a** in the section regarding *Investment Barriers*.

Step 3: Barrier analysis

The following barrier analysis highlights the barriers that have been identified to be hurdles to the development of the proposed CDM project activity. These barriers also apply to the Scenarios 3 and 4 identified in **Step 1**, hence leaving the "current practice - no project" option as the only available alternative and, as such, the baseline scenario for the project. The barrier analysis is not applied to Scenario 2 as it was eliminated from the list of possible alternative options on the grounds of it being inconsistent with current laws and regulations.

Sub-step 3a: Identify barriers that would prevent implementation of type of the proposed project activity

(a) Investment Barriers

Scenario 1: Relative investment costs of developing conventional thermal power plants are lower than for any other technology. Local capital markets (debt and equity) are familiar with the costs and risks of power sector investments and a ready supply of capital continues to flow into reliable and rewarding investments in new conventional power additions under the prevailing climate of sustained rises in electricity demand across the economy. In the last two years, China has experienced severe power shortages in 22 provinces, autonomous regions and municipalities. Over the last 5 years nearly 13,000MW of new generation capacity has been added to the Shandong Power Grid, taking the total to 32,924MWin 2004 and of this almost 100% was in the form of conventional, coal-fired plant. The investment barriers to the continuation of current practice are lower than for the other options identified and help to define Scenario 1 as the most likely business-as-usual development scenario.

Scenario 3: Compared to grid-connected coal-fired and gas-fired power plants, grid connected wind power projects face several obvious financial hurdles, including higher cost per installed MW coupled with shorter and less reliable operating hours, compared with conventional energy, supply cost of wind power is still too high. The resulting lower returns on investment and associated risks are key contributing

[11] Notice on Strictly Prohibiting the Installation of Fuel-fired Generators with the Capacity of 135MW or below issued by the General Office of the State Council, decree no. 2002-6.

factors to the challenges of raising capital (equity and debt) for wind farm developments in China and elsewhere.

At present no other specific financial incentives are in place at the provincial and/or national level and wind developers must compete with other energy projects on a commercial basis. The Chinese government is now conducting studies on renewable energy quota systems and electricity feed-in tariffs. However, for a vast country with an unbalanced power supply situation like China it is not practical to unify a national renewable energy quota system, so there are no plans for a uniform feed in tariff policy, as has been adopted to scale up wind investments in several European countries. If such a policy were to evolve in China, the provinces and regional power grids will have to develop their own quotas and renewable grid connected power price and at present there are no such regional policies which would lead to investments on these grounds. This is one of the reasons why the Chinese government encourages the application for CDM financing for wind power projects to improve their financial viability.

In 2003, the Chinese Government launched the Wind Concessions Programme for the development of 100-200 MW wind farms in pre-selected sites. The aim of the wind Concession Programme is to bring down the overall costs of wind power development through competition, but at the same time this system is creating a distortion in the way wind power is priced as developers bid ever lower prices in order to win the tender. This in turn affects the overall pricing policy for wind generated power in the whole of China. This is driving down the returns in the sector and exacerbating the problems in obtaining commercial loans or attracting foreign investment.

Roncheng Wind Power Project

The total financial cost of developing the Roncheng Wind Power Project is estimated at 502.67 Million Yuan. Of this approximately 35% of total investment (176 MYuan) will be solved by the project company and the remaining will be sourced in the form of a loan from domestic Commercial Bank.

The securing of the loan is one of the last steps in completing the project financing package. This, coupled with the increased capital expenditure since the Feasibility Study has indicated that both the increased cost of foundations due to the costal nature of the project as well as the increased tower height required to achieve a suitable wind speed, contributes to increase the financial risk of the proposed project. In the Feasibility Study the increased costs of construction have been estimated as follows:

- Tower construction and material: 30% increase;
- Power line: 2 Million Yuan investment increase .

Moreover, the price of raw materials including steel and construction materials is rising and this trend is expected to continue. The resulting higher incremental equipment cost on facility procurement is likely to have a negative impact on the project return. The financial analysis reported in the Feasibility Study shows that the price secured for the development of the windfarm is only marginal without the additional costs identified above. The IRR of the project is only 8.31% (which is only 0.31% above the minimum IRR required to obtain project approval by the NDRC). Under these conditions the Guohua Rongcheng project is clearly commercially marginal without the financial contribution of CERs. With the CDM revenues, the return on investment be significantly improved mitigating the technological risks of the project.

Scenario 4: Grid-connected hydropower is the only renewable technology option which could provide a technically plausible renewable energy alternative to the project. Due to the limited availability of usable hydropower resources in the region (refer to Technology Barriers section below) there is no potential for the development of large size hydropower plants, thus the only option would be the construction of small scale hydropower plants[12]. The primary barrier to the development of small hydropower plants in the region and in China as a whole is represented by the diminishing returns on investment. A large initial capital investment, inefficient management, a lack of technology innovation and a lack of cohesion as a sector has meant that the electricity cost from small hydropower are all factors contributing to make it difficult for companies to compete on the power market[13] and indeed the economic return of an hydropower plant in the region is certainly less attractive than that of Scenario 1 and likely to be less attractive than that of the proposed project, with or without CDM.

(b) Technology Barriers

Scenario 1: The power sector of the Shandong Power Grid and of China as a whole is dominated by the use of coal for power supply. As such the technology know-how for the design, manufacturing, installation and operation of conventional thermal power is widely available in China. Thus there are not deemed to be any technology barriers to the continuation of current practice.

Scenario 3: Compared to conventional commercial thermal power plants the technology know-how requirements for wind energy power generation are much higher. Although Wind power has been recognized as optimal clean energy, wind power commercialization in China is however faced with a number of barriers due to lack of input in R&D.[14] In 2004 the rules of the Wind Concession programme required that 70% of the components should be domestically made and that the wind turbines should be assembled in China. As a consequence the industry is now using domestically manufactured equipment on a far greater scale than has been demonstrated before.

An additional technology risk specific to wind power development is represented by the degree of uncertainty in the annual power output of a wind farm due to natural fluctuations in available resources. This, combined to the lack of up to date mapping of wind resources across the various provinces of China, constitutes one of the main barriers to commercial investments in this technology. With regards to the proposed project, and considering the scale of the investment in question, the amount and quality of wind resource data available to the developer is not optimal, and as such this presents the additional risk of not being reliable when used for estimating the power output.

In particular whilst China's wind resource is vast, wind speeds are generally quite low and as in the case of the Roncheng Wind Power Project may be classified as a Class III resource, requiring specialised technology able to operate at low speeds as well as an increase to the height of the tower. Additionally the load hours are very low and the costal nature of the project requires further additional investment in the foundations. All of these factors act as major barriers to investment.

Scenario 4: As outlined in the *Investment Barriers* section, grid connected hydropower is the only renewable technology option which can be considered as a plausible alternative renewable energy investment. Despite China being the world's number one producer of hydro equipment, considerable

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[12] The definition of SHP in China is an installed capacity of up to 25MW, however stations of up to 50MW can be recognised as SHP so as to take advantage of the preferential state policies as specified on Tong Jiandong, "*Small Hydro on a Large Scale: Challenges and Opportunities in China*", Renewable Energy World, January – February 2003

[13] Tong Jiandong, "*Small Hydro on a Large Scale: Challenges and Opportunities in China*", Renewable Energy World, January – February 2003

[14] P124, "2005 China Electricity Power Annual Book"

technology barriers to the development of hydropower project exist. National hydro power resources are rich but spread unevenly and over 3/4 national hydro power resources are concentrated in the Western Region of the country. Only 13% national hydro resource has been developed. For the region of the project, hydro power resources are far from rich due to it is short of hydro resource, characterised by smooth wasteland and with a flat topography and therefore there are no major exploitable resources for the development hydropower plants in Shandong province. In 2004, hydropower represented only 0.15% of total capacity and this is only 60% of the capacity installed in 2000[15].

Sub-step 3b: Show that the identified barriers would not prevent the implementation of at least one of the alternatives

A summary of the results of the steps undertaken in order to identify the baseline scenario option for the proposed project is presented below.

Scenario 2: construction of a fossil fuel power plant of annual output equivalent to the proposed project, is not a viable option due to the rules and regulations for fossil fuel-fired plants, and is eliminated in ***Sub-step 1b***.

Scenario 3 identified in **Step 1** is the development of a wind farm equivalent to the proposed project activity, but without registering it as a CDM project activity. As such the barriers specified in ***Sub-step 3a*** would equally affect this alternative scenario as well as the proposed project. As a consequence the third alternative option cannot be considered as the project baseline.

Alternative **Scenario 4**: commercial renewable power plant of equivalent capacity to the proposed project NOT undertaken as a CDM activity cannot be considered to be the baseline scenario for the proposed project on grounds of the technological and financial barriers for hydropower developments in the region as discussed in ***Sub-step 3a***.

In conclusion, it is possible to assume that the only alternative option available is the no project option (**Scenario 1**). As such the provision by the Shandong Power Grid of an amount of electricity equivalent to the project output will be taken as baseline for the Guohua Rongcheng wind project.

Step 4: Common practice analysis

Reforms of the China power sector since the early 1990s, which have sought to increase the economic efficiency of electricity production and supply, have consolidated coal based thermal power as the country's primary source of power. In the face of booming economic growth (10.1% GDP growth in 2004) and the availability of coal as a low cost energy carrier and power provider, coal plants continue to grow at a greater rate than any other technology. Table 5 shows the growth rate of installed capacity in the Shandong Power Grid, by power source, where coal constitutes almost 100% of all capacity additions during the period 2000-2004[16]. Wind power is not the least cost option for electricity generation in China as a whole and in the Shandong Power Grid in particular where coal generates almost 100% of the power and wind only 0.16%. Indeed, in the last 5 years the proportion of coal fired capacity on the Shandong Power Grid has increased at the expense of zero emissions sources (principally hydro, and to a lesser degree wind).

[15] China Electric Power Yearbook, 2005

[16] **Exhibit D**: Baseline calculation spreadsheet

Table 5: Installed capacity by source for Shandong Power Grid (2000-2004)

	Coal	Hydro	Wind	Source
Installed capacity in 2000 (MW)	19,926	84	0	China Electric Power Yearbook 2001
Installed capacity in 2004 (MW)	32,860	51	12	China Electric Power Yearbook 2005
Proportion of total installed capacity in 2000	99.58%	0.42%	0.00%	Calculated
Proportion of total installed capacity in 2004	99.81%	0.15%	0.04%	Calculated
% increase over the period 2000-2004	64.91%	-39.6%	n/a	Calculated

As described in Section A.4.4 the Chinese government has recently begun to actively promoting wind power development in recognition of its environmental benefits. Early investments in wind power at the end of the 1990s and in the years immediately following were undertaken under non-commercial conditions with the support of preferential policies such as a "cost-plus profit" pricing mechanism which resulted in the development of a series of 10 – 20 MW wind farms. These measures gave the industry a foothold in China, but the sector still could not support commercial investments on this basis. At the same time, wider power sector reforms in China were resulting in the separation of power generation from transmission and distribution and the diversification in the ownership of generation capacity. As a result, new generation capacity, including wind power, was expected to compete under more commercial conditions. This only strengthened the prominent position of coal power in the Chinese power generation scenario.

Despite the fact that China is seen as one of the world's biggest future markets for wind, wind power development in China has lagged far behind the world leaders in the past 10 years. The total installed wind capacity had reached 764 MW at the end of 2004, whereas, in India the total capacity reached 3,000 MW. Between 1999 and 2002, only 211 MW was installed in China, while globally 18,000 MW was added during the same period[17]. A major breakthrough in the Chinese wind sector was the launch in 2003 of the Wind Concessions Programme for the development of 100-200 MW wind farms in pre-selected sites. This programme was designed to bring wind power development in China onto a new commercial footing in order to meet the Government's very ambitious wind power target of 4GW wind capacity by 2010.

In the context of the CDM, the Wind Concession Programme is a *Type E-* policy (national and/or sectoral policy and regulation). The Programme is the principal instrument through which the national Government intends to affect a scaling-up of wind development in China. Because it was approved after the adoption by the COP of the CDM Modalities and Procedures (decision 17/CP.7, 11 November 2001) the Wind Concession Programme is not taken into account when developing the baseline scenario as specified in Paragraph 3 of the EB16 Report; Annex 3[18].

The Chinese Renewable Energy Promotion Law was formally endorsed by the Standing Committee of the National People's Congress of China on 28 February 2005 and is the first national law on renewable

[17] Zhu Li (2005) "*China's renewables law*" available online at Earthscan http://www.earthscan.co.uk/news/article/mps/UAN/432/v/1/sp/

[18] UNFCCC (November 2005) EB 22 Report; Annex 3; "Clarifications on the consideration of national and/or sectoral policies and circumstances in baseline scenarios" available online at http://cdm.unfccc.int/EB/Meetings/022/eb22_repan3.pdf

energy containing explicit articles that support wind developments and other renewables. The law came into effect on January 1st 2006.

In the context of the CDM, the Chinese Renewable Energy Promotion Law is also a *Type E-* policy (national and/or sectoral policy and regulation). The new law is expected to have the greatest impact on wind power development, but because it was approved after the adoption by the COP of the CDM Modalities and Procedures (decision 17/CP.7, 11 November 2001) it will not be taken into account when developing the baseline scenario as specified in Paragraph 3 of the EB16 Report; Annex 3[19].

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

Serving the Shandong Power Grid are several other windfarms as listed in Table 6. Latter 2 of the 3 projects mentioned in Table 6 are below 20MW and are indeed 1/2 smaller than capacity of the proposed project and therefore projects with such small scale cannot serve as similar projects as reference.

Table 6 General information on wind power plants operated in 1999-2006 in Shandong Power Grid

Project Name	Turbine Model	Unit Capacity (KW)	Number of Units	Date of Operation	Total Installed Capacity (MW)
Shandong Changdao Wind Power Plant	Nordex (imported)	600	9	1999.5	44.75
	Nordex (imported)	600	2	2003.10	
	Windey (China)	750	2	2003.12	
	Goldwind (China)	600	7	2004.08	
	Windey (China)	750	7	2005.11	
	Gamesa (imported)	850	32	2006.1st quarter	
Shandong Jimo Fengshan Wind Power Plant	Nordex (imported)	300	1	2000.06.	16.4
	Nordex (imported)	1300	12	2003.08.	
	Nordex (imported)	250	2	2003.08.	
Shandong Qixia Runlin Wind Power Plant	Windey (China)	250	2	2003.10.	12.2
	Goldwind (China)	600	7	2004.09.	
	Goldwind (China)	750	10	2005.11.	

[19] UNFCCC (November 2005) EB 22 Report; Annex 3; "Clarifications on the consideration of national and/or sectoral policies and circumstances in baseline scenarios" available online at http://cdm.unfccc.int/EB/Meetings/022/eb22_repan3.pdf

Only one of the above three project – Changdao Wind Power Plant has a comparable scale with the proposed project. However over 84% of Changdao's total capacity and over 61% of Changdao's recent incremental capacity in 2006 was provided by imported technology and equipment. This is of fundamental differences from the current proposed project in terms of technology transfer and equipment importation and therefore cannot serve as similar project to refer to in Shandong province.

Sub-step 4b: Discuss any similar options that are occurring
The existence of the Changdao Wind Power Plant will not affect the additionality of the proposed project given the fundamental distinctions between the Changdao Wind Power Plant and the proposed project with respect to the sources of financing and tariff policy. The Changdao Wind Power Plant enjoyed a policy support with high tariff of RMB 0.90yuan/kWh[20]. Such high tariff will not be applied to the proposed project.

Step 5: Impact of CDM registration

The CDM was identified as a mechanism to strengthen the project finances at an early stage and indeed was integral to the project feasibility study that was approved by the Shandong Development and Reform Commission on 5th April 2006. The project developer considered CDM as absolutely necessary option to make the investment financially viable and was important to secure financing, otherwise the project's ability to meet loan repayments would be at risk.

Furthermore, when taking into account the additional financial barriers that the project is facing, including the low feed-in tariff and the increased investment costs (refer to B3), the CDM can be seen to be the mechanism to ensure the success of the project that will further the use of wind technology in the region. In conclusion, the impacts of CDM registration on the Guohua Rongcheng wind project are multiple and summarised below:

- An estimated GHG annual emissions reduction of 82,670 tons of CO_2
- The CER revenue potential has been taken into consideration by project financiers from an early stage and has been influential in securing the project loan finance.

[20] July 4th, Jijiage [2000]876 by National Development and Reform Commission "Notice on Issue of Adjusting Tariff to Shandong Power Grid"

- The CER revenue will enable the project developer to carry out additional training activities for staff and construction workers with regard to the new technology being employed. Moreover the additional revenue will help to ensure that the skills and knowledge gained by the project can be transferred through out China and especially to regions that do not enjoy the high wind speeds that are commonly found in the coastal regions and other regions with better wind resources.
- The CER revenues will enable the project developer to increase the revenues from the project, which on a yearly basis may be used to ensure that the operation and maintenance of the turbines given the uncertainty in costs that is inherent when using new technology.
- The CER revenue will ensure the ultimate success of the project that is currently, at best, marginal in terms of the return that can be expected.

To summarize, given the analysis of above steps, the proposed project justifies it's additional and not (part of) baseline scenario. Without the CDM revenues, the project activity would not be implemented smoothly. Instead, the equivalent electricity will be generated by conventional coal-fire and the reduction of GHG emissions in this project would not be realized.

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

The Guohua Rongcheng Wind Farm Project is located in Shandong Province, which is covered by Shandong Power Grid; the only separate provincial power grid among the 6 major power grids nationwide[21], as shown in Figure 4. Shandong Power Grid has been selected as the boundary for the project. Relevant data presented by Shandong province can be easily accessible on China energy statistical yearbook and China electric Power year book, however, data specifically for Shandong Power Grid is not available. Therefore, it is conservative to include only the available provincial data as the one of Shandong Power Grid. Although Shandong Power Grid was interconnected with the North China Grid Company Limited in 2004, exchanges between the grids are insignificant (shown in Table 7).

[21] China Energy Study Report-regional P189

Figure 4: Shandong Power Grid

Shandong Power Grid became subsidiary of newly established North China Grid Company Limited in Nov., 2003.[22] The electricity generated by Shandong Power Grid however was not physically connected into North China Grid Company until 2004 and the data available cannot demonstrate the interconnection.

Table 7 Net Electricity Power Imports/Exports to/from Shandong Province x 10(8) kWh

	2000	2001	2002	2003	2004
Import to Shandong	0	0	0	0	0
Export from Shangdong	0.12	0.33	0.56	0	0
Import/Export ratio (%)	0	0	0	0	0

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 Baseline Study:10/06/2006

Organisation	**Is organisation a Project Participant *Yes/No***
Alex Westlake and Zhang Jie CAMCO International Suite 906, Lucky Tower A, No. 3 North Road, East 3rd Ring Road, Chaoyang District, Beijing 100027, China Tel: (86 10) 8448 3025/3049/1385/1623 Fax: (86 10) 8448 2499/2432	No

[22] See China Electric Power Yearbook 2004 p.402

email: alex.westlake@camco-international.com gina@camco-international.com.cn Website: www.camco-international.com	
Madeleine Rawlins Energy for Sustainable Development Ltd Overmoor, Neston, Corsham, Wiltshire, SN13 9TZ, UK Tel: +44 1225 816830 Fax: +44 1225 812103 email: madeleine@esd.co.uk WWW: http://www.esd.co.uk	No

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:

01/04/2007

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

25 years

C.2 Choice of the crediting period and related information:

The proposed project will use a renewable crediting period.

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

01/04/2007

C.2.1.2. Length of the first crediting period:

7 years 0 months

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

n/a

C.2.2.2. Length:

n/a

SECTION D. Application of a monitoring methodology and plan

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

ACM0002: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" is applicable to grid-connected renewable power generation project activities under the following conditions:

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

ACM0002: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" is applicable to grid-connected renewable power generation project activities under the following conditions:

- Applies to electricity capacity additions from:
- Run-of-river hydro power plants;
- Hydro power projects with existing reservoirs where the volume of the reservoir is not increased;
- New hydro electric power projects with reservoirs having power densities (installed power generation capacity divided by the surface area at full reservoir level) greater than 4 W/m^2.
- Wind sources;
- Geothermal sources;
- Solar sources;
- Wave and tidal.

The Guohua Wind Power Project involves 48.75 MW electricity capacity additions from wind power.

2. This methodology is not applicable to project activities that involve switching from fossil fuels to renewable energy at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site.

3. The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available.

Applying ACM0002 to the proposed Guohua 48.75MW Wind Power Project is justified because:

- ✓ This monitoring methodology shall be used in conjunction with the approved baseline methodology ACM0002, and the proposed project has adopted the baseline methodology ACM0002.
- ✓ The proposed project involves the electricity capacity additions from wind sources;
- ✓ The proposed project does not involve switching from fossil fuels to renewable energy at the site of the project activity;
- ✓ The geographic and system boundary of Shandong Power Grid can be clearly identified and information on the characteristics of the grid is available (refer to Section B4).

In line with monitoring methodology ACM0002, option 1 is chosen as the monitoring method.

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

The Guohua Rongcheng wind project is a zero-emission electricity generating activity; therefore no emissions from the project activity were identified. As a consequence there are no entries to the following table (D.2.1.1) and no formulae were used to calculate emissions from the project (D2.1.2).

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.)

$E_{Py} = 0$

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_y**	Electricity supplied to the grid by the project	Shandong Power Grid	*MWh*	m	Hourly measurement and monthly recording	100%	Electronic and paper backup. Data shall be archived for 2 years following the end of the crediting period.	Data source: project developer Electricity measurements will be net of any on-site parasitic losses.
2 **EF**	CO_2 Emission Factor	Own calculation	tCO_2/MWh	c	Fixed for the purpose of CER calculation	100%	Electronic and paper backup. Data shall be archived for 2 years following the end of the crediting period.	Calculated *ex ante* as a weighted sum of emission factors of Operating Margin and Build Margin (see Annex 3). The emission factor is fixed throughout the crediting period.
3 **EF_{OM}**	Operating Margin Emission Factor	Own calculation	tCO_2/MWh	c	Fixed for the purpose of CER calculation	100%	Electronic and paper backup. Data shall be archived for 2 years following the end of the crediting period.	Calculated *ex ante* as F_{SCE} times CEF_{SCE} using 3-year average data
4 **EF_{BM}**	Build Margin Emission Factor	Own calculation	tCO_2/MWh	c	Fixed for the purpose of CER calculation	100%	Electronic and paper backup. Data shall be archived for 2 years following the end of the crediting period.	Calculated *ex ante* as weighted average emission factor of the 20% most recent power plants built
5 **F_{SCE}**	Total fuel consumption per unit of generated power	China Electric Power Yearbooks	t_{SCE} /GWh	c	Fixed for the purpose of CER calculation	100%	Electronic and paper backup. Data shall be archived for 2 years following the end of the crediting period.	Total fuel consumption for power generated on the Shandong Power Grid (expressed in Standard Coal Equivalent) per unit of generated power
6 **CEF_{SCE}**	CO_2 emission factor	Own calculation	tCO_2/t_{SCE}	c	Fixed for the purpose of CER calculation	100%	Electronic and paper backup. Data shall be archived for 2 years following the end of the crediting period.	CO_2 emission factor for fuel used for power generation in the Shandong Power Grid expressed per unit of Standard Coal Equivalent

7 **NCV_{SCE}**	Net calorific value of Standard Coal	Chinese National Standard GB2589-90	GJ/t_{SCE}	m	Fixed for the purpose of CER calculation	100%	Electronic and paper backup. Data shall be archived for 2 years following the end of the crediting period.	Calorific value of Standard Coal as obtained from the General Code for Comprehensive Energy Consumption Calculation
8 **CC_i**	Carbon content for fuel *i*	IPCC default value	tC/TJ	c	Fixed for the purpose of CER calculation	100%	Electronic and paper backup. Data shall be archived for 2 years following the end of the crediting period.	Average carbon content for fuel *i* used to generate power in the Shandong Power Grid derived from IPCC default values
9 **$OXID_i$**	Oxidation factor for fuel *i*	IPCC default value		c	Fixed for the purpose of CER calculation	100%	Electronic and paper backup. Data shall be archived for 2 years following the end of the crediting period.	National standard fuel oxidation factor for coal in China
10 **W_i**	Split of capacity	China Electric Power Yearbooks	%	c	Fixed for the purpose of CER calculation	100%	Electronic and paper backup. Data shall be archived for 2 years following the end of the crediting period.	Split according to fuel type of new capacity (%) amongst the 20% most recent plants built on Shandong Power Grid available from the China Electric Power Yearbook
11 **EF_i**	Emission factor for fuel *i*	Own calculation	tCO_2/MWh	c	Fixed for the purpose of CER calculation	100%	Electronic and paper backup. Data shall be archived for 2 years following the end of the crediting period.	Emissions factors of new plants of fuel type *i* included in the 20% most recent additions to the Shandong Power Grid calculated according to the best available technology targets for China as F_{BAT} * CEF_{SCE}
12 **F_{BAT}**	Fuel consumption per unit of generated power	China BAT as reported in "Country Specific Study - China Climate Changes"	t_{SCE} /GWh	e	Fixed for the purpose of CER calculation	100%	Electronic and paper backup. Data shall be archived for 2 years following the end of the crediting period.	China National target for fuel consumption efficiency for Best Available Technology expressed in tonnes of Standard Coal Equivalent available on http://www.ccchina.gov.cn/source/ca/ca2004112501.htm

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

The total baseline emissions E_{By} are given by:

$$E_{By}\ (tCO_2/yr) = EG_y * EF \quad \text{Eq. 1}$$

Where:
EG_y *(MWh/yr)* = Electricity supplied to the grid by the project each year (*1*);
EF (tCO_2/MWh) = GHG emission factor for the Shandong Power Grid. (*2*)

The emission factor EF for the Shandong Power Grid is calculated *ex ante* as a weighted sum of emission factors of Operating Margin and Build Margin as described in **Section B2**, ***Step 3***. The weights selected are the default ones as suggested by the methodology ACM0002.

$$EF\ (tCO_2/MWh) = (EF_{OM} * 0.75 + EF_{BM} * 0.25 \quad \text{Eq. 2}$$

The Operating Margin emission factor (EF_{OMy}) is the generation-weighted average emissions per electricity unit of all generating sources serving the system, excluding zero or low-operating cost and must run power plants. It is calculated ex ante using a 3-year average, based on the most recent statistics at the time of PDD submission and is calculated using the following equation:

$$EF_{OM}\ (tCO_2/MWh) = (F_{SCE} * CEF_{SCE}) * 1/1000 \quad \text{Eq. 3}$$

Where:
F_{SCE} (t_{SCE} /*GWh*) is the annual total fuel consumption for power generated on the Shandong Power Grid expressed in tonnes of Standard Coal Equivalent[23] per unit of generated power;
CEF_{SCE} (tCO_2/t_{SCE}) is CO_2 emission factor for fuel used for power generation in the Shandong Power Grid expressed per unit of Standard Coal Equivalent.

The CO_2 emission factor for Standard Coal CEF is calculated as:

$$CEF_{SCE}\ (tCO_2/t_{SCE}) = NCV_{SCE} * (CC_i * OXID_i * 44/12) * 1/1000 \quad \text{Eq. 4}$$

[23] China typically converts all its energy statistics into "metric tons of standard coal equivalent" (t_{SCE}). One ton of standard coal equivalent provides between 29.31 GJ/t_{SCE} (low calorific value) and 31.52 GJ/t_{SCE} (high calorific value). Reference available online at http://www.nap.edu/books/0309068878/html/92.html

Where:
NCV_{SCE} (GJ/t_{SCE}) is the net calorific value of Standard Coal as obtained from the General Code for Comprehensive Energy Consumption Calculation (Chinese National Standard GB2589-90);
CC_i *(tC/TJ)* is the average carbon content for fuel *i*[24] used to generate power in the Shandong Power Grid derived from IPCC default values for fuel carbon contents[25];
$OXID_i$ is national standard fuel oxidation factor for coal[26] in China; and
44/12 is the carbon conversion factor from tonnes of C to tonnes of CO_2.

The Build Margin is the weighted average emission factor of the 20% most recent power plants built[27]. The Build Margin emission factor is derived from the following equation:

$$EF_{BM}\ (tCO_2/MWh) = [\ \sum_{i,} (EF_{i,} * W_i)] \qquad \text{Eq. 5}$$

Where:
W_i is the split according to fuel type of new capacity (%) amongst the 20% most recent plants built; and
$EF_{i,}$ are the emissions factors of new plants of fuel type *i* included in the 20% most recent additions to the Shandong Power Grid. The determination of the emission factor of new plants of fuel type *i* is calculated according to the best available technology targets for China, rather than to the average of operating power plants. The plants emissions factor of new plants is calculated according to the following equation:

$$EF_i\ (tCO_2/MWh) = (F_{BAT} * CEF_{SCE}) * 1/1000 \qquad \text{Eq. 6}$$

Where:
F_{BAT} (t_{SCE} /GWh) is the Chinese target for fuel consumption efficiency for Best Available Technology expressed in tonnes of Standard Coal Equivalent[28] per unit of generated power;

---

[24] In the Shandong Power Grid excluding the low-cost, must run sources, the only fuel used to generate power is coal.

[25] Table 1-2; Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories : Workbook

[26] Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories : Workbook (Table 1-4)

[27] Since the published data for China is reported as aggregated data rather than by each individual generating unit, the capacity to be included in the Build Margin is identified by direct comparison of two reporting years where the difference between the two years is approximately 20% of the most recent year. The following equation is being used to determine the reference year:

% Recent Capacity Additions = $[(C_{2004} - C_n)/ C_{2004}] * 100$

Where: C_{2004} is the capacity in 2004; and
C_n is the capacity in the reference year *n*.

CEF_{SCE} (tCO_2/t_{SCE}) is CO_2 emission factor for fuel used for power generation in the Shandong Power Grid expressed in tonnes of Standard Coal Equivalent.

The CO_2 emission factor for Standard Coal is calculated as per the operating Margin. The tables in Annex 3 show the results from the application of these equations and provide a further explanation of how these are derived and applied.

The balance of electricity imports to and exports from the Shandong Power Grid compared to the overall generation on the grid is such that a correction to the grid emission factor is considered unnecessary and is therefore omitted from the monitoring protocol.

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:

[28] BAT: China's target efficiency for 2010 http://www.ccchina.gov.cn/source/ca/ca2004112501.htm

The Guohua Rongcheng wind project only gives rise to GHG emissions from the manufacturing of the equipment and the construction phase. According to the methodology ACM0002 here applied, these emissions do not need to be considered as leakage. Therefore the project activity does not claim any credit for the assumed reduction in indirect emissions below the baseline level; as a consequence no entries are made to table D.2.3.1 and no formulae are used to estimate leakage in D.2.3.2

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

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

$L_y = 0$

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 annual emission reductions ER_y for the project activity are calculated as the baseline emissions minus the project emissions minus leakage. Being the proposed project a zero-emission activity the final GHG emission reductions are calculated as follows:

$$ER_y\ (tCO_2/yr) = BE_y - PE_y - L_y = (EG_y * EF_y) - 0 - 0$$

Where:

EG_y *(MWh/yr)* = Electricity supplied to the grid by the project each year;
EF_y *(tCO_2/MWh)* = GHG emission factor of the Shandong Power Grid calculated as from Eq.2 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.
3-1	Low, 0.5% accuracy	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, 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.
3-2	Low	Following ACM0002 the emission factor for Shandong Power Grid and all the parameters required for its calculation are fixed throughout the crediting period.

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 following key tasks will be carried out:

1. Continuous measurement and monitoring (electronic data from windfarm) on wind farm, and staff shifts will be arranged to supervise the operation of transforming station. Staffing and institution set up will be as follows: 23 staff accounts overall, including: 3 for General Manager and vice general managers, 2 for general engineer and chief economist each, 2 for accountant and cashier each, responsible for operation and management of wind farm; 12 staffs on operation and maintenance, in charge of supervision, daily maintenance. 4 persons x 2 shifts, and 2 standby.

2. Daily supervision and timely data report:

Control center including production area and residence area, will be supervised on 24 hour shift

3. Electric communications cable connects each unit in wind farm and the monitoring system in central control center. Operation order sent by operator and the monitoring data will be transmitted through telecommunication cable. Operation data and parameter from each individual wind unit will be transmitted through monitoring system to Guohua Rongcheng Wind Farm office for supervision.

4. Staff will be trained on safe production and operation against the specific operation manual.

5. Safety inspector will be allocated to conduct safety inspection and emergency responses.

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

Organisation	**Is organisation a Project Participant *Yes/No***
Madeleine Rawlins Energy for Sustainable Development Ltd Overmoor, Neston, Corsham, Wiltshire, SN13 9TZ, UK Tel: +44 1225 816830 Fax: +44 1225 812103 email: madeleine@esd.co.uk WWW: http://www.esd.co.uk	No
Zhang Jie CAMCO International Suite 906, Lucky Tower A, No. 3 North Road, East 3rd Ring Road, Chaoyang District, Beijing 100027, China Tel: (86 10) 8448 3025/3049/1385/1623 Fax: (86 10) 8448 2499/2432 email: gina@camco-international.com.cn Website: www.camco-international.com	No

SECTION E. Estimation of GHG emissions by sources

E.1. Estimate of GHG emissions by sources:

The project is a wind power project and therefore does not give rise to any direct GHG emissions and as such no estimation of emissions is provided here.

E.2. Estimated leakage:

The Guohua Rongcheng wind project only gives rise to emissions from the manufacture of the equipment and the construction phase. According to the methodology ACM0002 here applied, these emissions do not need to be considered as leakage. Also, by extension, the project activity does not claim any credit for the assumed avoidance of indirect emissions in construction of new power capacity in the baseline.

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

E.3 = E.1 + E.2 = 0

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

Step 1: Calculation of the Operating Margin emission factor ($EF_{OM,y}$)

$EF_{OM,y}$ = 0.959 tCO_2/MWh

Step 2: Calculation of the Build Margin emission factor ($EF_{BM,y}$)

$EF_{BM,y}$ = 0.868 tCO_2/MWh

Step 3: Calculation of the baseline emission factor (EF_y)
The annual combined margin is calculated as the weighted average of the OM emission factor ($EF_{OM,y}$) and the BM emission factor ($EF_{BM,y}$):

$$EF_y = w_{OM} * EF_{OM,y} + w_{BM} * EF_{BM,y}$$

Using the weights as specified in **Section B2**, the estimated values for the baseline emission factor is:

Operating Margin	***Build Margin***	***Combined Margin***
w_{OM} = 0.75	w_{BM} = 0.25	EF_y = 0.936 tCO_2/MWh
$EF_{OM,y}$ = 0.959 tCO_2/MWh	$EF_{BM,y}$ = 0.868 tCO_2/MWh	

Step 4: Calculation of the baseline emissions (*BE_y*)

$BE_y = EG_y * EF_y$

E.4 = 88,312 MWh* 0.936 tCO_2/MWh = 82,670 tCO_2

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

Since the direct and indirect emissions from the project activity are both zero, the annual emission reductions of the project activity are equivalent to the annual emissions of the baseline as calculated in E4.

E.4 – E.3 = E.4 = 82,670 tCO_2

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

Year	Estimation of Project Activity Emissions (tonnes of CO_2e)	Estimation of Baseline Emissions (tonnes of CO_2 e)	Estimation of Leakage (tonnes of CO_2e)	Estimation of Emission Reductions (tonnes of CO_2 e)
2007 (9 months)	0	62,002	0	62,002
2008	0	82,670	0	82,670
2009	0	82,670	0	82,670
2010	0	82,670	0	82,670
2011	0	82,670	0	82,670
2012	0	82,670	0	82,670
2013	0	82,670	0	82,670
2014 (3 months)	0	20,668	0	20,668
7 Year Total (tones of CO_2 e)	**0**	**578,689**	**0**	**578,689**
21 Year Total (tones of CO_2 e)	**0**	**1,736,067**	**0**	**1,736,067**

SECTION F. Environmental impacts

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

An Environmental Impact Assessment (EIA) for the Guohua Rongcheng Wind Power project was completed by the Rongcheng Academic Institute of Environmental Protection and was approved by Shandong Environment Protection Bureau in February, 2006. Construction of the project was registered in Shandong Development and Reform Committee according to the current regulation.

A summary of the impacts is presented below. The environmental impacts are not deemed to be significant.

Analysis of the impacts on the ecosystem

It is expected that the photosynthesis and respiration of plants thus the growth of plants will be potentially impacted by the transportation, digging and installation of equipment during the construction of the project.

The project is planned to construct in the undeveloped land north of Chengshan forest farm, therefore, it will not occupy forest land.

Analysis of the impacts to the air environment

Due to the comparative scattered construction sites including multiple function building, tower, electrical cable frame and channel, the ground dust will be generated and will thus impact atmosphere environment in limited scope. The impact on the atmosphere from the project will occur mainly at the stage of construction.

Analysis of the impacts on local waters
During the project construction phase the daily use of water by the workers will be solved by digging wells. The wastewater generated during equipment rinse is low in quantity (amount to approximately 0.6m3/day) and will be used to irrigate forest and plants and will not bring negative impact to environment.

Analysis of the noise impacts
Noise during construction will be mainly caused by wind turbine on operation. Low noise wind turbine will be applied in this project to mitigate the noise effect. In addition, noise shuffling facility will be installed in the connection of wind turbine and improved noise mitigation materials will be used. Noise is estimated less than 60dB(A) tested in the pedestal of wind turbine. The designed distance between all wind turbines and the closest residence is 1km. Therefore noise is in accordance with international and national relevant regulations. The impact of noise is thus not significant.

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:

The environmental impacts of the Guohua Rongcheng Wind Power Project are not considered significant.

SECTION G. Stakeholders' comments

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

The comments from local stakeholders were collected during process of project Feasibility Study and public Stakeholder Meeting.

During the project Feasibility Study, some public comments concerning the potential environmental impact and construction due to the project (summarized in G2 of the PDD) were collected.

An open public Stakeholders Meeting aiming to make the local residents understand the wind farm project of Guo Hua Rong Cheng Co. Ltd. and to learn what their opinion towards the wind power CDM project was conducted on Mar. 8, 2006 in local community - Cheng Shan Township People's Government, Rong Cheng City with over 30 representatives from local community including local authority participated and commented.

Following picture shows the site of stakeholder meeting:

G.2. Summary of the comments received:

A few questions and comments from the public were raised concerning on the occupation of farmland, wind turbine noise and natural scene change etc, summarized as follows:

(1) About the expropriation of land
Whether there will be problems regarding basic cropland occupation of the wind farm construction.

(2) About wind turbine noise
The noise problem, if any, is expected to be avoided during the coming construction of the wind farm.

(3) About natural scene
Hope the construction of the project will improve, or at least not impact surrounding landscape.

Meanwhile, the forum gave the residents attending the meeting a good opportunity to understand the concept of a CDM project. Participants said unanimously that they will support and give their attention to the construction of the wind farm project.

Following picture shows the signed name list of partial participants to the stakeholder meeting:

附件一：参加会议群众名单

序号	姓名			
1	[illegible]	[illegible]	[illegible]	
2	[illegible]	[illegible]	[illegible]	
3	[illegible]	[illegible]	[illegible]	
4	[illegible]	[illegible]	[illegible]	
5	[illegible]	王清海	[illegible]	
6	[illegible]	[illegible]	[illegible]	
7	[illegible]	[illegible]	周永强	
8	[illegible]	[illegible]	[illegible]	
9	[illegible]	[illegible]	[illegible]	
10	[illegible]	[illegible]	[illegible]	

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

The questions and concerns from the public were clarified and responded as follows:

(1) About the expropriation of land
According to the technological process and practice, the wind turbines are laying out at the clearings and green belts area at the south side of the surrounding sea road along the north part of Cheng Shan Town, each wind turbine will only occupy 50m^2 area. This is no occupying basic cropland problem within the wind farm .

(2) About wind turbine noise
The designed distance between all wind turbines and scattered residential housings is accordance with international and national relevant regulations. It will not cause noise pollution. T his is also reflected in EIA report.

(3) About natural scene
The natural scene of surrounding sea road along the north part of Cheng Shan Town is very beautiful, the establish of the wind farm project will add in one special beautiful scene for it, it will help the local tourism resource development.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Guohua Resourceful (Rongcheng) Wind Power Generation CO., Ltd.
Street/P.O.Box:	30-1 Jiefang Road
Building:	30-1 Jiefang Roa
City:	Jinan
State/Region:	Shandong
Postfix/ZIP:	250014
Country:	P.R.China
Telephone:	+86 531 8838 9377
FAX:	+86 531 8892 0775
E-Mail:	gongyufei@sd-guohua.com
URL:	
Represented by:	Gong Yufei
Title:	Vice General Manager
Salutation:	
Last Name:	Gong
Middle Name:	
First Name:	Yufei
Department:	
Mobile:	
Direct FAX:	+86 531 8892 0775
Direct tel:	+86 531 8838 9377
Personal E-Mail:	gongyufei@sd-guohua.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding for the Roncheng Wind Power Project.

Annex 3

BASELINE INFORMATION

The Tables below summarise the numerical results from the application of the ACM0002 methodology to the current project.

Step 1: Calculation of the Operating Margin emission factor ($EF_{OM,y}$)

TABLE A1	A	B	C	D	E	F	G	H	I
	Generation in NCPN GWh	Fuel Consumption t_{SCE}*/GWh	Fuel Consumption t_{SCE}/year	Fuel Calorific Value GJ/t_{SCE}	CO_2 Emission Factor tCO_2/GJ	CO_2 Emission Factor tCO_2/t_{SCE}	Emissions tCO_2/year	Total Included Generation	Emissions Factor tCO_2/MWh
	China Electric Power Yearbooks	*China Electric Power Yearbooks*	*=A*B*	*The General Code for Comprehensive Energy Consumption Calculation (Chinese National Standard GB2589-81)*	*Average carbon content for fuel (IPCC) * Average Oxidation Factor (IPCC)* 44/12*	*=D*E*	*=C*F*	*MWh (from Table A2 * 1000)*	*=G/H*
2002 - CEPY 2003 (Pages 585 & 591)									
Coal	124,162	361	44,822,482	29.3	0.0927	2.7163	121,753,298		
Total							121,753,298	124,162,000	**0.981**
2003 - CEPY 2004 (Page 709 & 670)									
Coal	139,547	361	50,376,467	29.3	0.0927	2.7163	136,839,834		
Total							136,839,834	139,547,000	**0.981**
2004 - CEPY 2005 (Page 474 & 472)									
Coal	163,918	337	55,240,366	29.3	0.0927	2.7163	150,051,859		
Total							150,051,859	163,918,000	**0.915**
3 Year Average									**0.959**

* SCE: Standard Coal Equivalent

IPCC Values

tC/TJ for Coking Coal and Other Bitumous Coal	25.8	Table 1-2 Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories : Workbook
Oxidation factor	0.98	Table 1-4 Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories : Workbook

The application of Equations 3 and 4 (see Section D2.1.4) to obtain a three year average Operating Margin is shown in Table A1 above, where Column A identifies the input data in terms of amount of included generation (GWh) from each fuel type included in the generation mix.

The fuel consumption data in Column B, above, is a physical unit publicly reported in the China Electric Power Yearbook each year for the amount of fuel consumed per unit of power generated in Column A.

The carbon contents of fuels are obtained from IPCC data[29] since this information is not available locally. Column E, reports the carbon content of each included generation fuel corrected by the average fuel oxidation factor[30] to give actual carbon emissions. The actual carbon emissions factor for each fuel is then converted into the CO_2 emissions factor, as these are the units of $COEF_i$ required by ACM0002.

Chinese conversion factors for coal and other fuels are given by Chinese National Standard (GB2589-90)[31]. For solid fuel, this gives 1 kg Standard Coal Equivalent = 29.27 MJ = 7, 000 Kcal, using low heat value.

The input values for power generation in Shandong Power Grid for years 2001, 2002 and 2003 appearing in Column A, Table A1 are obtained from the China Electric Power Yearbook according to the calculations shown in Tables A2 below:

---

[29] See Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook .page 1.6

[30] See Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook .page 1.8

[31] The General Code for Comprehensive Energy Consumption Calculation (China National Standard GB2589-90

)

TABLE A2 - 2002	A	B	C	D
	Generation (2002) GWh	Excluded Sources	Included Generation GWh	Excluded Generation GWh
	China Electric Power Yearbook 2003, page 585	*Baseline Methodology*	*(=A) if included*	*(=A) if excluded*
Coal	124,162		124,162	-
Gas	-		-	-
Oil	-		-	-
Hydro	15	X	-	15
Nuclear	-	X	-	-
Other (Wind)	-	X	-	-
Total	124,177		124,162	15

TABLE A2 - 2003	A	B	C	D
	Generation (2003) GWh	Excluded Sources	Included Generation GWh	Excluded Generation GWh
	China Electric Power Yearbook 2004, page 709	*Baseline Methodology*	*(=A) if included*	*(=A) if excluded*
Coal	139,547		139,547	-
Gas	-		-	-
Oil	-		-	-
Hydro	19	X	-	19
Nuclear	-	X	-	-
Other (Wind)	-	X	-	-
Total	139,566		139,547	19

TABLE A2 - 2004	A	B	C	D
	Generation (2004) GWh	Excluded Sources	Included Generation GWh	Excluded Generation GWh
	China Electric Power Yearbook 2005, page 474	*Baseline Methodology*	*(=A) if included*	*(=A) if excluded*
Coal	163,918		163,918	-
Gas	-		-	-
Oil	-		-	-
Hydro	41	X	-	41
Nuclear	-	X	-	-
Other (Wind)	16	X	-	16
Total	163,975		163,918	57

Step 2: Calculation of the Build Margin emission factor ($EF_{BM,y}$)

The application of Equation 5 and 6 (see Section D2.1.4) to obtain the Build Margin is shown in Table A3 below.

TABLE A3	A	B	C	D	E	F	G	H	I	J
	Installed Capacity 2002	Installed Capacity 2004	New Capacity Additions	Split of New Capacity	Fuel Consumption	Fuel Calorific Value	CO_2 Emission Factor	CO_2 Emission Factor	Emissions Factor	Weighted Average Build Margin Emissions Factor
	MW	MW	MW	%	t_{SCE}*/GWh	GJ/t_{SCE}	tCO_2/GJ	tCO2/t_{SCE}	tCO_2/MWh	tCO_2/MWh
	China Electric Power Yearbook 2003, page 584	*China Electric Power Yearbook 2005, page 473*	*= B - A*		BAT: China's target efficiency for 2010 http://www.ccchina.gov.cn/source/ca/ca2004112501.htm	*The General Code for Comprehensive Energy Consumption Calculation (Chinese National Standard GB2589-81)*	*Average carbon content for fuel (IPCC) * Average Oxidation Factor (IPCC)* 44/12*	*= F * G*	*= E * H/1000*	*= D * I*
Hydro	50.80	50.80	0.0	0.00%						0.000
Coal	25,102.40	32,860.40	7,758.0	99.84%	320	29.3	0.0927	2.7163	0.869	0.868
Nuclear	0.00	0.00	0.0	0.00%						0.000
Other (wind)	0.00	12.30	12.3	0.16%						0.000
Total / % Change	**25,153.2**	**32,923.5**	**7,770.3**	**23.6%**						**0.868**

The calculation of the Build Margin for the Guohua Rongcheng project is *ex ante*, based on the most recent information available at the time of PDD submission. As such it is fixed for the duration of the crediting period.

Step 3: Calculation of the baseline emission factor (EF_y)

The combined margin is calculated as the weighted average of the OM emission factor ($EF_{OM,y}$) and the BM emission factor ($EF_{BM,y}$) according to Equation 2 (see Section D2.1.4). The results are shown in Table A4 below:

TABLE A4		Units	Equation or Source	
A	Operating Margin emissions factor	tCO_2/MWh	Table A1	0.959
B	Build Margin emissions factor	tCO_2/MWh	Table A3	0.868
C	Baseline emissions factor	tCO_2/MWh	(=F3*0.75+F4*0.25)	**0.936**

Step 4: Calculation of the baseline emissions (*BE_y*)

The application of the baseline emission factor to the current project gives total emission reductions for the crediting period according to the estimates shown in Table A5. These are based on the assumption that annual generation from the wind farm will be of 88,312MWh. The annual emission reductions will be calculated *ex post* using the actual generation from the Guohua Rongcheng wind power plant and the baseline emission factor (from Table A4) using the following equation:

$BE_y = EG_y * EF_y$

TABLE A5		Units	Equation or source	
A	Guohua Roncheng Wind Project	MW	Feasibility Study	48.75
B	Capacity factor	%	Feasibility Study	20.7%
C	Annual generation	MWh	(=A * B * 8760)	88,312
D	Baseline emissions rate	tCO_2/MWh	See Table A4	0.936
E	Annual emissions reductions	tCO_2	(= C * D)	**82,670**
F	Crediting period	years	Project developer	2007 - 2028
G	Crediting lifetime	years	Project developer	21
H	Total emissions reductions over crediting lifetime (first 7-year period)	tCO_2	(= E * G/3)	**578,689**
I	Total emissions reductions over crediting lifetime (21-year period)	tCO_2	(= E * 21)	**1,736,067**

Annex 4

MONITORING PLAN

The monitoring requirements for the Guohua Rongcheng wind power project request the project developer to monitor the annual generation from the Guohua Rongcheng wind farm. All the other parameters for the calculation of the baseline emission factor are fixed throughout the crediting period.