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

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

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Heilongjiang Wuerguli Wind Power Project
Version number of the document: 02
Date: 10/03/2009

Revision history of PDD

Version	Date	Comment
1.0	14/07/2008	PDD for global stakeholder consunltation

A.2. Description of the project activity:

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The Heilongjiang Wuerguli Wind Power Project (hereafter referred to as the Project) is sited on the Wuerguli Mountain which is 20 km southeast to Fujin City of Heilongjiang Province, P.R.China. It is invested and operated by Heilongjiang Fulong Wind Power Co., Ltd.

The total installed capacity of the Project is 30 MW with 20 sets of turbines with a unit capacity of 1500 kW. The estimated electricity supplied to the Northeast China Grid by the Project is 71,945 MWh per year.

Prior to the Project, the electricity provided by the Project is provided by Northeast China Grid, which is mainly composed of traditional fossil fuel fired power plants and thus generates CO_2 emissions. This is also the baseline scenario.

It is expected that the Project as a renewable energy source will generate emission reductions of about 82,456 tCO_2e per year by avoiding CO_2 emissions from the same amount of electricity generation from Northeast China Grid, which is mainly composed of traditional fossil fuel fired power plants.

Grid connected wind power development is listed in the *Renewable Energy Law*[1], the *2005 Guiding Catalogue of Industrial Structure Regulation Issued by National Development and Reform Commission*[2] and the *Development Plan in New Energy Sources and Renewable Energy Sources from Year 2000 to 2015* as development priority of China[3]. The Project will not only supply renewable electricity to the grid, but also contribute to sustainable development of the local community, the host country and the world by means of:

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

1 Http://nyj.ndrc.gov.cn/nygz/t20060209_59146.htm.
2 Http://tzs.ndrc.gov.cn/xkxmql/xkxmyj/t20051221_78938.htm.
3 Http://www.chinainfo.gov.cn/data/200107/1_20010731_9469.html.

A.3. Project participants:

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Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
P.R.China (host)	Heilongjiang Fulong Wind Power Co., Ltd. (Project owner)	No
The Netherlands	Energy Systems International B.V.	No

More detailed contact information on the Project participants is provided in Annex 1.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

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The Host Country is the People's Republic of China.

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

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Heilongjiang Province

A.4.1.3. City/Town/Community etc:

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Dayushu Town/ Fujin City

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

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The Project is sited on the Wuerguli Mountain within Dayushu Town, Fujin City of Heilongjiang Province, P.R.China. The Project has geographical coordinates with east longitude from 132º15'41″ to 132º18'13″ and north latitude from 47º13'55″ to 47º14'33″. All of the 20 sets of wind turbines are sited in middle ridge of Wuerguli Mountain.

Fujin City is sited in the middle of the Sanjiang Plain in northeast Heilongjiang Province, on the north bank downstream of the Songhuajiang River and 150 km east to the Jiamusi City. Wuerguli Mountain is located 20 km southeast to Fujin City. Figure 1 shows the location of Fujin City. Figure 2 shows the location of the Project.

Figure 1: Location of Fujin City

Figure 2: Location of Wuerguli Mountain

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

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The objective of the Project is to utilize wind power to generate electricity. It falls into sectoral scope 1: energy industries (Renewable sources).

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

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Prior to the Project, the electricity provided by the Project was provided by Northeast China Grid, which is mainly composed of traditional fossil fuel fired power plants and thus generates CO_2 emissions. This is also the baseline scenario.

The total installed capacity of the Project is 30 MW with 20 sets of turbines with a unit capacity of 1500 kW. The turbines of FL1500/70 type manufactured by Sinovel Wind Co., Ltd were finally selected for the Project. The technology adopted by the Project is introduced from German while the turbines are manufactured mainly in China. The Project employs domestically manufactured turbines that involve no technology transfer from abroad. Implementation of the Project will contribute to promotion of localization of equipment production. Key technical indicators of the turbine and other major equipments are listed in Table 1. The estimated electricity supplied to the Northeast China Grid via a 66 kV outlet circuit by the Project is 71,945 MWh per year, and the annual average operating hour is 2398 h.

The electricity supplied to the grid and imported from the grid by the Project will be measured by the meter installed at the main substation on site.

Table 1. Key technical indicators

Turbine	Height(m)	65
	Blade number	3
	Rotor diameter(m)	70.5
	Cut-in wind speed(m/s)	4
	Rated wind speed(m/s)	15
	Cut-out wind speed(m/s)	25
	Blade rotating speed(rpm)	20~25
	Rated voltage(V)	690
	Output factor of generator	0.99
	Lifetime(years)	20
Main substation	Capacity	31500KVA
	Rated voltage(V)	66,000
	Life time(years)	20

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

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Renewable crediting period (7yrs×3) is adopted by the Project. It is expected that the project activities will generate emission reductions for about 82,456 tCO_2e per year over the first 7-year crediting period from Jul., 2009 to Jun., 2016.

Years	Annual estimation of emission reductions in tonnes of CO_2e
Jul to Dec, 2009	41,228
2010	82,456
2011	82,456
2012	82,456
2013	82,456
2014	82,456
2015	82,456
Jan to Jun,2016	41,228
Total estimated reductions of the first crediting period (tonnes of CO_2e)	**577,192**
Total number of the first crediting years	**7**
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	**82,456**

A.4.5. Public funding of the project activity:

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

SECTION B. Application of a baseline and monitoring methodology

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

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Approved consolidated baseline and monitoring methodology ACM0002 (ver 07): "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" and monitoring methodology.

The *Tool to calculate the emission factor for an electricity system* ver 1.1

The *Tool for the Demonstration and Assessment of Additionality* ver 5.2

For more information regarding the methodology please refer to http://cdm.unfccc.int/methodologies/approved.

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

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Wind power generation technology is a renewable electricity generation technology which displaces fossil fuel fired power generation technology to supply electricity to the grid. Therefore the Project applies the consolidated baseline methodology ACM0002 approved by CDM EB to determine the project baseline and calculate GHG emission reductions achieved by wind power generation.

The Project meets all applicability conditions of the consolidated baseline methodology ACM0002 as follows:

1） The Project involves the electricity capacity additions from the wind power plant.

2） The Project does not involve switching from fossil fuels to renewable energy at the site of the project activity.

3） The geographic and system boundaries for the Northeast China Grid can be clearly identified and information on the characteristics of the Northeast China Grid is available[4].

According to the consolidated baseline and monitoring methodology ACM0002, the emission factor of the electricity system is determined by using the *Tool to calculate the emission factor for an electricity system* approved by CDM EB and the additionalitiy of the Project is demonstrated and assessed by using the *Tool for the Demonstration and Assessment of Additionality* approved by CDM EB.

B.3. Description of how the sources and gases included in the project boundary

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As per the baseline methodology ACM0002 (ver 07), the delineation of grid boundaries as provided by the DNA of the host country is used.

Electricity generated by the Project will be supplied to the Heilongjiang Power Grid. According to the *China's Regional Grid Baseline Emission Factors* issued by China's DNA which provides the

4 Detailed information of the grid in China can be obtained from the *China Electric Power Yearbook* (from 2004 to 2006), the *China Energy Statistical Yearbook* (from 2004 to 2006) and the *China's Regional Grid Baseline Emission Factors* made publicly available on the website of China's DNA (http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=1889) on August 9th, 2007.

delineation of grid boundaries, Heilongjiang Power Grid is an integral part of the Northeast China Grid and the Northeast China Grid is the grid boundary of the Project. The Northeast China Grid is composed of Heilongjiang Power Grid, Jilin Power Grid and Liaoning Power Grid.

The spatial extent of the project boundary includes the project site and all power plants connected physically to the Northeast China Grid that the CDM project power plant is connected to and power flows within the grid system without any significant transmission constrains.

Overview of the emission sources included in or excluded from the project boundary is provided in Table 2 and Figure 3.

Table 2: Overview of the emission sources included in or excluded from the project boundary

	Source	Gas	Included?	Justification/Explanation
Baseline	Electricity generation of those fossil fuel-fired power plants connected into the Northeast China Grid.	CO_2	Yes	Main emission sources.
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
Project activity	Project emission	CO_2	No	The Project is a wind power project that the project emissions should not be considered as per ACM0002.
		CH_4	No	
		N_2O	No	

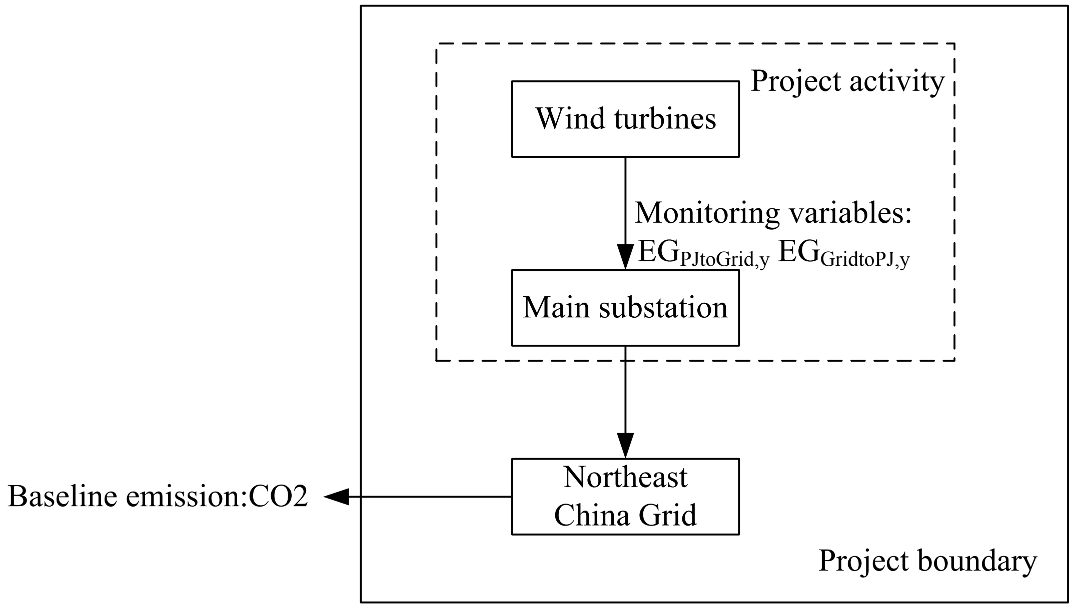

Figure 3 Flow diagram of the project boundary

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

According to the consolidated baseline methodology ACM0002, if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

Electricity supplied to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".

The Project is the installation of a new grid-connected renewable power plant that connects with and delivers electricity to the Heilongjiang Power Grid. According to the "Tool to calculate the emission factor for an electricity system", the delineation of grid boundaries of the Project is the Northeast China Grid. According to the consolidated baseline methodology ACM0002, the baseline scenario of the Project is "the provision of an equivalent amount of annual power output by the Northeast China Grid which the Project is connected to". Detailed analysis please refers to Section B.5.

B.5. **Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality)**:

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Turbines Purchase Agreement was signed on 28/02/2008. Then *Construction Contract* was signed on 15/03/2008 and the construction of the Project started on 25/03/2008. According to the definition of the "the start date of a CDM project activity" provided in paragraph 67 of EB41 meeting report, the starting date of the Project is determined as 28/02/2008. The starting date of the Project is prior to both 02/08/2008 and the date of publication of the PDD for global stakeholder consultation. According to *Guidance on the Demonstration and Assessment of Prior Consideration of the CDM* (Annex 46 of EB41), table 3 was provided to demonstrate that the incentive from the CDM was seriously considered in the decision to proceed with the project activity in parallel with the implementation process of the Project and actions which have been taken to achieve CDM registration.

Table 3 Timeline of the Project

No.	Date	Milestone	Evidence
1	2007-05	The Feasibility Study Report (FSR) was finished, showing that the Project was financially unattractive.	FSR.
2	2008-01-18	A board meeting was held. The project owner decided to continue to implement the Project, based on successful CDM registration experience of the Wuerguli 30 MW Wind Power Project and the potential CDM revenue of the Project.	Board Meeting Minute
3	2008-01-26	The project owner finally signed the Emission Reductions Purchase Agreement with Energy Systems International B.V.	ERPA
4	2008-02-28	Contract for turbines was signed	Turbines Purchase Agreement
5	2008-03-15	Construction Contract was signed.	Construction Contract

6	2008-03-25	The Project started construction.	Construction Contract
7	2008-07-18	The PDD was published for global stakeholder consultation process on UNFCCC website.	
8	2008-12-05	The Project was approved by the DNA of China.	Letter of Approval from DNA of China

All the evidences mentioned above have been provided to DOE for validation.

The additionality of the Project is demonstrated and assessed by using the *Tool for the Demonstration and Assessment of Additionality* v5.2 approved by CDM EB.

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

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

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

Plausible and credible alternatives available to the Project that provide outputs or services comparable to the proposed CDM project activity include:
Alternative I: Construction of a fossil fuel-fired power plant with equivalent amount of annual electricity generation;
Alternative II: The Project activity not undertaken as a CDM project activity;
Alternative III: Construction of a power plant using other sources of renewable energy with equivalent amount of annual electricity generation; and
Alternative IV: Provision of an equivalent amount of annual power output by the grid into which the Project is connected.

The Project is located in the hinterland of Sanjiang Plain with a flat topography and small hydraulic gradient[5], which is not suitable for hydropower project development. In China, power generation by biomass is still in the demonstration phase, and the technical barriers (such as the adaptability and stability of boiler) and market risks (such as the price and supply of disperse biomass residues) are so high that it has severe requirements on the technical capability, working capital and risk-resistant capability for building and operating a biomass power plant[6]. The project owner of the Project is a private enterprise, which mainly focuses on wind power, and doesn't have enough experience and ability required to build and operate a similar scale biomass power plant. For solar PV, installed capacity of the largest solar PV farm in China is only 8 MW[7]. Since the installed capacity of the Project is 30 MW, to construct a solar PV farm instead of the Project to provide outputs or services comparable to the Project is not feasible. Alternative III is not feasible.

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

For Alternative I, considering the same annual electricity generation, the alternative baseline scenario for the Project should be a fossil fuel-fired power plant with installed capacity lower than 30 MW. Further, as the Project is a grid-connected wind power generation project, the alternative baseline scenario must be a

5 The *Environmental Impact Statement Form*
6 http://www.new-energy.cn/lw/news.asp?id=27
7 http://market.ccidnet.com/pub/article/c1798_a135747_p1.html

grid-connected fossil fuel-fired power generation project. However, according to China's regulations, construction of fossil fuel-fired power plants with the installed unit capacity lower than 135 MW is prohibited in the areas which can be covered by large grids such as provincial grids[8]. Therefore the possible alternative baseline scenario of building a fossil fuel-fired power plant with an installed capacity lower than 30MW conflicts with China's current regulations. Therefore, Alternative I is not feasible.

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

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

Therefore Alternative II and Alternative IV are analyzed in Step 2 as potential baseline alternatives.

Step 2. Investment Analysis

Sub-step 2a. Determine appropriate analysis method

The *Tool for the Demonstration and Assessment of Additionality (ver.5.2)* suggests three analysis methods which are simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III). Since the Project will earn revenues not only from the CERs sales but also from electricity sales, the simple cost analysis method is not appropriate. The Project will use benchmark analysis method (Option III) based on the consideration that benchmark IRR of the power sector is available.

Sub-step 2b. Benchmark Analysis Method (Option III)

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

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

(1) Basic parameters for calculation of financial indicators

All the basic parameters for calculation of financial indicators of the Project came from the FSR and were summarized in Table 4. The FSR was compiled and finalized by Heilongjiang Electric Power Science Research institute in May, 2007, and has been approved by the Heilongjiang Development and Reform Committee. Heilongjiang Electric Power Science Research institute is a qualified and independent entity with qualification Level I in engineer consulting, qualification in engineer investigation and engineer designing.

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

Table 4. Financial parameters for calculation of project IRR of the Project

Series	Item	Value	Remark
	general description		
1	installed capacity	30	MW
2	feed-in electricity	71,945	MWh
3	construction period	1	year
4	operation period	20	year
5	bus-bar tariff (including VAT)	0.61	RMB/kWh
	investment plan		
	total investment	30,656.59	10000RMB
1	value of fixed assets	30,629.59	10000RMB
2	fluid capital	27	10000RMB
	tax		
1	VAT	8.50%	
2	income tax	33%	
3	urban maintenance and construction tax	5%	
4	surtax for education	3%	
	cost		
1	rate for maintenance fee	0.57%	Year 1~2
		1.08%	Year 3~5
		1.25%	Year 6~10
		2.00%	Year 11~15
		2.57%	Year 16~21
2	insurance premium rate	0.1%	
3	Staff	10	person
4	Salary	3	10000RMB/year
5	rate of employee welfare	54%	
6	depreciation period	15	year
7	residual value	5%	

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

In accordance with the benchmark analysis (Option III), if the IRR of a project are lower than the benchmark, the project is not considered as financially attractive. Based on the data above, without CERs sales revenues, the Project IRR is 7.09%, which is lower than the benchmark (8%). The Project is not financially attractive.

Sub-step 2d. Sensitivity analysis

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

- Total investment
- Annual O&M cost
- Annual feed-in electricity
- Bus-bar tariff (not including VAT)

The results of sensitive analysis of four indicators of the Project are shown in Table 5 and Figure 4.

Table 5 IRR sensitivity to different financial parameters of the Project
(without CERs sales revenues)

Parameter \ Range	-10%	0	+10%
Total investment (%)	8.43%	7.09%	5.94%
Annual O&M cost (%)	7.26%	7.09%	6.92%
Annual feed-in electricity (%)	5.81%	7.09%	8.31%
Bus-bar tariff (%)	5.81%	7.09%	8.31%

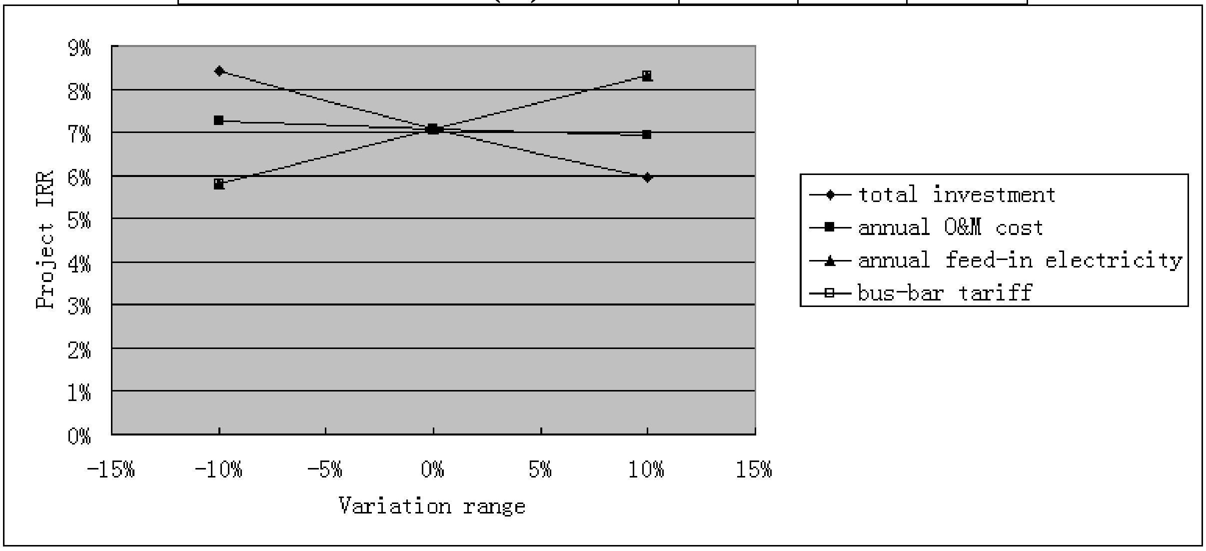

Figure 4. IRR sensitivity to different financial parameters of the Project
(without CERs sales revenues)

The Project IRR is 8% when total investment decreases by 6.98%. Notice that the prices of construction materials are keeping increasing[9], the total investment won't decrease by 6.98%. Actually up to now the investment has been about close to the design investment in the FSR. Relevant evidences have been provided to DOE.

The O&M costs comprise maintenance cost, salary and employ welfare and other cost. All of these expenses are determined by qualified entity based on long term operation experience, and considering the fact that the price of material and products are keeping raising[10], thus the annual O&M is impossible to decrease beyond 10% and is adversely possible to increase.

With an increase in feed-in electricity or bus-bar tariff beyond 7.40%, the Project IRR will beyond 8%. The electricity generation of the Project is estimated based on wind resource data of the latest 30 years, as stated in the FSR. Thus the electricity generation is relatively stable and will not change beyond 7.40%. The bus-bar tariff in the guided letter of the bus-bar tariff of Wuerguli 30 MW Wind Power Project is 0.61RMB/kWh(including VAT) just for the former 30000 operating hours, and then become the local thermal power plant bus-bar tariff for the rest operating hours, which is far lower than 0.61RMB/kWh(including VAT). The bus-bar tariff of Wuerguli 30 MW Wind Power Project is also the tariff guided by National Development and Reform Committee for the wind power projects within the

[9] http://www.shdrc.gov.cn/subdetail.jsp?id=7217&file=sub.jsp&hyhyhy=6-2&okokok,

[10] http://www.stats.gov.cn/was40/reldetail.jsp?docid=402450489

Northeast China Grid in 2007 and 2008[11], thus it is not likely that the tariff of the Project would be increased. In addition, the bus-bar tariff applied in the FSR and PDD IRR calculation is 0.61RMB/kWh (including VAT) for the whole operation life for conservativeness, but not the dual lower tariffs for two different periods in the tariff guided letter. Therefore in summary the actual bus-bar tariff of the Project doesn't have the possibility to be higher than that applied in the PDD IRR calculation, but will be lower than that. Moreover, with an increasing electricity tariff, it is assumed, O&M costs will also rise. An increase of the electricity price will raise the IRR whilst an increase of O&M costs will lower it. Given that scenario, an increase of the electricity price may not lead to a different outcome of the investment analysis.

As analysed, the variation range of the uncertain factors could not increase the Project IRR to reach the benchmark. The additionality of the Project would not be influenced.

If the Project can be successfully registered as a CDM project, the CERs sales revenues will guarantee the loan payback, supplement the high investment of the Project and significantly improve the financial indicators of the Project. Considering the CERs sales revenues (calculated with EURO 9tCO_2e, 7 yrs×3 crediting period), the Project IRR will be significantly improved to reach the benchmark, as shown in Table 6.

Table 6. Comparison of the Project IRR with and without CERs sales revenues

	the Project	**the benchmark**
Without CERs sales revenues (%)	7.09	8
With CERs sales revenues (%)	10.35	8

It is shown in Table 4 that the CERs sales revenues can alleviate the identified barriers, therefore the Project is additional.

Step 4 Common practice analysis

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

The Project is a newly built 30 MW wind farm located in Heilongjiang Province, therefore, activities similar to the Project should be wind farms located in Heilongjiang Province, with a starting date of operation later than January 1st, 2002[12]. Similar activities identified with such criteria and without developed for CDM revenues are listed in Table 7 below.

[11] http://www.sdpc.gov.cn/zfdj/jggg/dian/t20080813_230724.htm,
http://www.sdpc.gov.cn/zfdj/jggg/dian/t20080218_193009.htm,

[12] During 2002, a reform for electric power system in China, Electric Power System Reform was issued by China State Council dated February 10th 2002, which breaks the State-monopoly of the electric supply system, separates electric power generation and electric grid operation into sectors, and promotes market competition and other benefits.

Table 7. Activities similar to the Project[13]

	Name	Installed time	Type	Unit installed capacity kW	Qty. set	Installed capacity MW
1	Mulan Menggushan					
		03.12.	Xi'an Nordex	600	6	3.600
		04.07.	Xi'an Nordex	600	14	8.400
2	Fujin Bielayinshan					
		04.09.	NEG Micon	900	27	24.300
3	Mudanjiang Daimagou					
		06.12.	Vestas	850	58	49.300
		06.10.	HE	1200	1	1.200

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

Of the rest three wind farms listed in Table 7:

• Mulan Menggushan Wind Farm Project is the first wind farm project in Heilongjiang province, and the project owner has a deep background of Heilongjiang electric power company[14]. The bus-bar tariff of this project is approved as 0.85 RMB/kWh in 2004[15], about 39% higher than that of the Project.

• Fujin Bielayinshan Wind Farm Project is funded by international low interest loan and national soft loan[16].

• Mudanjiang Daimagou Wind Farm Project was invested by the enterprises with foreign capital[17], which enjoy the corporate income tax privilege[18].

There are essential distinctions between the Project and similar activities. Therefore, the Project fulfils the requirement of additionality.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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The consolidated methodology ACM0002 is applied in the context of the Project in the following four steps:

[13] Installed capacity of wind farm in China in 2007 by Mr. Shi Pengfei, Vice Chairman of Chinese Wind Association.

14 http://www.creia.net/html/2008109152129163.html,
http://www.chinapower.com.cn/yearbook/article/1998/51102003.html

[15]http://www.newenergy.org.cn/html/00412/20041605.html

[16] http://www.china5e.com/news/power/200208/200208220027.html

[17] http://www.mdjprojects.gov.cn/ArticleContent.asp?ID=1143,

[18] http://www.hlj.gov.cn/tzpd/tzhz/yhzc/200707/t20070706_22263.htm

- First, calculate the baseline GHG emissions;
- Second, calculate the project GHG emissions;
- Third, calculate the project leakage;
- Fourth, calculate the emission reductions.

I. Calculate the baseline GHG emissions

(1) Calculate the emission factor for project electricity system

The baseline GHG emissions is the result of the baseline emission factor ($EF_{grid,CM,y}$) times the electricity supplied to the grid by the Project. The baseline emission factor is determined ex ante by using the *Tool to calculate the emission factor for an electricity system* ver1.1 according to following steps:

Step 1. Identify the relevant electric power system

In accordance with the *Tool to Calculate the Emission Factor for an Electricity System*, the project electricity system of the Project is identified according to the delineation of the project electricity system and connected electricity systems published by China's DNA.

Electricity generated by the Project will be supplied to the Heilongjiang Power Grid. According to the *China's Regional Grid Baseline Emission Factors* (renewed on Aug 9th, 2007 on http://cdm.ccchina.gov.cn) issued by China's DNA which provides the delineation of relevant electric power systems, the Northeast China Grid is the relevant electric power system of the Project, and there is no electricity import of Northeast China Grid.

Step 2. Select an operating margin (OM) method

Four methods are provided in the *Tool to calculate the emission factor for an electricity system* for the calculation of Operating Margin Emission Factor(s) ($EF_{grid,OM,y}$), they are

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch data analysis OM, or
(d) Average OM.

As per the *Tool to calculate the emission factor for an electricity system*, with reference to the *China's Regional Grid Baseline Emission Factors*, method (a) simple OM is employed for calculation of the operating margin emission factor(s) ($EF_{grid,OM,y}$) of the Project.

As per the *Tool to calculate the emission factor for an electricity system*, the simple OM method only can be used when low-cost/must run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production. Among the total electricity generation of the Northeast China Grid which the Project is connected to, the amount of low-cost/must run resources accounts for about 7% in 2001, 5% in 2002, 5% in 2003 and 6% in 2004 and 8% in 2005, all less than 50%. Thus, the method (a) simple OM can be used to calculate the baseline emission factor of operating margin ($EF_{grid,OM,y}$) for the Project.

The emission factors were determined ex ante (A 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation) and will not be updated during the first crediting period.

Step 3. Calculate the operating margin emission factor ($EF_{grid,OMsimple,y}$) according to the selected method

Three options are provided in the *Tool to Calculate the Emission Factor for an Electricity System* for the determination of the simple OM emission factor ($EF_{grid,OMsimple,y}$). Since the data on fuel consumption, net electricity generation, the average efficiency and the fuel type(s) used in each power unit in the Northeast China Grid are not available, Option A and B can't be used. According to *China's Regional Grid Baseline Emission Factors*, nuclear and renewable power generation are considered as low-cost / must-run power sources and the quantity of electricity supplied to the grid by these sources is known as stated in step 2 above, Option C (based on data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system) is adopted to calculate the simple OM emission factor ($EF_{grid,OMsimple,y}$). The formula of $EF_{grid,OMsimple,y}$ calculation is

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_y} \qquad (1)$$

where:

$EF_{grid,OMsimple,y}$ is the simple operating margin CO_2 emission factor in year y (tCO_2/MWh);

$FC_{i,y}$ is the amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit);

$NCV_{i,y}$ is the net calorific value (energy content) of fossil fuel type i in year y (GJ/ mass or volume unit);

$EF_{CO2,i,y}$ is the CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ);

EG_y is the net electricity generated and supplied to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year y (MWh);

i are all fossil fuel types combusted in power sources in the project electricity system in year y;

y is the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation.

With reference to the *China's Regional Grid Baseline Emission Factors*, the simple OM emission factor ($EF_{grid,OM,y}$) of the Northeast China Grid is 1.2404 tCO_2e/MWh (see Annex 3 for details).

Step 4. Identify the cohort of power units to be included in the build margin

According to the *Tool to calculate the emission factor for an electricity system*, the sample group of power units m used to calculate the build margin consists of either:

(a) The set of five power units that have been built most recently, or

(b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

It is suggested that project participants should use the set of power units that comprises the larger annual

generation.

Considering data availability, CDM EB accepts the following deviation in application of methodology[19]:
1) Use of capacity additions during the last 1~3 years for estimating the build margin emission factor for grid electricity.
2) Use of weights estimated using installed capacity in place of annual electricity generation.

And it is suggested to use the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy.

Therefore for the Project: First, calculate the share of different power generation technology in recent capacity additions. Second, calculate the weight for capacity additions of each power generation technology. And finally calculate the emission factor using the efficiency level of the best technology commercially available in China.

According to the *Tool to calculate the emission factor for an electricity system*, project participants shall choose between one of the following two options to calculate the Build Margin Emission Factor ($EF_{grid,BM,y}$).
Option 1. Calculate the Build Margin emission factor ($EF_{grid,BM,y}$) ex-ante based on the most recent information available on plants already built for sample group m at the time of PDD submission.
Option 2. For the first crediting period, the Build Margin emission factor ($EF_{grid,BM,y}$) must be updated annually ex-post for the year in which actual project generation and associated emissions reductions occur. For subsequent crediting periods, the Build Margin emission factor ($EF_{grid,BM,y}$) should be calculated ex-ante, as described in option 1 above.

Option 1, calculate the Build Margin emission factor ($EF_{grid,BM,y}$) ex-ante based on the most recent information available on plants already built for sample group m at the time of PDD submission is employed by the Project.

Step 5. Calculate the build margin emission factor

According to the methodology ACM0002, calculate the Build Margin Emission Factor ($EF_{grid,BM,y}$) according to the *Tool to calculate the emission factor for an electricity system* using equation (2):

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \qquad (2)$$

where:
$EF_{grid,BM,y}$ is the build margin CO_2 emission factor in year y (tCO_2/MWh);
$EG_{m,y}$ is the net quantity of electricity generated and supplied to the grid by power unit m in year y (MWh);
$EF_{EL,m,y}$ is the CO_2 emission factor of power unit m in year y (tCO_2/MWh);
m is the power units included in the build margin;

19 Http://cdm.unfccc.int/Projects/Deviations.

y is the most recent historical year for which power generation data is available.

Since the data of installed capacity can not be separated into coal fired, oil fired and gas fired currently, BM is calculated by the following steps and formula:

Step a. Calculate the power generation emissions of solid fuel, liquid fuel and gas fuel and each share in the total emissions based on the *Energy Balance Table* of the most recent year.

$$\lambda_{Coal} = \frac{\sum_{i \in COAL, j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}} \quad (3)$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}} \quad (4)$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}} \quad (5)$$

where:

$F_{i,j,y}$ is the amount of fuel i (in a mass or volume unit) consumed by province j in year(s) y,

$NCV_{i,y}$ is the net calorific value (energy content) of fossil fuel type i in year y (GJ/ mass or volume unit);

$EF_{CO2,i,y}$ is the CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ).

COAL, OIL and GAS are footnote group for solid fuels, liquid fuels and gas fuels.

Step b. Calculate the emission factor for thermal power of the grid based on the result of Step a and the efficiency level of the best technology commercially available in China.

$$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y}$$

(6)

Where $EF_{Coal,Adv,y}$, $EF_{Oil,Adv,y}$ and $EF_{Gas,Adv,y}$ are emission factor proxies of efficiency level of the best coal fired, oil fired and gas fired power generation technology commercially available in China.

Step c. Calculate BM of the grid based on the result of Step b and the share of thermal power of recent 20% capacity additions.

$$EF_{grid,BM,y} = \frac{CAP_{Thermal,y}}{CAP_{Total,y}} \times EF_{Thermal,y} \quad (7)$$

Where $CAP_{Total,y}$ is total capacity additions while $CAP_{Thermal,y}$ is capacity additions of thermal power.

The data on different fuel consumptions for power generation and the net caloric values of the fuels are obtained from the *China Energy Statistical Yearbook* from 2004 to 2006. The emission factors and oxidation factors of the fuels employed are obtained from Table 1.3 and Table 1.4 on page 1.21-1.24 of volume 2 of 2006 *IPCC Guidelines for National Greenhouse Gas Inventories*.

With reference to the *China’s Regional Grid Baseline Emission Factors*, the weighted average fuel

consumption for power generation of 14 sets of 600 MW sub-critical coal fired power generation units built in 2005 (343.33 gCe/kWh) and the 200 MW oil/gas fired combined cycle power generation units with the best performance (258 gCe/kWh) are taken as the efficiency level of the best technology commercially available in China.

With reference to the *China's Regional Grid Baseline Emission Factors*, the Build Margin emission factor ($EF_{grid,BM,y}$) of the Northeast China Grid is 0.8631 tCO_2e/MWh.

Step 6. Calculate the combined margin emissions factor

Based on the *Tool to calculate the emission factor for an electricity system*, the baseline emission factor ($EF_{grid,CM,y}$) is calculated as the weighted average of the operating margin emission factor ($EF_{grid,OM,y}$) and the build margin emission factor ($EF_{grid,BM,y}$), as

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times \omega_{OM} + EF_{grid,BM,y} \times \omega_{BM} \quad (8)$$

According to the *Tool to calculate the emission factor for an electricity system*, the weight w_{OM} is 0.75 and the weight w_{BM} is 0.25 for wind power projects. Therefore the combined baseline emission factor $EF_{grid,CM,y}$ =0.75×1.2404+0.25×0.8631 =1.1461 tCO_2e/MWh.

(2) Calculate the baseline emissions

Baseline emissions are calculated with the combined baseline emission factor and the electricity supplied to the grid by the Project as follows:

$$BE_y = \left(EG_{PJ,y} - EG_{baseline}\right) \times EF_{grid,CM,y} \quad (9)$$

$$EG_{PJ,y} = EG_{PJtoGRID,y} - EG_{GRIDtoPJ,y} \quad (10)$$

where

BE_y is baseline emission in year y in tCO_2e;

$EF_{grid,CM,y}$ is baseline emission factor in tCO_2e/MWh;

$EG_{baseline}$ is baseline electricity supplied to the grid in the case of modified or retrofit facilities (MWh). For new power plants this value is taken as zero;

$EG_{PJ,y}$ is net electricity supplied to the grid by the Project in year y in MWh,;

$EG_{PJtoGRID,y}$ is electricity supplied by the Project to the grid in year y in MWh;

$EG_{GRIDtoPJ,y}$ is electricity imported by the Project from the grid in year y in MWh

II. Calculate the project GHG emissions

The Project is a wind power project that the project emissions should not be considered as per ACM0002, i.e. $PE_y = 0$ tCO_2e.

III. Calculate the project leakage GHG emissions

According to the consolidated baseline methodology ACM0002, the main indirect emissions potentially giving rise to leakage in the context of electric sector projects result from activities such as power plant construction, fuel handling (mining, processing, and transportation), and land inundation (for hydroelectric projects). The project developer does not need to consider such indirect emissions when applying the methodology. Therefore the Project can take no account of such leakages, $L_y = 0$ tCO_2e.

IV. Calculate the emission reductions

The project activity will generate GHG emission reductions by avoiding CO_2 emissions from electricity generation by fossil fuel power plants. The emission reduction (ER_y) during a given year y is calculated as follows:

$$ER_y = BE_y - PE_y - L_y \quad (11)$$

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

Data / Parameter:	$CAP_{j,y}$
Data unit:	MW
Description:	Total installed capacity of province j in year y
Source of data used:	*China Electric Power Yearbook* 1999, 2000 and 2006
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from the *China Electric Power Yearbook* issued by authorized entity in China are reliable.
Any comment:	-

Data / Parameter:	$GEN_{j,y}$
Data unit:	MWh
Description:	Total power generation of province j in year y
Source of data used:	*China Electric Power Yearbook* from 2004 to 2006
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from the *China Electric Power Yearbook* issued by authorized entity in China are reliable.
Any comment:	-

Data / Parameter:	$r_{j,y}$
Data unit:	-
Description:	Auxiliary electricity consumption rate of province j in year y
Source of data used:	*China Electric Power Yearbook* from 2004 to 2006
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from the *China Electric Power Yearbook* issued by authorized entity in China are reliable.
Any comment:	-

Data / Parameter:	$F_{i,j,y}$
Data unit:	t or m^3
Description:	Consumption of fuel type i of province j in year y
Source of data used:	*China Energy Statistical Yearbook* from 2004 to 2006
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from the *China Energy Statistical Yearbook* issued by authorized entity in China are reliable.
Any comment:	-

Data / Parameter:	$NCV_{i,y}$
Data unit:	TJ per mass or volume unit of fuel i
Description:	Net caloric value of fuel i
Source of data used:	P287 of *China Energy Statistical Yearbook* 2006 edition
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from the *China Energy Statistical Yearbook* issued by authorized entity in China are reliable.
Any comment:	-

Data / Parameter:	$EF_{CO2,i,y}$
Data unit:	tC/TJ
Description:	CO_2 emission factor per unit of energy of the fuel i
Source of data used:	*2006 IPCC Guideline for National Greenhouse Gas Inventories*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from *2006 IPCC Guideline for National Greenhouse Gas Inventories* are reliable.
Any comment:	-

Data / Parameter:	$FC_{adv,coal}$
Data unit:	gCe/kWh
Description:	weighted average fuel consumption for power generation of 14 sets of 600 MW coal fired power generation units built in 2005 (taken as efficiency level of the best technology commercially available in China)
Source of data used:	*China's Regional Grid Baseline Emission Factors*
Value applied:	343.33
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from the *China's Regional Grid Baseline Emission Factors* made publicly available by China's DNA are reliable.
Any comment:	-

Data / Parameter:	$FC_{adv,oil/gas}$
Data unit:	gCe/kWh
Description:	weighted average fuel consumption for power generation of 200 MW oil/gas fired combined cycle power generation units (taken as efficiency level of the best technology commercially available in China)
Source of data used:	*China's Regional Grid Baseline Emission Factors*
Value applied:	258
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data obtained from *China's Regional Grid Baseline Emission Factors* are reliable.
Any comment:	-

B.6.3 Ex-ante calculation of emission reductions:

>>

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

According to the *Feasibility Study Report* of the Project, the annual electricity supplied to the grid is estimated to be 71,945 MWh. With reference to the *China's Regional Grid Baseline Emission Factors*, the baseline emission factor for the Project is calculated ex ante as 1.1461 tCO_2e/MWh and the annual baseline emission of the Project is 82,456 tCO_2e.

II. Estimated project activity emissions:

The Project is a wind power project that the project emissions should not be considered as per ACM0002, i.e. $PE_y = 0$ tCO_2e.

III. Estimated project leakage emissions:

As above ACM0002, the leakage of the Project is not considered, i.e. L_y =0 tCO_2e.

IV. Estimated emission reductions

As per formula (11) , the annual emission reductions of the Project are 82,456 tCO_2e.

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

>>

Renewable crediting period (7yrs×3) is adopted by the Project. It is expected that the project activities will generate emission reductions for 577,192 tCO_2e per year over the first 7-year crediting period from Jul, 2009 to Jun, 2016.

Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
Jul to Dec,2009	0	41,228	0	41,228
2010	0	82,456	0	82,456
2011	0	82,456	0	82,456
2012	0	82,456	0	82,456
2013	0	82,456	0	82,456
2014	0	82,456	0	82,456
2015	0	82,456		82,456
Jan to Jun, 2016	0	41,228	0	41,228
Total (tCO_2e)	**0**	**577,192**	**0**	**577,192**

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

B.7.1 Data and parameters monitored:

Data / Parameter:	$EG_{PJtoGRID,y}$
Data unit:	MWh
Description:	Electricity supplied by the Project to the grid in year y
Source of data to be used:	The data used in the PDD are obtained from the FSR of the Project. Actual data will be obtained through on-site measurement.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	71,945
Description of measurement methods and procedures to be applied:	Hourly measured and monthly recorded.
QA/QC procedures to be applied:	Double check by receipt of sales.
Any comment:	-

Data / Parameter:	$EG_{GRIDtoPJ,y}$
Data unit:	MWh
Description:	Electricity imported by the Project from the grid in year y
Source of data to be used:	Assumed as zero in the PDD. Actual data will be obtained through on-site measurement.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	Hourly measured and monthly recorded.
QA/QC procedures to be applied:	Double check by receipt of sales.
Any comment:	-

B.7.2 Description of the monitoring plan:

>>

1. Monitored Data

The ex ante determined baseline emission factor will be employed. The quantity of electricity supplied to the grid ($EG_{PJtoGRID,y}$), the quantity of electricity imported by the Project from the grid ($EG_{GRIDtoPJ,y}$) will be monitored.

2. Monitoring System Organization Chart

The monitoring system organization chart is shown in Figure 4, in which the authority and responsibility of project management are defined.

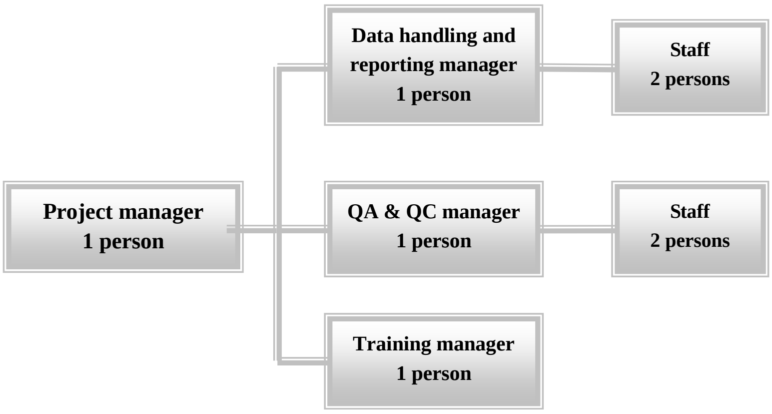

Figure 4 monitoring system organization chart of the Project for CDM

The project manager is responsible for 1) implementation and supervision of the monitoring activity 2) periodical training on the staff of the whole monitoring system 3) liaison of this CDM project.

The data handling and reporting staff is responsible for managing, processing and submitting data.

The QA & QC staff is responsible for calibration of meters and supervision of the whole process quality.

The training manger is in charge of training plan and implementation for relevant staffs.

3. Installation of meter and data monitoring

The location of meter is showed in figure 5.

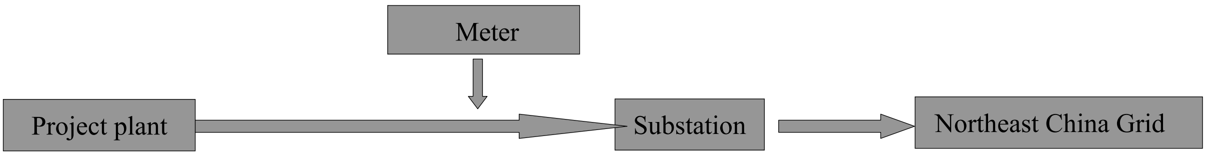

Figure 5 Locations of the meter

The quantity of electricity supplied to the grid ($EG_{PJtoGRID,y}$) and the quantity of electricity imported by the Project from the grid ($EG_{GRIDtoPJ,y}$) are hourly measured by the meter and monthly recorded by the data handling and reporting staff.

The net electricity supplied to the grid by the Project ($EG_{PJ,y}$) is calculated through subtracting the $EG_{GRIDtoPJ,y}$ from the $EG_{PJtoGRID,y}$.

Receipts of electricity sale will be used to ensure the consistency.

4. Precision and calibration of Ammeters

The meter of the Project will be equipped in line with the requirements of the grid company. The measurement precision of the meter employed by the Project is at least 0.5. The meter of the Project will be calibrated once a year. And such calibration will be carried out in line with national norms.

5. Data Management System

• Specific staff will be appointed by the project owner to take the overall responsibility for monitoring greenhouse gas emission reductions and keeping all the data collected as part of monitoring archived electronically and kept at least for two years after the end of the last crediting period.
• Electronic data and documents, including readings from meters connected into the computer central control system, will be regularly copied and archived via optical discs or storage tapes, and kept at least for two years after the end of the last crediting period.

Information of preparation for verification and initial training are described in Annex 4.

B.8 Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

>>

The application of the baseline study and monitoring methodology of the Project was completed on 10/03/2009 by below party:

Name/Origination	Project participate Yes/No
Millennium Capital Services 1202 Jinbao Office Building, 89 Jinbao Street, Dongcheng District, Beijing 100005, P.R.China Tel: +86 (10) 8522 1210 Fax: +86 (10) 8522 1906	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:

>>
28/02/2008 (signing date of Turbines Purchase Agreement)

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

>>
20y-0m

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

C.2.1. Renewable crediting period

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

>>
01/07/2009
The date will be postponed to the date of registration if the date of registration is after 01/07/2009.

C.2.1.2. Length of the first crediting period:

>>
7y-0m

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
Not applicable.

C.2.2.2. Length:

>>
Not applicable.

SECTION D. Environmental impacts

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

>>

The Environmental Impact Statement Form was completed by Jiamusi Academy of environmental science of Heilongjiang Province on June, 2007. And it was approved by Heilongjiang Environmental Protection Bureau on Aug 20th, 2007 (Document No. Hei Huanjianshen [2007]104). According to the Environmental Impact Statement Form, environmental impacts possibly caused by the Project and corresponding measures employed by the project owner are analyzed as follows:

Dust and exhaust gas

Due to the excavation and the running of construction vehicles during the construction of the Project, dust and exhaust gas will be generated around the construction area. However, by means of installing fence and watering to dedust, the dust pollution during construction can be weaken and controlled. The exhaust gas will disappear after the finish of construction. And as the construction site is far from resident site, the Project will not have significant impact on local residents.

Waste water

It will generate construction waste water and sanitary water during the construction period. There are mainly suspended sand in the construction waster water, and through screening and depositing process, the construction waster water can be discharged directly and won't have negative impact on the environment. After septic tank deposition and integral treatment, the sanitary water will not impact the environment.

Noise

Noises generated by the Project are from the operation of construction machines and equipments. The noises will weaken to below 45dB(A) 250m away from construction site, which meets the requirement of Grade I of Standard for Environmental Noise of Urban Area (GB3096-1993). And as the construction site is 2 km away far from resident site, there is no disturbance on local residents

The noise from turbines during the operation of the Project will not have significant impacts on the local residents 2 km away, after the noise being weakened by the sound absorption of forest and the long distance.

Solid waste

During the construction period, waste soil and bricks generated will be reused on site for levelling soil or backfilling. The living waste, mainly composed of kitchen waste and package materials, will be collected and transported away on time to make sure they will not impact the environment.

Ecological impact

The Project site will occupy certain forest land. The construction work will try to minimize the area of digging and material piling, occupying the least forest land and. The vegetation should be recovered gradually during construction and the construction site will be cleaned up after construction to recover the ecological environment. After taking these measures, there will be no significant impacts on local land environment.

There are certain numbers of birds in the project site. Generally the heights of the turbines are relatively much lower than the normal flying heights of the birds, the space area occupied by each turbine is small

and the rotating speeds of the turbines are low, thus the birds will get used to the turbines and their habitation and propagation will not be disturbed.

In summary, by means of measures of pollution avoidance and control as well as ecological recovery, the Project will not impact the environment.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>

The Project employs clean and renewable energy to generate electricity whose environmental impacts comply with relevant laws and regulations of the host country. Environmental impacts are considered not significant.

SECTION E. Stakeholders' comments

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

>>

The Project owner conducted a survey on the stakeholders of the Project to get the comments from the habitants nearby the Dayushu Town in July, 2007. The survey was conducted through distributing and collecting responses to a questionnaire.

For the total 30 questionnaires distributed to the stakeholders, 30 returned with a response rate of 100%. The basic structure of the respondents is illustrated in Table 8.

Table 8. Structure of the respondents

Structure of gender		
Gender	**No.**	**Percentage (%)**
Male	17	57
Female	13	43

Structure of educational level		
Educational level	**No.**	**Percentage (%)**
Technical college and college	1	3
Technical secondary school and senior high school	10	33
Primary school	15	50
Elementary school	4	14

Structure of age		
Age	**No.**	**Percentage (%)**
20~30	10	33
31~40	15	50
41~50	4	14
51~60	1	3

The questionnaires mainly focus on the following issues:

- What's the extent of the stakeholders' knowledge about wind farms and wind power projects?
- What positive impacts will be introduced by the implementation of the Project from the view of stakeholders?
- What negative impacts will be introduced by the implementation of the Project from the view of stakeholders?
- What's the overall impact by the implementation of the Project?
- What's the attitude of the stakeholders on the construction of the Project?

E.2. Summary of the comments received:

>>

According to the 30 questionnaires received:

- 28 respondents (93%) understand or have a very good understanding of the Project.
- Respondents consider that positive impacts possibly caused by the construction of the Project mainly include reducing air pollution (70%), decreasing the power price (63%), increasing employment opportunities (57%), improving living standards 37%), and increasing income (23%).
- Respondents consider that negative impacts possibly caused by the construction of the Project mainly include land occupation and noise.
- 15 respondents (50%) consider the overall effect of the Project is positive and 11 respondents (37%) consider the Project has no impact on their lives. 4 respondents (13%) leave blank.
- 26 respondents (87%) support the implementation of the Project and 4 respondents (13%) keep a neutral attitude.

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

>>

We know from the results of questionnaire statistics that stakeholders of the project location generally understand and support the construction of the Project. Based on the comments received from the stakeholders, there has been no necessity to modify the Project in the aspect of design, construction and operation.

Regarding the issues of land occupation and noise concerned by the stakeholders, the project owner gives the following considerations: the Project will only occupy certain state-owned forest land, which has been approved by the government, and no private farmland will be occupied. As analyzed in D.1, the local residents will not be impacted by the noise, as the project site is 2km far away.

Annex 1

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

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

Annex 3

BASELINE INFORMATION

To determine the simple OM emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$) for the Project, data recommended in the *China's Regional Grid Baseline Emission Factors* issued on August 9th, 2007 are adopted.

The following tables summarise the numerical results from the equations listed in the *Tool to calculate the emission factor for an electricity system*. Information provided by the tables includes data, data sources and the underlying calculations.

Table A1. Electricity generation of the Northeast China Grid in 2003

	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity supplied to the grid (MWh)
Liaoning	79751000	7.17	74,032,853
Jilin	29739000	7.32	27,562,105
Heilongjiang	48493000	8.48	44,380,794
Total			145,975,752

Data source: China Electric Power Yearbook 2004.

Table A2. Electricity generation of the Northeast China Grid in 2004

	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity supplied to the grid (MWh)
Liaoning	84543000	7.21	78,447,450
Jilin	33242000	7.68	30,689,014
Heilongjiang	53482000	7.84	49,289,011
Total			158,425,475

Data source: China Electric Power Yearbook 2005.

Table A3. Electricity generation of the Northeast China Grid in 2005

	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity supplied to the grid (MWh)
Liaoning	83697000	7.03	77,813,101
Jilin	35294000	6.59	32,968,125
Heilongjiang	58000000	7.96	53,383,200
Total			164,164,426

Data source: China Electric Power Yearbook 2006.

Table A4. Calculation of simple OM emission factor of the Northeast China Grid in 2003

Energy	Unit	Liaoning A	Jilin B	Heilongjiang C	Total Fuel D=A+B+C	Emission factor (tC/TJ) E	NCV (MJ/t or 1000m^3) F	Emission [20] (tCO_2e) G
Coal	10^4t	3556.51	2006.66	2763.62	8326.79	25.8	20908	164695313
Cleaned coal	10^4t	70.83	0	3	73.83	25.8	26344	1839948.734
Other washed coal	10^4t	617.04	15.9	53.41	686.35	25.8	8363	5429988.017
Coke oven gas	10^8m^3	1.66	0	0	1.66	13	16726	123184.7599
Other gas	10^8m^3	5.31	0	0	5.31	13	5227	123141.3249
Crude oil	10^4t	3.39	0	0	3.39	20	41816	103954.576
Diesel	10^4t	0.32	0.34	0	0.66	20.2	42652	20850.00368
Fuel oil	10^4t	14.87	0.7	4.32	19.89	21.1	41816	643474.2257
LPG	10^4t	1.55	0	0	1.55	17.2	50179	49051.64513
Refinery gas	10^4t	4.03	0	0.46	4.49	18.2	46055	137995.8246
Natural gas	10^8m^3	0	0.04	4.47	4.51	15.3	38931	984997.1241
Other energy	10^4tCe	29.38	0	0	29.38	0	0	0
Total emission of the Northeast China Grid (tCO_2e)					174,151,899			
Fossil power supply of the Northeast China Grid (MWh)					145,975,752			
OM emission factor of the Northeast China Grid (tCO_2e/MWh)					1.193019			

Data sources: China Energy Statistical Yearbook 2004

20 If the unit of the fuel is 10^4 t, then G=D×E×F×44/12/10^2; if the unit of the fuel is 10^8 m^3, then G=D×E×F×44/12/10. The same about the calculation of G in Table A5 and Table A6.

Table A5. Calculation of simple OM emission factor of the Northeast China Grid in 2004

Energy	Unit	Liaoning A	Jilin B	Heilongjiang C	Total Fuel D=A+B+C	Emission factor (tC/TJ) E	NCV (MJ/t or $1000m^3$) F	Emission (tCO_2e) G
Coal	10^4t	4144.2	2310.9	3084.8	9539.9	25.8	20908	188689376.8
Cleaned coal	10^4t	84.75	1.09	4.88	90.72	25.8	26344	2260871.585
Other washed coal	10^4t	577.67	14.26	61	652.93	25.8	8363	5165589.096
Coke oven gas	10^8m^3	4.83	2.91	0	7.74	13	16726	574367.4948
Other gas	10^8m^3	57.33	4.19	0	61.52	13	5227	1426676.894
Diesel	10^4t	2.04	1.16	0.24	3.44	20.2	42652	108672.7465
Fuel oil	10^4t	12.81	1.78	2.86	17.45	21.1	41816	564536.2111
LPG	10^4t	2.19	0	0	2.19	17.2	50179	69305.22764
Refinery gas	10^4t	9.79	0	1.14	10.93	18.2	46055	335923.0208
Natural gas	10^8m^3	0	0.03	2.53	2.56	15.3	38931	559111.4496
Other energy	10^4tCe	26.97	5.07	0	32.04	0	0	0
Total emission of the Northeast China Grid (tCO_2e)					199,754,431			
Fossil power supply of the Northeast China Grid (MWh)					158,425,475			
OM emission factor of the Northeast China Grid (tCO_2e/MWh)					1.260873			

Data sources: China Energy Statistical Yearbook 2005

Table A6. Calculation of simple OM emission factor of the Northeast China Grid in 2005

Energy	Unit	Liaoning A	Jilin B	Heilongjiang C	Total Fuel D=A+B+C	Emission factor (tC/TJ) E	NCV (MJ/t or $1000m^3$) F	Emission (tCO_2e) G
Coal	10^4t	4305.41	2446.13	3383.21	10134.75	25.8	20908	200454895.9
Other washed coal	10^4t	524.74	19.26	24.16	568.16	25.8	8363	4494939.888
Coke oven gas	10^8m^3	1.03	3.57	0.68	5.28	12.1	16726	391816.5856
Other gas	10^8m^3	12.62	8.37	0	20.99	12.1	5227	486767.6854
Crude oil	10^4t	1.16	0	0	1.16	20	41816	35571.47733
Diesel	10^4t	1.18	1.48	0.57	3.23	20.2	42652	102038.6544
Fuel oil	10^4t	9.32	2.46	1.55	13.33	21.1	41816	431247.4323
LPG	10^4t	0.12	0	0	0.12	17.2	50179	3797.54672
Refinery gas	10^4t	5.48	0	1.32	6.8	18.2	46055	208991.4493
Natural gas	10^8m^3	0	0.84	2.24	3.08	15.3	38931	672680.9628
Other energy	10^4tCe	16.18	0	0	16.18	0	0	0
Total emission of the Northeast China Grid (tCO_2e)	207,282,748							
Fossil power supply of the Northeast China Grid (MWh)	164,164,426							
OM emission factor of the Northeast China Grid (tCO_2e/MWh)	1.262653							

Data sources: China Energy Statistical Yearbook (2000-2006)

Therefore the operating margin emission factor(s) ($EF_{OM,y}$) of the Project is calculated as 1.2404 tCO_2e/MWh.

Table A7. Data and result of Step a.

Energy	Unit	Liaoning A	Jilin B	Heilongjiang C	Total D=A+B+C	Emission factor (tC/TJ) E	NCV (MJ/t or 1000m^3) G	Emission (tCO_2e) H
Raw coal	10^4t	4305.41	2446.13	3383.21	10134.75	20908	1	200,454,896
Cleaned coal	10^4t	0	0	0	0	26344	1	0
Other washed coal	10^4t	524.74	19.26	24.16	568.16	8363	1	4,494,940
Sub-total								**204,949,836**
Crude oil	10^4t	1.16	0	0	1.16	41816	1	35,571
Diesel	10^4t	1.18	1.48	0.57	3.23	42652	1	102,039
Fuel oil	104t	9.32	2.46	1.55	13.33	41816	1	431,247
Sub-total								**568,858**
Natural gas	10^7m^3	0	8.4	22.4	30.8	38931kJ/m 3	1	672,681
Coke oven gas	10^7m^3	10.3	35.7	6.8	52.8	16726kJ/m 3	1	391,817
Other gas	10^7m^3	126.2	83.7	0	209.9	5227 kJ/m3	1	486,768
LPG	10^4t	0.12	0	0	0.12	50179 kJ/kg	1	3,798
Refinery gas	10^4t	5.48	0	1.32	6.8	46055 kJ/kg	1	208,991
Sub-total								**1,764,054**
Total								**207,282,748**

Data sources: China Energy Statistical Yearbook 2006.

Table A8. Emission factor of best technology

	Variable	Electricity supply efficiency	Emission factor of fuel (tC/TJ)	Emission factor (tCO_2/MWh)
		A	B	D=3.6/A/10^3×B×44/12
Coal-based power plants	$EF_{Coal,Adv}$	35.82%	25.8	0.9508
Gas-based power plants	$EF_{Gas,Adv}$	47.67%	15.3	0.43237
Oil-based power plants	$EF_{Oil,Adv}$	47.67%	21.1	0.5843

Calculate with data provided in Table A7 and formula (4)~(6), the value for λ_{Coal} is 98.87%, the value for λ_{Oil} is 0.27% and the value for λ_{Gas} is 0.85%. Therefore $EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv}$ =0.9453 tCO_2e/MWh.

Table A9. Installed capacity of the Northeast China Grid in 2005

	Liaoning	**Jilin**	**Heilongjiang**	**Total**
Thermal power (MW)	15999	6359.4	11575.6	33934
Hydropower (MW)	1403.9	3720.8	846.7	5971.4
Nuclear power (MW)	0	0	0	0
Wind power and Other (MW)	135.5	85.4	52.4	273.3
Total (MW)	17538.4	10165.6	12474.7	40178.7

Data source: China Electric Power Yearbook 2006.

Table A10. Installed capacity of the Northeast China Grid in 1999

	Liaoning	**Jilin**	**Heilongjiang**	**Total**
Thermal power (MW)	12425.7	4583.1	10128.1	27136.9
Hydropower (MW)	1240	3508.2	774.5	5522.7
Nuclear power (MW)	0	0	0	0
Wind power and Other (MW)	22.9	0	0	22.9
Total (MW)	13688.6	8091.3	10902.6	32682.5

Data source: China Electric Power Yearbook 2000.

Table A11. Installed capacity of the Northeast China Grid in 1998

	Liaoning	**Jilin**	**Heilongjiang**	**Total**
Thermal power (MW)	12560.3	4428.6	9116	26104.9
Hydropower (MW)	1223.1	3474.7	784.5	5482.3
Nuclear power (MW)	0	0	0	0
Wind power and Other (MW)	17	0	0	17
Total (MW)	13800.4	7903.3	9900.5	31604.2

Data source: China Electric Power Yearbook 1999.

Table A12. Calculation of BM emission factor of the Northeast China Grid

	Installed capacity in 1998 (MW) A	Installed capacity in 1999 (MW) B	Installed capacity in 2005 (MW) C	Capacity additions from 1997 to 2004 (MW) D=C-A	Share in total capacity additions
Thermal power	26104.9	27136.9	33934	7829.1	91.31%
Hydropower	5482.3	5522.7	5971.4	489.1	5.70%
Nuclear power	0	0	0	0	0.00%
Wind power and Other	17	22.9	273.3	256.3	2.99%
Total	31604.2	32682.5	40178.7	8574.5	100.00%
Share in total installed capacity of 2004	78.66%	81.34%	100.00%		

$EF_{BM,y}$ =0.9453×91.31.20%=0.8632 tCO_2e/MWh.

Since all the data used to determine the emission factor, thus to determine the emission reductions of the Project, are obtained from public available data source published by authoritative statistical department and China's DNA, the uncertainty level of GHG emission estimation is low.

Annex 4

MONITORING INFORMATION

6. Preparation for Verification

Besides the recorded data and the documents for double check required in Section B.7.1, other documents will be prepared by the project owner for verification by DOE including, but not limited to:

- PDD (registration version), including the electronic spreadsheets and supporting documentation (assumptions, estimations, measurement, etc);
- Report on qualifications of persons responsible for monitoring and calculation;
- Report on Quality Control and Quality Assurance;
- Report on maintenance and calibration of meters;
- Report on Project Management Record (including the data collection and management system).
- Report on monitoring.

7. Initial training

The project owner has made plan training courses for the fresh employees. The employees will get trained on how to use the equipments, the fundamental theory of the operation of a wind farm and the knowledge of power grid, etc. Then the employees will be sent to a same type wind farm for practical on site training. The employees can only be qualified for the Project after passing the test examinations. The training can ensure that the monitoring plan and the operation of the Project will be executed by qualified professionals.