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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Jiangsu Dongtai Phase II Wind Power Project
Version number of the document: 2
Date: 29/12/2011

A.2. Description of the project activity:

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The objective of Jiangsu Dongtai Phase II Wind Power Project (here after refer to the Project), a grid-connected renewable power project, is to utilize the wind resources for generating renewable electricity to sell into the East China Power Grid, so as to be a self-sustained green-power investment project in the market of the PRC. The Project activity will achieve the greenhouse gas (GHG) emission reductions by avoiding CO2 emissions from the business-as-usual scenario, the electricity generation of those fossil fuel-fired power plants connected into the East China Power Grid.

The Project is sited within the Jianggang Town, Dongtai County, Yancheng City, Jiangsu Province, in the East China. The Project involves the installation of 100 turbines, each of which have a capacity of 2000kW, providing a total installed capacity of 200MW. The annual operating hours of the proposed project are 2030 hours and it is expected to generate 406,020[1] MWh per year to be sold into the Jiangsu Power Grid, which is part of the East China Power Grid, and generate emission reductions for 338,011 tCO_2e annual average.

The purpose of the Project is to generate zero-emission wind power and supply it to East China Power Grid.

For the Project,

(a) The scenario existing prior to the start of the implementation of the project activity is East China Power Grid providing the same electricity supply as the Project;

(b) The project scenario is the implementation of the Project (with CDM as an indispensible consideration), i.e., the installation and operation of 100 sets of 2000kW wind turbines which will supply an average annual generation of 406,020 MWh to East China Power Grid and replace the same amount of electricity generated by fossil fuel fired power plants connected into East China Power Grid;

(c) The baseline scenario is the same as the scenario existing prior to the start of implementation of the project activity.

The Project clearly fits into the development priority of the PRC, and will support China in stimulating and accelerating the commercialization of grid-connected renewable energy technologies and the green-power market development. The Project will contribute to the sustainable development of the host country and the local community mainly by:

- ✧ reducing GHG emissions in China compared to the business-as-usual scenario;
- ✧ helping to stimulate the growth of wind power industry in China;

[1] Data from FSR edited by Hydrochina Huadong Engineering Corporation accredited by National Development and Refom Commission

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

A.3. Project participants:

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The parties involved in the Project are listed as following:

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)	Guohua (Jiangsu) Wind Power Co., Ltd.	No
France	Electrabel NV/SA	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.		

Annex 1 lists the complete contact information on participants in the project activity.

A.4. Technical description of the project activity:

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A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

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People's Republic of China

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

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Jiangsu Province

A.4.1.3. City/Town/Community etc:

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Jianggang Town, Dongtai County, Yancheng 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 in the Jianggang Town, Dongtai County, Yancheng City, Jiangsu Province, P.R.China. The Project has geographical coordinates with east longitude of 120°54′11" and north latitude of 32°39′35" .Figure 1 show the location of the Project.

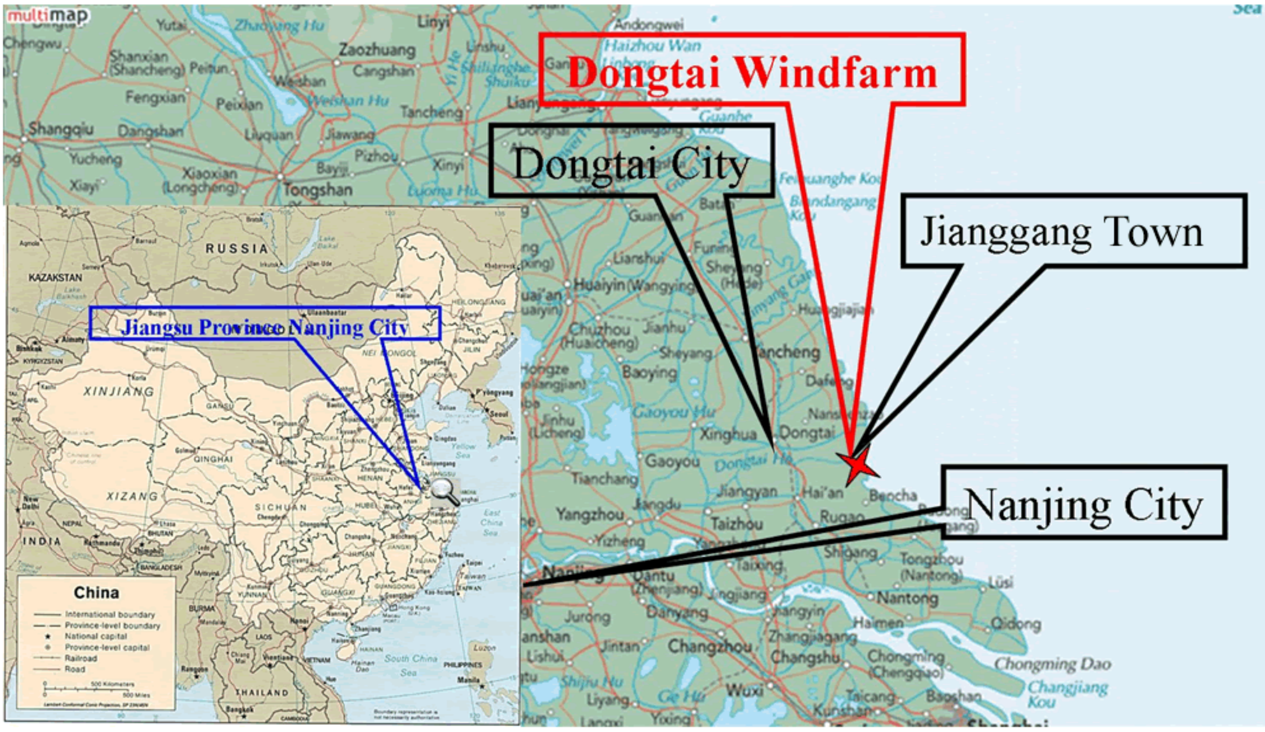

Figure A-1. Location of the project

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

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Sectoral scope 1: energy industries (renewable sources)

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

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The purpose of the Project is to generate zero-emission wind power and supply it to East China Power Grid. For the Project,

(a) The scenario existing prior to the start of the implementation of the project activity is East China Power Grid providing the same amount electricity supply as the Project;

(b) The project scenario is the implementation of the Project (with CDM as an indispensible consideration), i.e., the installation and operation of 100 sets of 2000kW wind turbines which will supply an average annual generation of 406,020 MWh (plant load factor of the Project is 23.17%) to East China Power Grid and replace the same amount of electricity generated by fossil fuel fired power plants connected into East China Power Grid;

(c) The baseline scenario is the same as the scenario existing prior to the start of implementation of the project activity.

The main parts of the Project include wind turbine, transformer, and substation. Totally 100 sets of W2000M-93-80 turbines with a unit capacity of 2000kW were selected for the Project, providing a total installed capacity of 200MW. The W2000M-93-80 turbines are manufactured by local supplier Sewind

Co. Ltd. According to the turbine layout, each turbine will have a 690V-to-35kV transformer. The Project consist two area, north wind farm with 60 sets of turbines and south wind farm with 40 sets of turbines. The electricity generated by the Project from north wind farm will be delivered to the Jiangsu Power Grid through the Guohua Dongtai Phase II Wind Farm North 220kV substation. The electricity generated by the Project from south wind farm will be delivered to the Jiangsu Power Grid through Guohua Dongtai Phase I Wind Farm 220kV substation. The Jiangsu Power Gird is a part of the East China Power Grid. So the Project can replace electricity generated from fossil fuel fired power plant connected to the Grid and reduce GHG emissions.

It is estimated that the annual generation of the Project will be 406,020MWh. As a result, 338,011 tCO_2 emission reductions will be generated annually.

In order to be normal operation of the Project, the Project owner and local suppliers will train all the relative staffs before the operation of the generators. There was no technology transfer occurred in the project activity. Key technical parameters of turbines are listed in the following Table A-1.

Table A-1. Technology parameters of W2000M-93-80 Turbines

Item	Unit	Index
Nominal capacity	kW	2000
Number of blades	piece	3
Rotor diameter	m	93
Cut-in speed	m/s	3
Cut-out speed	m/s	25
Rated voltage of generator	V	690
Frequency	Hz	50
Estimated life time (year)	Year	20

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

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It is expected that the Project activity will generate emission reductions for about 338,011 tCO_2 annually in the first 7-year crediting period from 26/05/2012 to 25/05/2019.

Years	Annual estimation of emission reductions in tones of CO_2e
26/05/2012 - 25/05/2013	338,011
26/05/2013 - 25/05/2014	338,011
26/05/2014 - 25/05/2015	338,011
26/05/2015 - 25/05/2016	338,011
26/05/2016 - 25/05/2017	338,011
26/05/2017 - 25/05/2018	338,011
26/05/2018 - 25/05/2019	338,011
Total estimated reductions (tones of CO_2e)	2,366,077
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tones of CO_2e)	338,011

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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Methodology used for the Project is the approved ACM0002"Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (Version 12.1.0).

This methodology adopts tools list as below:

1. "Tool for the demonstration and assessment of additionality" (version 05.2.1),
2. "Tool to calculate the emission factor for an electricity system" (version 02.2.1)

For more information regarding the methodology please refer to Website of Executive Board: http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html.

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 methodology used to determine the Project baseline is the approved consolidated baseline methodology ACM0002. The methodology can be used to calculate GHG emission reductions achieved by wind power generation.

The project meets all applicability conditions of baseline methodology ACM0002 as follows:

1) The proposed project is the installation of a new grid-connected wind power generation activity at a site where no renewable power plant was operated prior to the implementation of the project activity;
2) The Project does not involve switching from fossil fuel-fired to renewable energy at the site of the Project activity.

Therefore, the approved consolidated baseline methodology ACM0002 "Consolidated Baseline and Monitoring Methodology for Grid-connected Electricity Generation from Renewable Sources." is applicable to the Project.

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

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	Source	Gas	Included?	Justification / Explanation
Baseline	Electricity generation of those fossil fuel-fired power plants connected into the East China Power 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, so the project emissions should not be considered as per ACM0002.
		CH_4	No	
		N_2O	No	

The proposed project is the installation of a new grid-connected renewable power plant, and the baseline

scenario is the following:
Electricity delivered 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 spatial extent of the Project boundary includes the Project and all power plants connected physically to the electricity system that the Project is connected to. The project site includes 100 sets of W2000M-93-80 turbines and auxiliary electric equipments. The Project is connected to the East China Power Grid. Therefore, the Project and all its auxiliary electric equipments and the East China Power Grid including all power plants connected are selected as the project boundary. The East China Power Grid includes Shanghai Grid, Jiangsu Province Grid, Zhejiang Province Grid, Anhui Province Grid, and Fujian Province Grid.

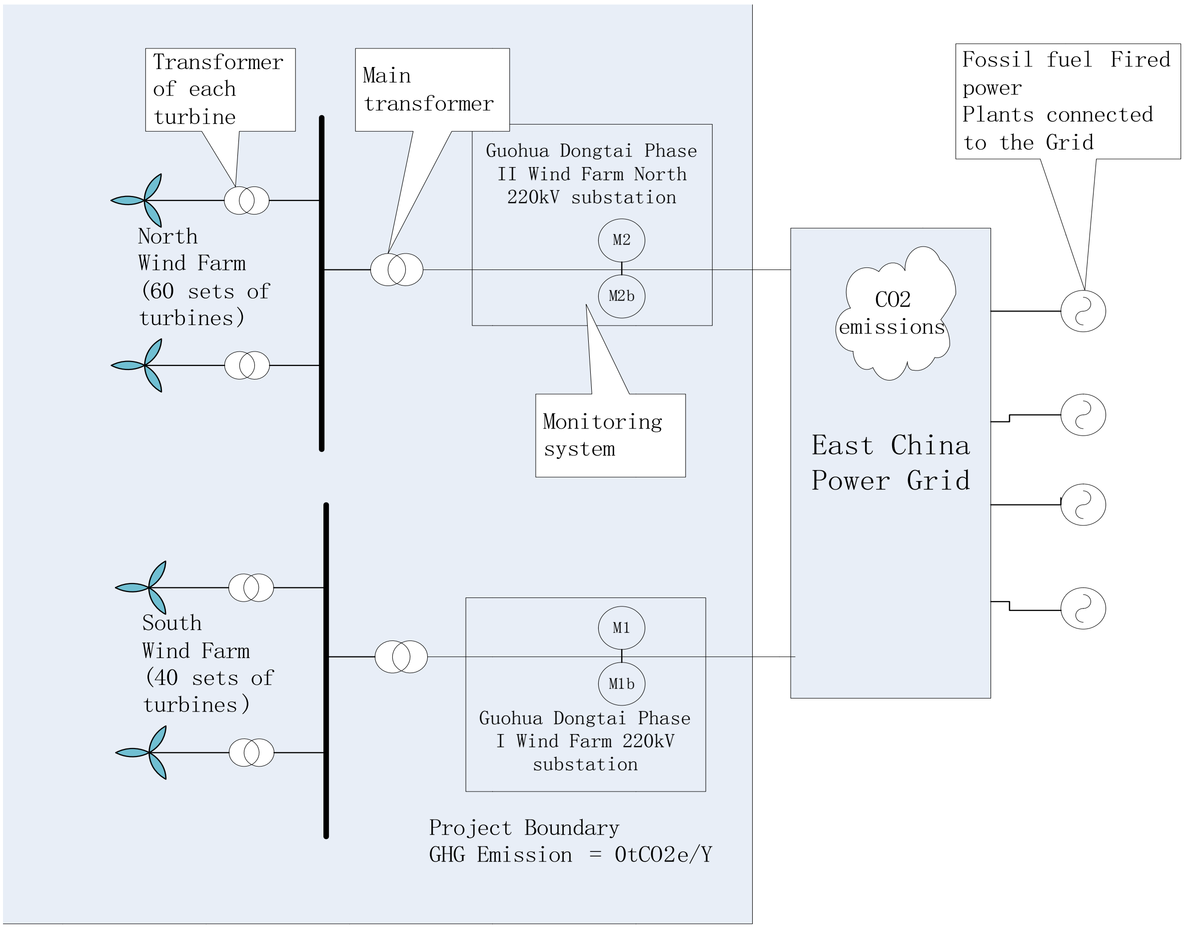

Figure B-1. The follow diagram of the project boundary

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

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According to the description in the approved baseline methodology ACM0002 (version 12.1.0), for the project activities that do not modify or retrofit an existing electricity generation facility, the baseline scenario is the following:

> *Electricity delivered to the grid by the project 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) calculated described latter.*

Under the condition that the additionality of the Project activity is demonstrated (see B.5).

The Project is connected to the Jiangsu Grid, an integrated part of the East China Power Grid. So East China Power Grid is considered as the **project electricity system**, which is defined as the "project boundary" of the Project. Therefore, being a project with the boundary of East China Power Grid that does not modify or retrofit an existing electricity generation facility, the baseline scenario of the Project can be identified as the following:

> Electricity delivered to the grid by the Project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources within the East China Power Grid, as reflected in the combined margin (CM) calculated described latter.

The analysis and description in B.5 and B.6 will support the baseline scenario shown above.

According to ACM0002, baseline emissions are equal to the power generated by the Project that is delivered to the East China Power Grid, multiplied by the baseline emission factor. The baseline emission factor (EF_y) is calculated as a Combined Margin (CM), which consists of the weighted average of Operating Margin (OM) emission factor and Build Margin (BM) factor. An ex-ante 3 years data vintage for the East China Power Grid is used. The key parameters[2] used for emission reductions calculation are as follow:

Parameter	Unit	Value
EF_{OM}	tCO_2e/MWh	0.8825
EF_{BM}	tCO_2e/MWh	0.6826
EF_y	tCO_2e/MWh	0.8325

The emission reductions calculations are specified in B.6 and Annex 3.

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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Since the Project is not financially attractive, the incentive from the CDM was seriously considered by the Project owner. The Feasibility Study Report (hereafter, FSR) of the Project was completed by in September 2009 and was approved by National Development and Reform Commission in January 2010. However the financial indicator such as total investment IRR of the Project is lower than the financial

[2] http://qhs.ndrc.gov.cn/qjfzjz/t20090703_289357.htm

benchmark. The Project is not financially attractive. In order to improve the financial attractiveness of the Project, the FSR pointed out that if the revenues from CDM could be considered, the financial disadvantage could be alleviated. So the CDM was seriously considered by the Project owner. Based on the economic analysis and suggestion in FSR, the Board of the Project Owner held a meeting in October 2009. In the Board Meeting, the directors made the decision to seek the help from CDM revenue to alleviate the financial disadvantages. The board decision showed that, only with the compensation from CDM project, the IRR can be increased to normal level to promote the continuous development of the Project. The project is started in March 2010.

The timeline of milestone of the Project is shown in the table below:

Table B-1 timeline of milestone of the Project

Time	**Milestones**
10/09/2006	EIA finished.
12/12/2008	EIA approval from General Office of Ministry of Environmental Protection of the People's Republic of China (No.[2008] 899)
09/2009	The feasibility study report of the proposed project (FSR) was finished, which indicated that the Project IRR is lower than benchmark.
28/10/2009	The meeting of the board of directorates was conducted. According to the FSR, the project is financially unattractive. In order to increase the IRR of the proposed project, the project owner made a decision of investment and CDM application.
15/01/2010	The CDM consultancy contract signed.
26/03/2010	Wind turbine contract signed.
07/04/2010	Construction contract signed[3].
05/05/2010	Transformer contract signed.
20/05/2010	Notification for CDM prior consideration to DNA
26/09/2010	Notification for CDM prior consideration to UNFCCC
31/12/2010	LOA from DNA of China.
22/07/2011	LOA from DNA of Annex one country.

The additionality of the Project is demonstrated and assessed by using the *Tool for the Demonstration and Assessment of Additionality* approved by EB (version 05.2.1). It includes the following steps:

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:

[3] The construction of the project started when the contract signed.

Realistic and credible alternatives that provide outputs or services comparable to the Project activity include:

***Alternative 1*:** Construction of a fossil fuel-fired power plant with equivalent amount of annual electricity generation;
Alternative 2: The Project activity not undertaken as a CDM project activity;
Alternative 3: Construction of a power plant using other sources of renewable energy with equivalent amount of annual electricity generation;
Alternative 4: Provision of an equivalent amount of annual power output by the grid into which the project is connected.

Sub-step 1b. Enforcement of applicable laws and regulations:

For ***Alternative 1***, in generally speaking, the annual operating hours of a fossil fuel-fired power plant are about at least 2 times more than that of a wind power project. The annual operating hours of the proposed project are 2030 hours, and the annual operating hours of a fossil fuel-fired power plant in China are over 5000 hours in 2007[4]. Considering the same annual power generation capacity, the alternative baseline scenario for the proposed project should be a fossil fuel-fired power plant with installed capacity of 100MW or lower. Further, as the proposed project is a grid-connected wind power generation project, the alternative baseline scenario must be a grid-connected fossil fuel-fired power generation project. However, according to Chinese regulations (*On Prohibition of 135MW and Smaller-scale Fuel-fired Power Plants*, General Office of State Council[5]), construction of fossil fuel-fired power plants with the installed unit capacity less than 135MW is prohibited to be built in the areas covered by large grids such as provincial grids. For these reasons, the possible alternative baseline scenario of building a 100MW fuel-fired power plant conflicts with China's current regulations. So, ***Alternative 1*** is not feasible as an alternative scenario.
For ***Alternative 2***, developing the proposed project not as a CDM project in accordance with current regulations and laws of China – should be eliminated from the following consideration because the investment analysis in section B.5 will convey that the proposed project not undertaken as a CDM project is not financially attractive for the potential investors without CERs income.
For ***Alternative 3***, Solar[6] resource is limited and lacked in Yancheng city, Jiangsu province, so the development of hydropower and solar power are unpractical in the area. In China, power generation by biomass is still in the demonstration phase, which brings poor economic performance and cannot be commercialized in the absence of national policy support[7]. According to the FSR of the proposed project, the latitude of the Project is lower than 5m, so there is no adequate exploitable hydro resource available for construction of a hydro power utility to provide the same generation as the Project. So there exist no economically exploitable hydro or biomass resources with a commensurate scale within the area of the Project. Hence ***Alternative 3*** is not feasible.

For ***Alternative 4***, "Provision of an equivalent amount of annual electricity output by the grid into which the project is connected": The provision of an equivalent amount of annual electricity output by the East

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[4] China Electric Yearbook 2008

[5] http://www.gov.cn/gongbao/content/2002/content_61480.htm

[6] http://cwera.cma.gov.cn/upload/b_3_left_02.jpg

[7] http://jjckb.xinhuanet.com/cjxw/2007-11/27/content_75467.htm

China Power Grid is an economically viable alternative, and in compliance with the national legal and regulatory requirements.

Hence, in the absence of the Project, the most realistic and credible alternative is ***Alternative 4***.

Outcome of Sub-step 1b:
Therefore ***Alternative 2*** and ***Alternative 4*** are analyzed in **Step 2 Investment Analysis** as potential baseline alternatives.

Step 2. Investment Analysis

Sub-step 2a. Determine appropriate analysis method

The *Tools for the Demonstration and Assessment of Additionality* recommends three analysis methods which are simple cost analysis (option I), investment comparison analysis (option II) and benchmark analysis (option III).

The simple cost analysis (option I) is not applicable for the proposed project because the project activity will produce economic benefit (from electricity sale) other than CDM related income. The investment comparison analysis (option II) is also not applicable for the proposed project because the baseline scenario, providing the same capacity or electricity output by the East China Power Grid, is not a new investment project.
To conclude, the benchmark analysis (Option III) will be used to assess the financial viability of the Project activity.

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

In according with *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects* issued by former State Power Corporation of China, the financial benchmark Project IRR of electrical industry for the total investment is regulated as 8% (after tax) . When the Project IRR is above the corresponding financial benchmark, the project is financially feasible and economically reasonable. On the basis of the benchmark 8%, 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

The basic parameters for calculation of financial indicators of the Project are shown in Table B-1 as follows:

Table B-2 Parameters for calculation of key financial indicators

Parameter	Unit	Amount	Source
Installed capacity:	MW	200	FSR
Annual output:	MWh	406,020	FSR
Construction period	year	3	FSR

Designed project life time	year	20	FSR
Total investment:	Million Yuan	2026.52	FSR
Static total investment:	Million Yuan	1952.88	FSR
Tariff (Including VAT):	Yuan/KWh	0.487	FSR
Rate of income tax	%	25	FSR
Rate of value added tax	%	17[8]	FSR
Tax rebate rate of value added tax	%	50	FSR
Rate of city construction tax	%	5	FSR
Rate of additional education fee	%	3	FSR
Rate of depreciation	%	5	FSR
Rate of Residual	%	0[9]	FSR
Annual Maintenance cost	10^4 Yuan	3032	FSR
Annual Salary and Welfares of employees	10^4 Yuan	326	FSR
Annual Material Fee	10^4 Yuan	100	FSR
Annual Insurance premium of fixed assets	10^4 Yuan	505	FSR
Annual Others Fee	10^4 Yuan	600	FSR
Short-term loan interest rate	%	5.31%	FSR
Long-term loan interest rate	%	5.94%	FSR
Short term loan/ Floating capital	%	70%	FSR
Long term loan/Total investment	%	75%	FSR

[8] Equipment VAT return has been considered in IRR calculation.

[9] The estimated residual value is less than 5% and can be decided by the project owner. http://www.gov.cn/zwgk/2007-12/11/content_830645.htm

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

In accordance with benchmark analysis (Option III), if the financial indicators (such as IRR) of a project are lower than the benchmark, it is not considered to be financially attractive.

Table B-2 shows the total investment IRR of the Project with and without the CDM revenues. Without the CDM revenues, the IRR of total investment is 4.38%, which is lower than the financial benchmark. Thus the Project is not financially attractive. With income from CERs, the IRR is 8.02%, which is higher than the financial benchmark..

Table B-3 Project IRR of the Project

	Project IRR
Without CERs	4.38%
With CERs	8.02%

Sub-step 2d. Sensitivity analysis

The sensitivity analysis shall show whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions.

According to *Economical Assessment and Parameters for Construction Project*[10], the fluctuation of sensitivity analysis in construction projects could be in ±10% which is same as FSR. Besides the Project, similar wind power projects in China always adopt ±10% as the fluctuation of sensitivity analysis, which is the common sense in China. So, the sensitivity analysis conducted by altering from -10% to +10% respectively is commonly acknowledged and used in China.

For the Project, four parameters were selected as sensitive factors to assess the financial attractiveness:

1) Total investment
2) Annual O&M cost
3) Electricity output
4) Feed-in-Tariff

The results of sensitivity analysis (without CDM revenues) are shown in Table B-3 and Figure B-1 below.

Table B-3. Sensitivity of total investment IRR to different financial parameters

IRR value / Factors	Total investment	Annual O&M cost	Feed-in-Tariff	Electricity output
34%	-	-	8%	8%
10%	3.12%	4.01%	5.62%	5.62%
5%	3.74%	4.20%	5.03%	5.03%

[10] *Economical Assessment and Parameters for Construction Project* issued by National Planning Committee and Ministry of Construction and Published by China Planning Press.

0%	4.38%	4.38%	4.38%	4.38%
-5%	5.05%	4.57%	3.69%	3.69%
-10%	5.72%	4.75%	2.97%	2.97%
-25.8%	8%	-	-	-
-100%	-	7.85%	-	-

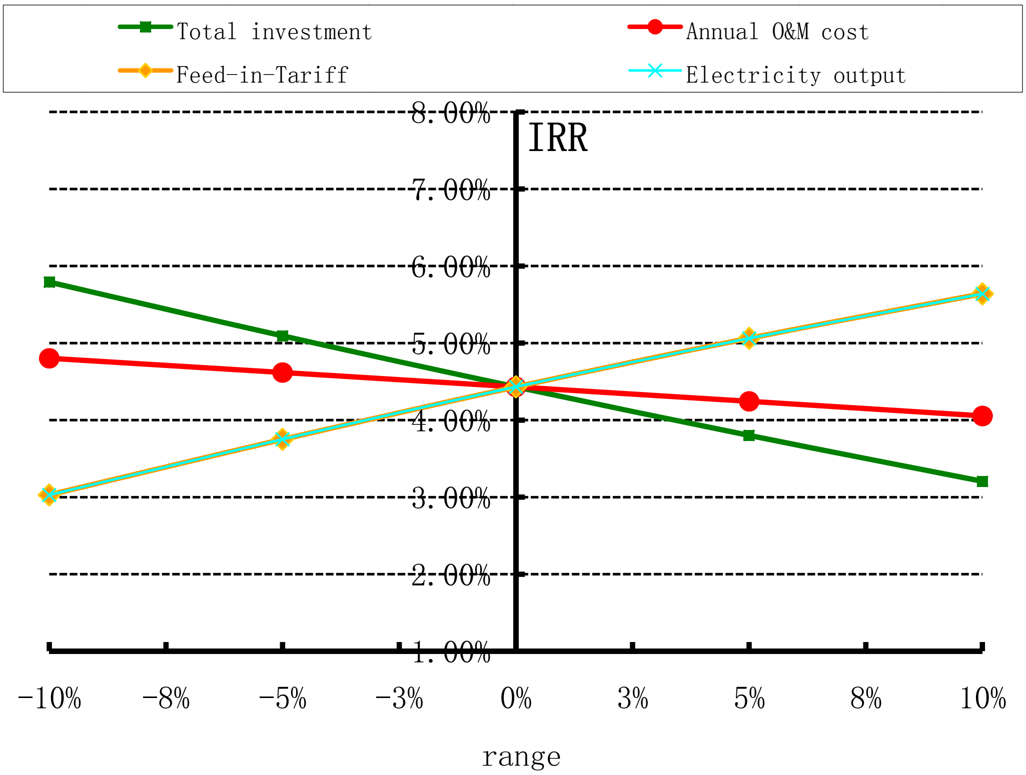

Figure B-2. Sensitivity of total investment IRR to different financial parameters

As shown in the sensitivity analysis, even the variation range of the uncertain factors reaches ±10%, the IRR of total investment of the Project could not reach the benchmark and the additionality of the Project would not be influenced.

Static total investment
Compare the Project with other wind farm project that registered as CDM project in Jiangsu province, as shown in table B-4 below, the max value of total static investment per KW is 10680 RMB/KW and the min value is 8136 RMB/KW, the value of the Project is 9764RMB/KW, it's in a normal range. It could be found that the total investment IRR of the Project will reach the benchmark IRR when the Static total investment decreases 25.8%. In 2006, approval of *Renewable Energy Law of the People's Republic of China* by Chinese government boosted the development of wind power in China and the total installed

capacity of wind farm increased sharply since then[11]. The increase of wind farm construction caused the shortage of wind turbine and price increase occurred when wind turbine can't meet the need of the market. On the other hand, the prices of construction materials are continuously increasing[12] in these years. So it is unlikely that the static total investment of the Project decreases. Therefore, it is impossible the static total investment would be 25.8% less than the estimated value.

Table B-4 Registered CDM wind power projects in Jiangsu province

Project NO.	Project	Installed capacity (MW)	Plant load factor (%)	Static total investment (10^4RMB)	O&M (10^4 RMB)	Static total investment/ Installed Capacity (RMB/KW)	O&M/ Installed capacity (RMB/KW)
0491	Rudong County Wind Farm Project – China[13]	100	25.01 %	81,360	-	8136	-
0833	Jiangsu Rudong Huangang Dongling Wind Power Project[14]	100.5	25.95 %	101,734	2,190	10123	218
1118	Jiangsu Dongtai 201MW Wind Power Project[15]	201	24.77 %	181,681	3,773	9039	188
905	Jiangsu Qidong 91.5 MW Wind Power Project[16]	91.5	27.23 %	92,415	1,602	10100	175
2169	Jiangsu Rudong Lingyang Wind Power Project [17]	49.5	24.61 %	47,478	948	9592	200
2857	Jiangsu Qidong Dongyuan Wind Power Project [18]	100.5	23.92 %	96,002	1,882	9552	197
2532	Jiangsu Dongling Wind Farm Project[19]	70.5	23.97 %	71,740	1,480	10176	210
3027	Jiangsu Xiangshui 201MW Wind Power Project[20]	201	24.74 %	202,882	3,846	10094	191
3736	Jiangsu Rudong (II) Expansion Wind Power Project [21]	100.5	26.30 %	107,331	2,066	10680	206

[11] http://www.sdpc.gov.cn/zjgx/t20070105_109006.htm

[12] http://energy.people.com.cn/GB/5720709.html

[13] http://cdm.unfccc.int/Projects/DB/TUEV-SUED1155911792.37/view

[14] http://cdm.unfccc.int/Projects/DB/DNV-CUK1167201624.99/view

[15] http://cdm.unfccc.int/Projects/DB/DNV-CUK1178600288.96/view

[16] http://cdm.unfccc.int/Projects/DB/DNV-CUK1169847796.5/view

[17] http://cdm.unfccc.int/Projects/DB/TUEV-SUED1218638332.96/view

[18] http://cdm.unfccc.int/Projects/DB/TUEV-SUED1249379398.09/view

[19] http://cdm.unfccc.int/Projects/DB/KEMCO1240304249.15/view

[20] http://cdm.unfccc.int/Projects/DB/AENOR1254999774.15/view

[21] http://cdm.unfccc.int/Projects/DB/SGS-UKL1274858070.56/view

5214	Jiangsu Nantong Rudong Wind Power Project[22]	150	23.23 %	151,161	2,547	10077	170
	The Project	200	23.17 %	195,288	4,564	9764	228

Annual O&M cost

As show in table B-4, the max value of O&M cost per KW of most registered projects in Jiangsu is 218 RMB/KW and min value is 170 RMB/KW, the value of the Project is 228 RMB/KW, it's about 4.6% higher than the max value, considering the consistent rising price of materials and staff salaries these years in China, it is reasonable. It could be found that the total investment IRR of the Project can't reach the benchmark IRR even the annual O&M decreases 100%.It is impossible that the annual O&M cost could decrease 100% and the Project always lacks financial attractiveness within the reasonable range of annual O&M cost.

Annual electricity output

As show in table B-4, the max PLF value of all registered project in Jiangsu province is 27.23%, and the min value is 23.23%, the value of the project is 23.17%, it's a little lower than the min value, according to the FSR of the Project, the annual output is estimated basing on the historic wind resource (Based on 2 years on-site assessment of wind resource of the Project (2007–2008) and 28 years (1981-2008) wind resource data from Dongtai Meteorological Station), so the value can be trusted. It could be found that the total investment IRR of the Project will reach the benchmark IRR when the annual electricity output increase 34%. In addition, if machine run long time, and the malfunction rate of the machine will tend to increase. The generate electricity efficiency of wind turbines will tend to decrease year after year. Therefore, the probability that annual electricity output is 34% higher than the estimated value is very low.

Feed-in-Tariff

The tariff of the Project approved by NDRC[23] on 20/01/2010 for the project is 0.487 Yuan/KWh (include VAT) it's equal to the highest tariff in all registered CDM project of Jiangsu province of China. It could be found that when the feed-in-tariff of the Project increased by about 34%, the IRR of the proposed project begins to exceed the benchmark. However there is extremely unlikely for the tariff of the proposed project to have an increase of 34%, as the electricity price is regulated by the government in China[24,] the electricity price of the Project is impossible to over the national standard tariff of wind project, so this project is always financial unattractive.

To sum up, it can be concluded that without CDM revenues, the Project is not financially attractive.

Outcome of Step2:

In conclusion, the realistic and credible alternatives to the Project activity are selected and ***Alternative 2*** is excluded. The realistic and credible baseline scenario is ***Alternative 4*** Equivalent electricity service provided by the East China Power Grid.

Step 3.Barrier analysis

As the sensitivity analysis concluded that the proposed CDM project activity is unlikely to be the most financially attractive, step 3 is not applied for this project activity.

[22] http://cdm.unfccc.int/Projects/DB/DNV-CUK1315913502.91/view

[23] National Development and Reform Commission of China

[24] http://code.fabao365.com/law_237850.html

Step 4. Common practice analysis

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

In China, there are significant differences between policies, regulations and economic conditions between different provinces, therefore wind power projects in different provinces face very different operational environments. Further, with a population of 77.25 million people[25], the province of Jiangsu is larger than many countries. The common practice analysis in this PDD therefore limits the region to the province, which is standard practice for Chinese CDM projects. We chose all wind power projects in Jiangsu province.

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

According to Statistics on China Wind Farm Installed Capacity 2010 issued by Chinese Wind Energy Association (CWEA), the prior consideration page of EB website and the projects list in China NDRC website[26], all the projects developed in Jiangsu province are either registered CDM project activities or project activities which have been published on the UNFCCC website, this fully demonstrates that wind power projects are not the common practice in Jiangsu Province.

Outcome of Step 4:

To summarize, it can be proved that the Project activity is additional and not (part of) baseline scenario. Without the CDM revenues, the Project activity would not be implemented. The above additionality analysis provides sufficient evidence that the CDM revenues can alleviate the financial disadvantages of the Project.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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Emission reductions from the Project can be calculated based on “Tool to calculate the emission factor for an electricity system” (version 02.2.1). It has an option to estimate the Operating Margin (OM) and the Build Margin (BM) emission factor ex-ante, and through weighted average of OM and BM, the Combined Margin baseline emission factor of the East China Power Grid can be obtained and then the emission reductions from the CDM project activity can be estimated.

The details are shown following steps:

Step 1. Identify the relevant electric power system

Using the boundary definitions of the Chinese NDRC, The spatial extent of the project boundary includes the proposed project and all power plants connected physically to the East China Power Grid that the CDM project power plant is connected to. The East China Power Grid is defined as the **project electricity system**, which consists of independent province-level electricity systems including Shanghai, Jiangsu, Zhejiang, Anhui and Fujian province that can be dispatched without significant transmission constraints. The **connected electricity system** is Center China Power Grid, which is connected by

[25] http://www.stats.gov.cn/tjsj/ndsj/2010/indexeh.htm

[26] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2613.pdf

transmission lines to the project electricity system. Power plants within the connected electricity system can be dispatched without significant transmission constraints but transmission to the project electricity system has significant transmission constraint.

Furthermore, although Yangcheng Power Plant is located in Shanxi Province which is covered by the North China Power Grid, all the generation of the plant is delivered to the East China Power Grid. Therefore, the generation from Yangcheng Power Plant is also considered in the calculation of baseline emission factor (See Annex 3).

Electricity transfers from connected electricity systems to the project electricity system are defined as **electricity imports** and electricity transfers to connected electricity systems are defined as **electricity exports**. The East China Power Grid has the electricity imports from the Center China Power Grid and Yangcheng Power Plant.

For the purpose of determining the build margin emission factor, the spatial extent is limited to the project electricity system (East China Power Grid), since the electricity **imports** from Center China Power Grid and Yangcheng Power Plant account for a very small percentage and recent or likely future additions to transmission capacity will not enable significant increases in imported electricity.

According to the definition of the East China Power Grid by National Development and Reform Commission of China (hereafter referred to as NDRC), it covers five provinces (Shanghai, Jiangsu, Zhejiang, Anhui, Fujian, and its geographic and system boundaries can be clearly identified. The power to be generated from the Project will be delivered to Jiangsu Power Grid, which is an integral part of the East China Power Grid.

For the purpose of determining the operating margin emission factor, electricity exports should not be subtracted from electricity generation data used for calculating and monitoring the electricity emission factors.

For the purpose of determining the operating margin emission factor, use one of the following options to determine the CO_2 emission factor(s) for net electricity imports ($EF_{grid, import, y}$) from a connected electricity system within the same host country:

a) 0 tCO_2/MWh, or
b) The weighted average operating margin (OM) emission rate of the exporting grid, determined as described in step 3 below; or
c) The simple operating margin emission rate of the exporting grid, determined as described in step 3 below; or
d) The simple adjusted operating margin emission rate of the exporting grid, determined as described instep 3 below.

For the project activity, option (c) is used to determine the CO_2 emission factor(s) for net electricity imports ($EF_{grid, import, y}$) from Central China Power Grid.

Step 2. Choose whether to include off-grid power plants in the project electricity system (option)

Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

Option I: Only grid power plants are included in the calculation.

Opiton II: Both grid power plants and off-grid plants are included in the calculation.

Option I is chosen for the project.

Step 3. Select a method to determine the operating margin(OM)

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

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

The simple OM method (option a) can only be used if low-cost/must-run resources[27] 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.

For the simple OM, the simple adjusted OM and the average OM, the emissions factor can be calculated using either of the two following data vintages:

- Ex ante option: If the ex ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use 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.
- Ex post option: If the ex post option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required calculating the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year (y-1) may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year (y-2) may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

For the dispatch data analysis OM, use the year in which the project activity displaces grid electricity and update the emission factor annually during monitoring.

The data vintage chosen should be documented in the CDM-PDD and not be changed during the crediting periods.

Power plants registered as CDM project activities should be included in the sample group that is used to calculate the operating margin if the criteria for including the power source in the sample group apply.

[27] Low-cost/must-run resources are defined as power plants with low marginal generation costs or power plants that are dispatched independently of the daily or seasonal load of the grid. They typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. If coal is obviously used as must-run, it should also be included in this list, i.e. excluded from the set of plants.

Among the total electricity generations of the East China Power Grid which the Project is connected into, the amount of low-cost/must run resources accounts for about 10.96% in 2003, 9.77% in 2004, 11.65% in 2005, 11.44% in 2006 and 10.92% in 2007, all less than 50% (see Annex 3 for details). Thus, the method (a) Simple OM is used to to calculate OM emission factor for the proposed project.

Step 4. Calculate the operating margin emission factor according to the selected method

According to *Tool to Calculate the Emission Factor for an Electricity System,* there are two options for the calculating the Simple OM.

Option A: Based on the net electricity generation and a CO2 emission factor of each power unit, or
Option B: Based 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.

For the project electricity system, the data on fuel consumption, net electricity generation and the average efficiency of each power unit are unavailable, thus option A cannot be used. Nevertheless, the 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 are available, and, 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, and, off-grid power plants are not included in the calculation which means Option I has been chosen in Step 2, therefore, Option B can be used.

On Option B, the simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost / must-run power plants / units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows:

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

where:

$EF_{grid,OMsimple,y}$ = Simple operating margin CO_2 emission factor in year *y* (tCO_2/MWh)

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

$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ / mass or volume unit)

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

EG_y = Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year *y* (MWh)

i = All fossil fuel types combusted in power sources in the project electricity system in year *y*

y =The relevant year as per the data vintage chosen in Step 3

Following above, the Operating Margin emission factor (EF_{OM}) of the East China Power Grid is calculated ex ante as 0.8825 tCO_2e/MWh[28]. The details calculation and data were listed in the annex 3.

[28] http://qhs.ndrc.gov.cn/qjfzjz/t20090703_289357.htm

Step 5. Calculate the build margin (BM) emission factor

According to *Tool to Calculate the Emission Factor for an Electricity System*, there are two options for calculation of build margin emission factor:

Option 1: Calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of PDD submission.

Option 2: The build margin emission factor shall be updated annually, ex-post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available.

Option 1 is chosen for the Project.

According to *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:

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

(2) 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

In China, it is very difficult to obtain the data of the five existing power plants built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that were built most recently because these data are considered as confidential business information by the owners of the plants. In consideration of this situation, 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 is reasonable for East China Power Grid.

According to Tool to Calculate the Emission Factor for an Electricity System, power plant registered as CDM project activities should be excluded from the sample group m. However, if group of power units, not registered as CDM project activity, identified for estimating the build margin emission factor includes power unit(s) that is (are) built more than 10 years ago then:

(i) Exclude power unit(s) that is (are) built more than 10 years ago from the group; and

(ii) Include grid connected power projects registered as CDM project activities, which are dispatched by dispatching authority to the electricity system

According to China Electric Power Yearbook, it is impossible to separate the more than 10 years plants and registered as CDM projects from sample group m, so (ii) Include grid connected power projects registered as CDM project activities, which are dispatched by dispatching authority to the electricity system is reasonable for East China Power Grid.

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units *m* during the most recent year y for which power generation data is available, calculated as follows:

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

where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)

$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2/MWh)

m = Power units included in the build margin

y = Most recent historical year for which power generation data is available

However, in China it is very difficult to obtain the data of the five existing power plants built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that were built most recently. Taking notice of this situation, EB accepts the following deviation in methodology application:

1) Capacity addition from one year to another is used as basis for determining the build margin, i.e. the capacity addition over 1-3 years, whichever results in a capacity addition that is closest to 20% of total installed capacity.
2) Use proportional weights that correlate to the distribution of installed capacity in place during the selected period above, using plant efficiencies and emission factors of commercially available best practice technology in terms of efficiency. 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.

The build margin calculations featured below is derived from NDRC.

Since there is no way to separate the different generation technology capacities as fuel coal, fuel oil, fuel gas from thermal power based on the present statistical data, the following calculating measures will be taken:

- First, according to the statistical data of the most recent one year, determine the ratio of CO2 emissions produced by coal, oil and gas fuels consumption for power generation;
- Second, multiply this ratio by the respective emission factors based on commercially available best practice technology in terms of efficiency;

Finally, this emission factor for thermal power is multiplied with the ratio of thermal power identified within the approximation for the latest 20% installed capacity addition to the grid. The result is the BM emission factor of the grid.

Sub-step 1: Calculate the proportion of CO_2 emissions related to consumption of coal, oil and gas fuel used for power generation as compared to total CO_2 emissions from the total fossil fuelled electricity generation (sum of CO_2 emissions from coal, oil and gas).

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

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

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

Where:

$F_{i,j,y}$ = The amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources *j* in year(s) *y*;

$NCV_{i,y}$ = The net caloric value of fossil fuel *i* (GJ/mass or volume unit);

$EF_{CO2,i,y}$ = The CO_2 emission factor of fossil fuel *i* in year *y*;

Sub-step 2: Calculate the emission factor of fuel-based generation:

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \quad (6)$$

Where:

$EF_{Coal,Adv}$, $EF_{Oil,Adv}$, $EF_{Gas,Adv}$ are the emission factors for coal-fired, oil-fired and gas-fired generation technology according to commercially available best practice technology in terms of efficiency.

To be conservative, the best commercially available technology for coal fired power generation is identified as domestically produced 600MW sub-critical power unit. The coal consumption per kWh electricity supplied to grid by domestically produced 600MW sub-critical power unit is estimated as 329.94 gce/kWh, equivalent to 37.28% as power supply efficiency[29]. For gas and oil power plants a 200MW combined cycle power plant with a specific fuel consumption of 252 gce/kWh, which corresponds to an efficiency of 48.81% for electricity generation, is selected as commercially available best practice technology in terms of efficiency[30].

Sub-step 3: Calculate the building Margin emission factor

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

[29] http://qhs.ndrc.gov.cn/qjfzjz/t20090703_289357.htm
[30] http://qhs.ndrc.gov.cn/qjfzjz/t20090703_289357.htm

Where:

CAP_{Total} = The total capacity addition

$CAP_{Thermal}$ = The total thermal (coal, oil and gas) power capacity addition.

Following these steps above, the Build Margin emission factor ($EF_{grid,BM,y}$) of the East China Power Grid is calculated ex ante as 0.6826tCO_2e/MWh[31]. The details calculation and data were listed in the annex 3.

Step 6. Calculate the combined margin emissions factor

The calculation of the combined margin (CM) emission factor (EFgrid,CM,y) is based on one of the following methods:

(a) Weighted average CM; or
(b) Simplified CM.

The weighted average CM method (option a) is selected.

The combined margin emissions factor is calculated as follows:

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

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)

$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year y (tCO_2/MWh)

w_{OM} = Weighting of operating margin emissions factor (%)

w_{BM} = Weighting of build margin emissions factor (%)

Wind power generation project activities: w_{OM} = 0.75 and w_{BM} = 0.25 for the first crediting period and for subsequent crediting periods.

The $EF_{grid,OM,y}$ and $EF_{grid,BM,y}$ are calculated as described in Step 4 and 5. The baseline emission factor $EF_{grid,CM,y}$ for the Project is 0.8325tCO2e/MWh.

Calculate the baseline emissions (BE$_y$)

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

$$BE_y = EG_y \times EF_y \quad (9)$$

[31] http://qhs.ndrc.gov.cn/qjfzjz/t20090703_289357.htm

$EG_y = EG_{out} - EG_{in}$

Where:
BE_y = Baseline emissions in year y (tCO2/yr)
EG_y = Net electricity supplied by the project activity to the grid (MWh)
EG_{out} = Electricity exported by the project activity to the grid (MWh)
EG_{in} = Electricity imported by the project activity to the grid (MWh)
$EF_{,y} = EF_{grid,CM,y}$, combined margin CO2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system".

1. Project emissions (PE_y)

As described before, the emissions of the proposed project activity is zero, PE_y=0

2. Leakage (L_y)

According to the ACM0002 methodology, the leakage in the construction period of the proposed project is neglected. So the GHG emission within the project boundary is zero, i.e. L_y =0.

3. Emission reductions (ER_y)

The emission reduction (ER_y) by the project activity during a given year y is the difference between baseline emissions (BE_y), project emissions (PE_y) and emissions due to leakage(LE_y), as follows:

$$ER_y = BE_y - PE_y - LE_y \qquad (10)$$

Where:
ER_y = Emission reductions in year *y* (t CO_2e/yr)
BE_y = Baseline emissions in year *y* (t CO_2e/yr)
PE_y = Project emissions in year *y* (t CO_2/yr)
LE_y = Leakage emissions in year *y* (t CO_2/yr)

Since PE_y and L_y are zero as described before, ER_y can be calculated as follows:

$$ER_y = BE_y = EG_y \times EF_y \qquad (11)$$

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

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Data / Parameter:	**$FC_{i,m,y}$**
Data unit:	Mass or volume unit
Description:	Amount of fossil fuel *i* consumed by power plant / unit *m* in year *y*
Source of data used:	China Energy Statistical Yearbook 2006-2008
Value applied:	See Annex 3 for details
Justification of the choice of data or	Official statistical data

description of measurement methods and procedures actually applied :	
Any comment:	-

Data / Parameter:	**$NCV_{i,y}$**
Data unit:	kJ/kg, or kJ/m^3
Description:	Net calorific value of fossil fuel type *i* in year *y*
Source of data used:	China Energy Statistical Yearbook 2006-2008
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the latest version of ACM0002, the Project uses the national values
Any comment:	-

Data / Parameter:	**$EF_{CO2, i,y}$**
Data unit:	tC/TJ
Description:	CO_2 emission factor of fossil fuel type *i* in year *y*
Source of data used:	2006 IPCC Guidelines 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 :	According to the latest version of ACM0002, the Project uses the IPCC default values.
Any comment:	-

Data / Parameter:	$\eta_{coal,adv}$
Data unit:	%
Description:	Best electricity supply efficiency for coal fired plant
Source of data used:	http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2552.pdf
Value applied:	39.08
Justification of the choice of data or description of measurement methods and procedures actually applied :	Following the EB guidance
Any comment:	-

Data / Parameter:	$\eta_{oil,adv}$
Data unit:	%

Description:	Best electricity supply efficiency for oil fired plant
Source of data used:	http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2552.pdf
Value applied:	51.46
Justification of the choice of data or description of measurement methods and procedures actually applied :	Following the EB guidance
Any comment:	-

Data / Parameter:	$\eta_{gas,adv}$
Data unit:	%
Description:	Best electricity supply efficiency for gas fired plant
Source of data used:	http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2552.pdf
Value applied:	51.46
Justification of the choice of data or description of measurement methods and procedures actually applied :	Following the EB guidance
Any comment:	-

Data / Parameter:	**CAP_y**
Data unit:	MW
Description:	The Installed Capacity of the power plants in the grid in the year y
Source of data used:	China Electric Power Yearbook 2006-2008
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistical data
Any comment:	-

Data / Parameter:	**$F_{i,j,y}$**
Data unit:	mass or volume unit of the fuel i
Description:	The total amount of fuel *i* (in a mass or volume unit) consumed by all the relevant power sources *j* in year(s) *y*
Source of data used:	China Energy Statistical Yearbook
Value applied:	See Annex 3 for details
Justification of the choice of data or description of	This kind of data accords with the latest version of ACM0002

measurement methods and procedures actually applied :	
Any comment:	-

Data / Parameter:	**$GEN_{j, y}$**
Data unit:	MWh
Description:	the electricity (MWh) delivered to the grid by source j
Source of data used:	China Electric Power Yearbook 2006-2008
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistical data
Any comment:	-

Data / Parameter:	**Electricity self-consumption ratio**
Data unit:	%
Description:	The ratio of electricity self-consumption to the total electricity generation of the power plants
Source of data used:	China Electric Power Yearbook 2006-2008
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official statistical data
Any comment:	-

Data / Parameter:	**$EF_{grid,CM,y}$**
Data unit:	tCO_2/MWh
Description:	Combined margin CO_2 emission factor for grid connected power generation in year *y* calculated using the latest version of the "Tool to calculate the emission factor for an electricity system"
Source of data used:	http://cdm.ccchina.gov.cn/web/index.asp
Value applied:	0.8325(Chinese NDRC)
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per the "Tool to calculate the emission factor for an electricity system"
Any comment:	-

B.6.3 Ex-ante calculation of emission reductions:

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According to the calculation results in B6.1, the emission reductions of the proposed project are calculated as follows:

Baseline emissions

Operating Margin emission factor ($EF_{OM,y}$) (tCO_2/MWh) : 0.8825[32]
Build Margin emission factor ($EF_{BM,y}$) (tCO_2/MWh) : 0.6826[33]
Baseline Emission factor (EF_y) (tCO_2/MWh) : 0.8325[34]

Project emissions

According to the baseline methodology ACM0002, the GHG emission of the proposed project within the project boundary is zero, i.e.

$$PE_y = 0$$

Leakage

According to the baseline methodology ACM0002, the leakage of the proposed project is not considered,

Project Emission Reductions

The emission reduction (*ERy)* by the project activity during a given year y is the difference between baseline emissions (*BEy*), project emissions (*PEy*) and emissions due to leakage (*Ly*), as follows:

$$ER_y = BE_y - PE_y$$

Where: according to the baseline methodology ACM0002, PE_y=0 and L_y=0. Therefore, the annual emission reductions of the project during the first crediting period are estimated to be:

$$ER_y = BE_y = EG_y \times EF_y$$

Annual generation is estimated as 406,020MWh. Using the approach above, the annual emission reductions are estimated to be 338,011 tCO_2e.

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

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Over the first 7-year period, it is expected that the Project activities will generate emission reductions for 338,011 tCO_2e annually.

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[32] See Annex3

[33] See Annex3

[34] See Annex 3

Year	Estimation of baseline emission reductions (tCO_2e)	Estimation of emission reductions generated by the Project Activity(tCO_2e)	Estimation of leakage (tCO_2e)	Estimation of emission reduction (tCO_2e)
26/05/2012 - 25/05/2013	0	338,011	0	338,011
26/05/2013 - 25/05/2014	0	338,011	0	338,011
26/05/2014 - 25/05/2015	0	338,011	0	338,011
26/05/2015 - 25/05/2016	0	338,011	0	338,011
26/05/2016 - 25/05/2017	0	338,011	0	338,011
26/05/2017 - 25/05/2018	0	338,011	0	338,011
26/05/2018 - 25/05/2019	0	338,011	0	338,011
Total (t-CO_2e)	0	2,366,077	0	2,366,077

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

>>

B.7.1 Data and parameters monitored:

>>

Data / Parameter:	$EG_{out,y}$
Data unit:	MWh
Description:	Electricity delivered to grid in year *y*
Source of data to be used:	Measured by meters
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Estimation of annual electricity generation delivered to grid: 406,020 MWh
Description of measurement methods and procedures to be applied:	There are bidirectional meters installed in the project site through which the exported and imported generation can be measured. The readings of the electricity meters will be continuously measured and monthly recorded. Data will be archived for 2 years following the end of the crediting period by means of electronic and paper backup. The accuracy of electricity meters will not exceed 0.5s. The national Calibration standard (DL/T 448-2000) will be applied in the project. The calibration frequency is one time/year.
QA/QC procedures to be applied:	Data measured by meters will be cross checked by electricity sales receipt.
Any comment:	

Data / Parameter:	$EG_{in,y}$
Data unit:	MWh
Description:	Electricity imported from grid in year *y*
Source of data to be used:	Measured by meters
Value of data applied	Estimation of annual electricity generation imported from grid: 0MWh

for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	There are bidirectional meters installed in the project site through which the exported and imported generation can be measured. The readings of the electricity meters will be continuously measured and monthly recorded. Data will be archived for 2 years following the end of the crediting period by means of electronic and paper backup. The accuracy of electricity meters will not exceed 0.5s. The national Calibration standard (DL/T 448-2000) will be applied in the project. The calibration frequency is one time/year.
QA/QC procedures to be applied:	Data measured by meters will be cross checked by electricity purchase receipt.
Any comment:	

Data / Parameter:	EG_y
Data unit:	MWh
Description:	Net electricity delivered to the Grid by the Project activity in year y.
Source of data to be used:	Calculation from $EG_{in,y}$, $EG_{out,y}$
Value of data applied for the purpose of calculating expected emission reductions in section B.5	In this PDD, the expected net electricity delivered to the Grid 406,020MWh is applied.
Description of measurement methods and procedures to be applied:	$EG_y = EG_{out,y} - EG_{in,y}$
QA/QC procedures to be applied:	The electricity record should be cross-checked by the confirmation from the grid company.
Any comment:	

B.7.2 Description of the monitoring plan:

>>

Baseline emission factor the project is determined ex ante. Therefore the electricity delivered by the project to the East China Power Grid is defined as the key data to be monitored. The monitoring plan is drafted to focus on monitoring the electricity delivered by the project to the East China Power Grid.

1. Introduction

The Project adopts the approved consolidated monitoring methodology ACM0002 (version 12.1.0) “Consolidated baseline methodology for grid-connected electricity generation from renewable sources” to determine and monitor the emission reductions from the net electricity generation from the Project.

2. Monitoring organization

Project owner will organize a special CDM workgroup to take charge of the monitoring work of the whole project. The general manager of the project entity will appoint a CDM project manager. Monitoring staff, on-site engineers and internal audit staff are responsible for the collection of the data and information required in the monitoring plan. The collected data and information will be documented and sent to the CDM manager monthly. The CDM manager will be in charge of the implementation of the monitoring plan and report to the general manager of the project owner. The general manager will make the confirmations on monitoring, calculation data and reports. The management framework is illustrated as follows:

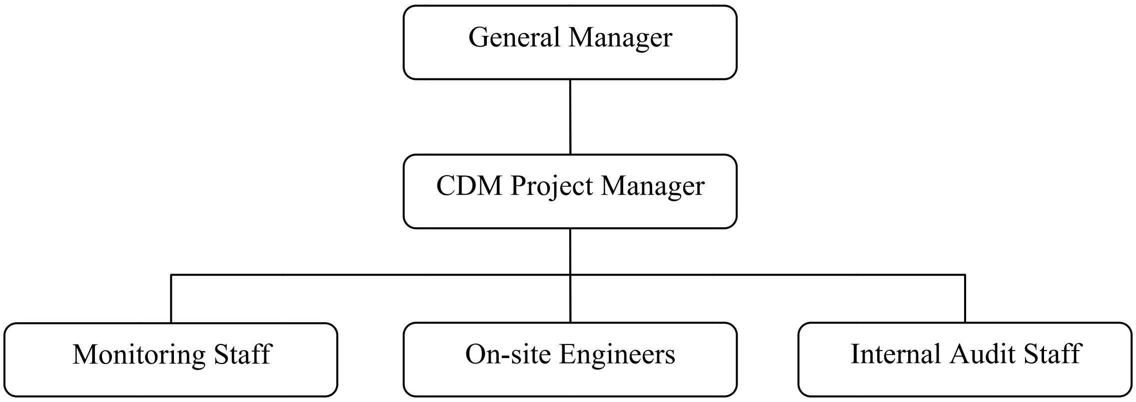


Figure B-3. The Management Framework

3. Monitor devices and calibration

The project consists two wind farms, 60 sets of turbines is installed in north wind farm and the other 40 sets of turbines is installed in south wind farm. Two pairs bidirectional electricity meters are installed for the measurement of net electricity delivered to grid. One pair (meter M1 and its backup meter M1b) were installed at Guohua Dongtai Phase I Wind Farm 220kV substation to measure the electricity export to the grid and electricity import from the grid by south wind farm of the project. Another pair (meter M2 and its backup meter M2b) will be installed at Guohua Dongtai Phase II Wind Farm North 220kV substation to measure the electricity generated from the north wind farm of the project. The metering equipments will be properly configured and checked according to the requirement from Technical Administrative Code of electric energy metering (DL/T448-2000).The metering equipment will be checked by the project owner and Grid Company before operation. The main meter will be owned, operated and maintained by East China Power Grid, and the backup meter will be owned, operated and maintained by the owner company. When the main meter is out of order, the readings from the backup meter will be used for reference.

The calibration of electric energy meter should be periodically carried out according to relevant national electric industry standards or regulations. Calibration is carried out by the authorized entity with the records being provided to the project owner, and these records will be maintained by the proposed project owner and the third party designated. The indicative grid connection diagram is provided in figure B-4.

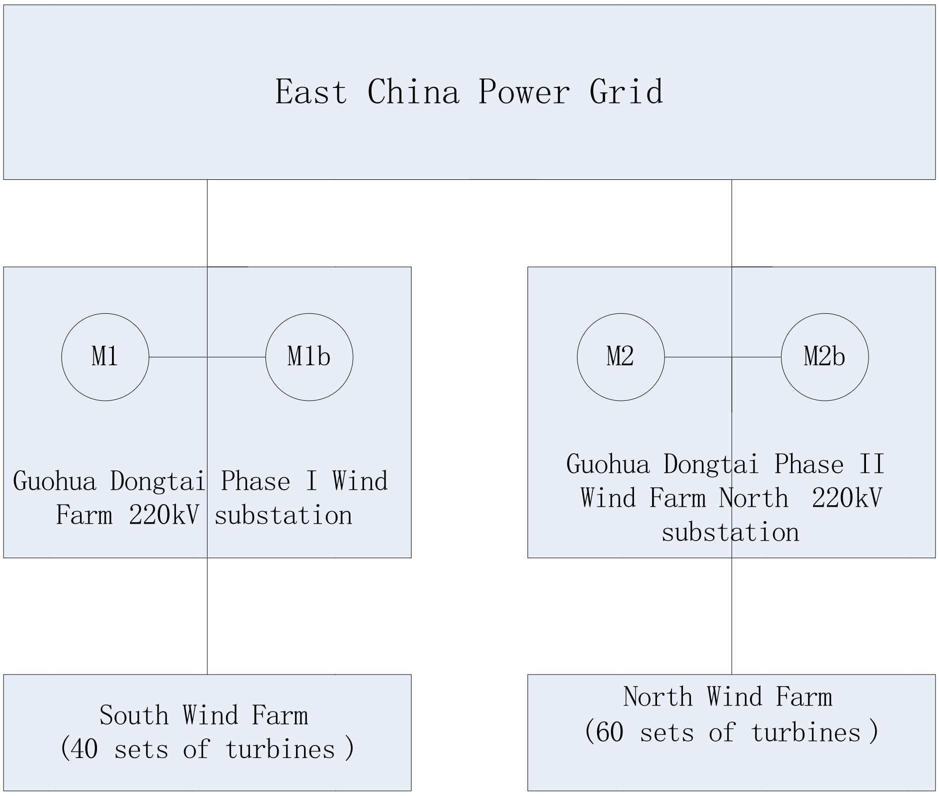


Figure B-4. Indicative Grid Connection Diagram

4. **Data monitored and collection**

The emission factors of the baseline are based on ex-ante calculation; therefore the main data to be monitored will be the amount of electricity supplied to the East China Power Grid by the proposed project.

CDM project manager is responsible for supervising and checking data and whole data record process as well as keeping receipt of sales for cross check. The backup meter will be maintained by the project owner and read by the site engineer with the same frequency of data reading of main electricity meter.

If the main meter is inaccurate by detecting errors larger than the allowable one, or functions improperly, the grid-connected electricity generated by the proposed project shall be determined by the reading of its backup meter.

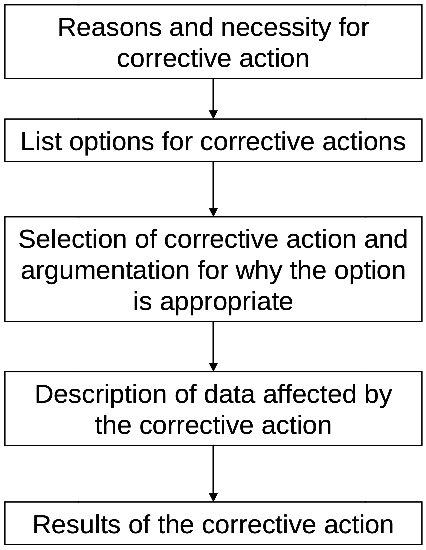
5. Data management system

This provides information on record keeping of the data collected during monitoring. Record keeping is the most important exercise in relation to the monitoring process.

In order to facilitate auditor's reference, monitoring results will be indexed. All paper-based information will be stored by the Project owner and kept at least in one copy. And all data collected should be archived electronically and be kept for at least 2 years after the end of the last crediting period.

6. Corrective actions

Specific staff will log all corrective actions and will report in the monitoring report. In case corrective actions are considered necessary, these actions will be implemented according to the procedure outlined below.



7. Training

The monitoring officers will attend a training session by the CDM consultants of Beijing RuiChi Electric Power Information Technology Co.,Ltd. The training session will include the following:

• Background of CDM
• Contents of PDD and monitoring plan (including monitoring procedures)
• Practical requirements for monitoring (including metering, calibration)
• Audit procedures / project performance review / corrective actions
• Worksheet (excel) containing monitoring data and calculations
• Monitoring report template
• Practical training exercise

8. Verification

The table below outlines the key documents relevant to monitoring and verification of the emission reductions from the Project. With all these documents compiled, the Project owner will sign a verification service agreement with specific DOE.

I.D. No.	Document Title	Main Content	Source
F-1	PDD, including the electronic spreadsheets and supporting documentation (assumptions, estimations, measurement, etc)	Calculation procedure of emission reduction and monitoring items	the Project owner, or directly download from UNFCCC website
F-2	Record on maintenance and calibration of metering equipment	Reasons for maintenance and calibration and the precision after maintenance and calibration	the Project owner
F-3	Monitoring report	CO_2 emission reduction calculation	the Project owner
F-4	Project Management Record (including data collection and management system)	Comprehensive and true reflection of the management and the operation of the Project	the Project owner

9. Quality assurance and quality control

The quality assurance and quality control procedures for recording, maintaining and archiving data shall be improved as part of this CDM project activity according to EB rules and real practice in terms of the need for verification of the emission reductions on an annual basis according to this PDD.

10. **Monitoring report**

Monitoring report, including monitoring data, process and results of reduction calculation, will be prepared by project owner and designed consultative organization together. Relevant maintenance records of monitoring equipments will be provided to DOE for the future verification.

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 baseline and monitoring study of the Project was completed on 01/01/2010 by Beijing Ruichi Electric Power Information Technology Co. Ltd. The key persons are following. The persons and Beijing Ruichi Electric Power Information Technology Co. Ltd are not the project participants listed in Annex 1.

1. *Mr. Gao Bo , bo.gao@richserc.com.cn* , Beijing Ruichi Electric Power Information Technology Co. Ltd., Floor7, Ruichi Grand Hotel, No.1 Xinhua South Street, Beijing, China, tel: (8610) 5876 8246

2. *Mr. Chen Yifei, Yifei.chen@richserc.com.cn* , Beijing Ruichi Electric Power Information Technology Co. Ltd., Floor7, Ruichi Grand Hotel, No.1 Xinhua South Street, Beijing, China, tel: (8610) 5876 8246

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:

>>

26/03/2010 (Signing date of the equipment contract)

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

>>

23years 0 months (including 3 years construction period)

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:

>>

26/05/2012 or the registration date, whichever is the latest

C.2.1.2. Length of the first crediting period:

>>

7 years

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:

>>

In accordance with relevant Chinese environmental laws and regulations, the environmental impact assessment (EIA) report of the proposed project was complied by Jiangsu Electric Power Design Institute has been approved by the General Office of Ministry of Environmental Protection of the People's Republic of China on 12/12/2008.

The environmental impacts arising from the Project are analyzed in the following two phases:

Construction Phase

Land use

Construction occupied land is just minor part for the whole wind farm. The Project mainly takes wasteland and wetland ground for permanent and temporary construction use. Inside the project location there are few trees, so it doesn't cut trees during the constructing phase, and no need to pay the compensation of the seeding for the peasants. There are no households within the site area, the immigration and disturbing of the residents do not exist. The vegetation, which is destroyed by the project construction, can resume in short-term time because of the vital life-force. During the construction, the problems of soil-erosion cannot be produced. Temporarily occupied land will be restored according to its characteristics after construction and will ensure its reutilization. Overall, land use impact on the local residents arising from the Project is considered to be insignificant.

Noise

The running noise of mechanical facilities and the traffic noise are the main source in the construction process. There are no households within the site area, so the noise influence to the residents during the construction does not exist. And the Project owner will control and manage the noise pollution source to be in line with the relevant rules on the environment noise during the construction period around the construction site.

Dust and exhaust gas

Due to the earthwork excavation and the running of construction vehicles dust, reentrainment of dust and tail gas are generated around. The Project owner will take measure, by means of dust wetting, adoption of advanced environment friendly equipments strengthening the workers' protection devices and so on, to control and minimize the air pollution of dust and exhaust gas.

Waste water

Certain amount of production wastewater and sanitary wastewater will be generated during the construction period. In order to reduce the pollution to the water environment nearby production wastewater and sanitary wastewater will not be directly discharged into the surrounding waters. The waste water will be treated by separation sedimentation tank, and will be recycled . Since construction workers are lived near the substation, the living wastewater produced in construction period will be collected and disposed by temporary waste water treatment facilities located in the substation.

Solid waste

The extra excavated earthwork during the construction period will be directly used, whose impact on the environment is insignificant. As to the municipal waste the Project owner will arrange garbage cans classified by areas and types of garbage and ask the environmental sanitation service company to clean and transport them.

Operation Phase

Noise

The operating noise of wind power turbine generator system comes from the friction between wind and blades and the running mechanical parts inside it. The wind farm is located in the area of wasteland and wetland, so there are no houses and local residents. As a result, the operating noise from the wind power turbine produces little impact on the surrounding residents.

It is regulated in the Code for Noise Control Design of Industrial Enterprises that the noise limit in the workshop of industrial enterprises is 96~104db(A) and the noise level at 500m from the tower foundation of the generator system is estimated to be much lower than the national standards (45db). The operators mainly work in the control tower, so it is believed that the wind farm will not do harm to the operators physically.

Electromagnetic radiation

Electromagnetic waves can be reflected for the rotation of the blades, so it can disturb the signals quality of radio and television programs. But the wind farm is located in the area of wasteland and wetland, there are no houses and local residents. So the electromagnetic radiation influences don't take into account.

Sanitary wastewater

The sanitary wastewater from the management staff of the wind farm will be discharged into waste water treatment facilities, which are located in the substation. The qualities of disposed wastewater meet the national standard grade one of *wastewater discharging comprehensive standards (GB8978-96).* So the wastewater influence is minor to the environment.

Impacts on bird and vision

Few birds live and feed in the Project area. The probability of this type of bird colliding with the turbine blades is nearly zero. Therefore the wind farm impact on birds living and feeding is negligible. At the same time, the construction of the wind farm can provide pleasing feeling from vision. The local residents also enjoy the wind farm. So the wind farm will be an attractive tour resource.

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:

>>

According to the results of EIA and the reply from the Environmental Protection Bureau, the impacts on the environment are not significant.

SECTION E. Stakeholders' comments

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

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Investigate Form: Questionnaires.
The Project owner conducted a survey on the local villagers and residents possibly affected by the Project on 06/01/2010. The survey was conducted through distributing questionnaires and collecting responses. During the process, the announcement on introducing the project and survey was broadcasted in the nearest village. Meanwhile, the announcement was published on the village billboard by the village commission. Totally 30 questionnaires distributed to the villagers and residents were returned. The investigation had taken full account into the public advice of different ages, civilizations and occupations. The brief summary of the survey was circulated to all of the local stakeholders. The opinions expressed by the stakeholders were recorded and are available on request.

E.2. Summary of the comments received:

>>

The survey was conducted through distributing questionnaires and collecting responses to the questionnaire. Totally questionnaires returned with response rate. The following is a summary of the key comments based on 30 returned questionnaires. Questions and topics for discussion are as follows:
– Are they satisfied with their surrounding environment?
– Do they know the wind power?
– Will the project improve the local development or increase job opportunities?
– Will the project have negative impacts on their livelihood?
– What impacts on environment should be considered?
– Will they support the construction of the project?

Statistic of the comments:

- All respondents (100%) are satisfied with their living conditions and surrounding environment.
- 24 (80%) persons of the respondents know well about wind power, and 6 (20%) persons know a little.
- The respondents consider construction and operation of the Project may improve living level (57%), increase employment opportunities (27%) and income (10%), mitigate air pollution (30%), and decrease local electricity price (6%).
- Among the negative impacts mentioned, the main issues concerned are garbage (50%).
- 28 (93%) persons of the respondents support the local constructed wind farm.
- All of the 30 respondents support the construction of the Project.

This survey shows that people all agree the Project actively decrease environment pollution and mitigate local environmental quality. In addition, the construction of this Project will promote development of other industries, and partly address local employment pressure. All the stakeholders support the Project.

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

>>

The residents and local government are all very supportive to the Project therefore there has been no need to modify the project due to the comments received.

Meanwhile the Project owner will actively take measures to control. (See Section D for details.)

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

The Seller:

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Represented by:	
Title:	Head of Procurement and Portfolio Management
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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

The following tables summarize the numerical results from the equations listed in the ACM0002 Baseline methodology for grid-connected electricity generation from renewable sources. The information provided by the tables includes data, data resources and the underlying computation.

1. Calculation of EF_{OM}

Table A1 Calculating the Operating Margin Emission Factor of East China Power Grid in 2005												
Fuel	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total	Emission Factor of the Fuel	Oxidation Factor	Calorific Value	Average Lower Calorific value	Emission of CO_2 （tCO_2e）
								（tc/TJ）	（%）	（MJ/t,km3）	（MJ/t,km3）	K=F*I*J/100000 (solid and oil)
		A	B	C	D	E	F=A+B+C+D+E	G	H	I	J	K=F*I*J/10000 (gas)
Raw coal	10^4t	2847.31	9888.06	4801.52	3082.9	2107.69	22727.48	25.8	100	87300	20908	414837511
Cleaned coal	10^4t	0	0	0	0	0	0	25.8	100	87300	26344	0
Other washed coal	10^4t	0	0	0	0	0	0	25.8	100	87300	8363	0
Coke	10^4t	0	0	0.03	0	0	0.03	29.2	100	95700	28435	816
Coke oven gas	10^8m^3	1.68	1.38	0	1.71	0	4.77	12.1	100	37300	16726	297591
Other Coal Gas	10^8m^3	83.72	24.97	0.06	30	0	138.75	12.1	100	37300	5227	2705169
Crude Oil	10^4t	0	0	27.01	0	0	27.01	20	100	71100	41816	803039
Gasoline	10^4t	0	0	0	0	0	0	18.9	100	67500	43070	0
Diesel	10^4t	1.25	16	4.52	0	1.67	23.44	20.2	100	72600	42652	725828
Fuel oil	10^4t	59.39	13.22	153.22	0	7.45	233.28	21.1	100	75500	41816	7364902
Liquefied Petroleum	10^4t	0	0	0	0	0	0	17.2	100	61600	50179	0
Refinery gas	10^4t	0.57	0.83	0	0	0	1.4	15.7	100	48200	46055	31078
Natural gas	10^8m^3	1.09	1.85	0.62	0	0	3.56	15.3	100	54300	38931	752567
Other Petroleum Products	10^4t	21	8.38	34.8	0	0	64.18	20	100	75500	41816	2026232

Other Coking Pruducts	10^4t	0	0	0	0	0	0	25.8	100	95700	28435	0
Other Energy	10^4 tce	12.36	0	15.29	0	0	27.65	0	0	0	0	0
											Total	429544732

Data source: *China Energy statistical Yearbook 2006*

Table A2 Fossil Fuel-fired Power Generation of East China Power Grid in 2005

Regions	Electricity Supply of Grid	Electricity Supply of Grid	Rate of Electricity Consumption	Electricity Supply of Grid
	10^8MWh	（MWh)	（%）	（MWh)
Shanghai	746.06	74606000	5.05	70838397
Jiangsu	2114.29	211429000	5.96	198827831.6
Zhejiang	1081.1	108110000	5.59	102066651
Anhui	629.18	62918000	5.9	59205838
Fujian	486	48600000	4.57	46378980
Total				477317697.6

Data source: *China Electric Power Yearbook 2006*

Table A3 Power Import of East China Grid in 2005

Power Import from Shanxi Yangcheng(MWh)	11,282,000
Emission of CO_2 (TCO_2/MWh)	1.066040
Power Import from Central China Power Grid(MWh)	27,039,000
Emission of CO_2 (TCO_2/MWh)	1.16148

Data source: Power Industry Summary Statistics 2005

Table A4 Calculating the Operating Margin Emission Factor of East China Power Grid in 2006

Fuel	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total	Emission Factor of the Fuel	Oxidation Factor	Calorific Value	Average Lower Calorific value	Emission of CO_2 （tCO_2e）
								（tc/TJ）	（%）	（MJ/t,km3）	（MJ/t,km3）	K=F*I*J/100000 (solid and oil)
		A	B	C	D	E	F=A+B+C+D+E	G	H	I	J	K=F*I*J/10000 (gas)
Raw coal	10^4t	2744.45	10945.42	6065	3455.2	2369.63	25579.7	25.8	100	87300	20908	466898181
Cleaned coal	10^4t	0	0	0	0	0	0	25.8	100	87300	26344	0
Other washed coal	10^4t	0	150.54	0	23.06	0	173.6	25.8	100	87300	8363	1267436
Coke	10^4t	0	0	39.07	0	0	39.07	29.2	100	95700	28435	1063184
Coke oven gas	10^8m^3	1.71	3.13	0.23	0.71	0	5.78	12.1	100	37300	16726	360603
Other Coal Gas	10^8m^3	84.64	106.54	3.28	25.12	0	219.58	12.1	100	37300	5227	4281088
Crude Oil	10^4t	0	0	20.3	0	0	20.3	20	100	71100	41816	603543
Gasoline	10^4t	0	0	0	0	0	0	18.9	100	67500	43070	0
Diesel	10^4t	2.13	3.7	4.11	1.21	1.11	12.26	20.2	100	72600	42652	379635
Fuel oil	10^4t	44.51	3.77	71.98	0.02	4.5	124.78	21.1	100	75500	41816	3939439
Liquefied Petroleum	10^4t	0	0	0	0	0	0	17.2	100	61600	50179	0
Refinery gas	10^4t	0.29	0.4	0	2.95	0	3.64	15.7	100	48200	46055	80803
Natural gas	10^8m^3	3.2	13.5	9.18	0	0	25.88	15.3	100	54300	38931	5470911
Other Petroleum Products	10^4t	18.82	3.57	0	0	0	22.39	20	100	75500	41816	706876
Other Coking Pruducts	10^4t	0	0	0	0	0	0	25.8	100	95700	28435	0
Other Energy	10^4 tce	6.66	2.8	27.45	3.21	0	40.12	0	0	0	0	0

											Total	485051699

Data source: *China Energy statistical Yearbook 2007*

Table A5 Fossil Fuel-fired Power Generation of East China Power Grid in 2006				
Regions	Electricity Supply of Grid	Electricity Supply of Grid	Rate of Electricity Consumption	Electricity Supply of Grid
	10^8MWh	（MWh)	（%）	（MWh)
Shanghai	720.33	72033000	5.06	68388130.2
Jiangsu	2512.58	251258000	5.69	236961419.8
Zhejiang	1403.49	140349000	5.62	132461386.2
Anhui	718.67	71867000	6.05	67519046.5
Fujian	555.8	55580000	4.51	53073342
Total				558403324.7

Data source: *China Electric Power Yearbook 2007*

Table A6 Power Import of East China Grid in 2006	
Power Import from Shanxi Yangcheng(MWh)	11,150,820
Emission of CO_2 (TCO_2/MWh)	0.997020
Power Import from Central China Power Grid(MWh)	24,029,150
Emission of CO_2 (TCO_2/MWh)	1.12157

Data source: Power Industry Summary Statistics 2006

Table A7 Calculating the Operating Margin Emission Factor of East China Power Grid in 2007												
Fuel	Unit	Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total	Emission Factor of the Fuel	Oxidation Factor	Calorific Value	Average Lower Calorific value	Emission of CO_2 （tCO_2e）

								(tc/TJ)	(%)	(MJ/t,km3)	(MJ/t,km3)	K=F*I*J/100000 (solid and oil)
		A	B	C	D	E	F=A+B+C+D+E	G	H	I	J	K=F*I*J/10000 (gas)
Raw coal	10^4t	2754.04	11060.78	7350	3929.9	3097.87	28192.59	25.8	100	87300	20908	514590436
Cleaned coal	10^4t	0	0	0	0	0	0	25.8	100	87300	26344	0
Other washed coal	10^4t	0	459.17	0	29.32	0	488.49	25.8	100	87300	8363	3566416
Coke	10^4t	0	0	35.06	0	0	35.06	29.2	100	95700	28435	954063
Coke oven gas	10^8m^3	0.89	9.73	0.22	1.56	0.75	13.15	12.1	100	37300	16726	820402
Other Coal Gas	10^8m^3	98.92	70.45	3.41	36.3	1.71	210.79	12.1	100	37300	5227	4109712
Crude Oil	10^4t	0	0	15.15	0	0	15.15	20	100	71100	41816	450427
Gasoline	10^4t	0	0	0	0	0	0	18.9	100	67500	43070	0
Diesel	10^4t	1.23	5.37	2.76	0	1.01	10.37	20.2	100	72600	42652	321111
Fuel oil	10^4t	40.76	1.55	29.52	0	2.04	73.87	21.1	100	75500	41816	2332156
Liquefied Petroleum	10^4t	0	0	0	0	0	0	17.2	100	61600	50179	0
Refinery gas	10^4t	0.2	0.63	0	2.55	0	3.38	15.7	100	48200	46055	75031
Natural gas	10^8m^3	4.61	19.17	11.01	0	0	34.79	15.3	100	54300	38931	7354444
Other Petroleum Products	10^4t	20.39	2.78	0	0	0	23.17	20	100	75500	41816	731502
Other Coking Pruducts	10^4t	0	0	0	0	0	0	25.8	100	95700	28435	0
Other Energy	10^4 tce	6.89	28.88	44.93	7.52	9.43	97.65	0	0	0	0	0
											Total	535305699

Data source: *China Energy statistical Yearbook 2008*

Table A8 Fossil Fuel-fired Power Generation of Eest China Power Grid in 2007

Regions	Electricity Supply of Grid	Electricity Supply of Grid	Rate of Electricity Consumption	Electricity Supply of Grid
	10^8MWh	（MWh)	（%）	（MWh)
Shanghai	726	72600000	4.72	69173280
Jiangsu	2709	270900000	5.55	255865050
Zhejiang	1723	172300000	5.83	162254910
Anhui	848	84800000	5.92	79779840
Fujian	723	72300000	5.59	68258430
Total				635331510

Data source: *China Electric Power Yearbook 2008*

Table A9 Power Import of East China Grid in 2007	
Power Import from Shanxi Yangcheng(MWh)	12,773,620
Emission of CO_2 (TCO_2/MWh)	0.972544
Power Import from Central China Power Grid(MWh)	31,823,310
Emission of CO_2 (TCO_2/MWh)	1.10197

Data source: Power Industry Summary Statistics 2007

Table A10 The Operating Margin Emission Factor of East China Power Grid in 2005-2007

Year	**2005**	**2006**	**2007**	**EF_{OM}**
CO2 emission (tCO2e)	472,977,053	523,119,663	582,797,047	0.88248
Fuel-fired power generation of East China Power Grid (MWh)	515,638,698	593,583,295	679,928,440	

Data source: *Table A1~A9*

2. Calculation of EF_{BM}

Table A11 The Oxidation Factor, Emission Factors and Average Low Calorific Value of the Fuel i

		Shanghai	Jiangsu	Zhejiang	Anhui	Fujian	Total	Average Low Calorific Value	Emission Factor of the Fuel	Oxidation Factor	Emission of CO_2
Fuel i	Unit	A	B	C	D	E	F=A+...+E	G	H	I	J=F*G*H*I/ 100000
Raw coal	10^4t	2754.04	11060.78	7350	3929.9	3097.87	28192.59	20908	87300	1	514,590,436
Cleaned coal	10^4t	0	0	0	0	0	0	26344	87300	1	0
Other washed coal	10^4t	0	459.17	0	29.32	0	488.49	8363	87300	1	3,566,416
Briquette	10^4t	0	0	0	0	0	0	20908	87300	1	0
Coke	10^4t	0	0	35.06	0	0	35.06	28435	95700	1	954,063
Other Coking Pruducts	10^4t	0	0	0	0	0	0	28435	95700	1	0
							0				519,110,916
Crude oil	10^4t	0	0	15.15	0	0	15.15	41816	71100	1	450,427
Gasoline	10^4t	0	0	0	0	0	0	43070	67500	1	0
Diesel	10^4t	1.23	5.37	2.76	0	1.01	10.37	42652	72600	1	321,111
Fuel oil	10^4t	40.76	1.55	29.52	0	2.04	73.87	41816	75500	1	2,332,156
Other Petroleum Products	10^4t	20.39	2.78	0	0	0	23.17	41816	75500	1	731,502
							0				3,835,196
Natural gas	10^7m^3	46.1	191.7	110.1	0	0	347.9	38931	54300	1	7,354,444
Coke oven gas	10^7m^3	8.9	97.3	2.2	15.6	7.5	131.5	16726	37300	1	820,402
Other coal gas	10^7m^3	989.2	704.5	34.1	363	17.1	2107.9	5227	37300	1	4,109,712
Liquefied Petroleum	10^4t	0	0	0	0	0	0	50179	61600	1	0
Refinery gas	10^4t	0.2	0.63	0	2.55	0	3.38	46055	48200	1	75,031
											12,359,588

										Total	535,305,699

Data source: *China Energy statistical Yearbook 2008*

Table A12 CO_2 emission from the coal ,oil and gas in East China Power Grid

λ_{Coal}	λ_{Oil}	λ_{Gas}
96.98%	0.72%	2.31%

Table A13 The Emission Factor of the unit applying best commercially available technology

	Variable	*Efficiency of Power Supply*	*Emission Factor of the Fuel (tc/TJ)*	*Oxidation Factor*	*Emission Factor (tCO_2/MWh)*
		A	*B*	*C*	*3.6/A/10000×B×C*
Coal-fired power plant	$EF_{Coal,adv}$	38.10%	87,300	1	0.8249
Oil-fired power plant	$EF_{Oil,adv}$	49.99%	75,500	1	0.5437
Gas-fired power plant	$EF_{Gas,adv}$	49.99%	54,300	1	0.3910

Table A14 Change in Installed Capacity of East China Power Grid in 2005-2007

	2005	2006	2007	Change in Installed Capacity from 2005 to 2007	The Proportion of the Total Change Capacity
	A	B	C	D＝C-A	
Fuel-fired Power	104076.6	128828	138650	34573.4	83.97%
Hydropower	16069.4	18463	19970	3900.6	9.47%
Nucleus power	3066	3066	5070	2004	4.87%
Wind power	401.3	547	1095.6	694.3	1.69%
Total	123613.3	150904	164785.6	41172.3	100.00%
Percentage of the Installed Capacity of 2007	75.01%	91.58%	100.00%		

Data source: *China Electric Power Yearbook 2006-2008*

$EF_{Thermal,adv}$ = 0.8249*96.98%+0.5437*0.72%+0.3910*2.31%=0.8129

According to the data, the EF_{BM} of the China East Power Gird is equal to $\frac{CAP_{Thermal,addition}}{CAP_{Total,addition}} \times EF_{Thermal,adv}$ = 0.8129×83.97% =0.6826 tCO_2/MWh.

Table A15 Calculation the baseline emission factor EF_y of East China Power Gird

OM(tCO_2e/MWh) **A**	**BM(tCO_2e/MWh)** **B**	**CM(tCO_2e/MWh)** **C=0.75×A+0.25*B**
0.88248	0.6826	0.8325

Annex 4

MONITORING PLAN

No other information.