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

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SECTION A. General description of project activity

A.1 Title of the project activity:

Fujian Zhangpu Liuao 45MW Wind Power Project
Version：06
Date: November 12, 2007

A.2. Description of the project activity:

The proposed Fujian Zhangpu Liuao 45 MW Wind Power Project is located in Liuao town, Zhangpu County, Fujian Province, P.R.C. It involves the installation of 36 turbines, each of which has a rated output of 1250kW, providing a total capacity of 45MW. The annual output of the proposed project is estimated to be 95,602 MWh. The electricity to be generated will be sold to the East China Grid through Power Purchase Agreement (PPA).

The project will help reduce GHG emissions generated from the high-growth, coal-dominated power generation. And also, it will contribute to the sustainable development in the region by reducing pollution, creating employment opportunities, promoting the local tourism industry and improving the livelihoods of local people. At a larger scale, the project will assist China in stimulating and accelerating the commercialization of grid-connected renewable energy technologies and markets in China.

The construction of the project has begun in December 2006. The project is expected to be operational in September 2007.

A.3. Project participants:

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)
People's Republic of China (host)	Datang Zhangzhou Wind Power Co., Ltd (project owner)	No
Netherlands	Essent Energy Trading BV	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.		

Please see Annex 1 for detailed contact information.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

People's Republic of China

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

Fujian Province

A.4.1.3. City/Town/Community etc:

Liuao town, Zhangpu County

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

The project site is located in the east of Liuao peninsula, Zhangpu County in Fujian Province. It has the Taiwan Strait to the east, Gulei Peninsula in the southwest and Jiugang town in the north. The site is 48km from the Zhangpu county government in the northwest, 100km from Zhangzhou Municipality in the north. The exact geographical coordinates of the project are 117° 28′ 20″ ～117° 29′ 43″ E，23° 34′ 25″ ～24° 0′ 39″ N. Figure A-1 shows the location of the proposed project.

Figure A-1: Location of the proposed project

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

Sectoral scope 1: energy industries (renewable sources)

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

For this proposed project, 36 turbines will be installed, each of which has 1250kW capacity, providing a total capacity of 45MW. Turbine type of 64/1250 manufactured by Suzlon will be used. It is expected that the annual electricity delivered to the grid is 95,602MWh. The height of the wheel hub is 65m. As the wind resource in the area is plentiful, and the average wind speed is relatively high, the turbines were arranged in a matrix shape with row spacing of 7D and column spacing of 5D, so the land resource can be used as much as possible.

According to the turbine layout, each turbine will be equipped with one transformer. The construction will also include the wind farm 110kV step-up substation. The wind power to be generated will be delivered to the 110kV step-up substation by 35kV transmission lines. The power in the 110kV step-up substation will be transmitted to Changjiaoying substation.

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

The project activity is expected to generate an estimated annual emission reduction of 84,130 tCO_2e and 588,910 tCO_2e during the first crediting period of the project (01/12/2007-30/11/2014).

Year	Annual estimation of emission reductions(tCO_2 e)
2007 (the last one month)	7,011
2008	84,130
2009	84,130
2010	84,130
2011	84,130
2012	84,130
2013	84,130
2014 (the first eleven months)	77,119
Total estimated reductions(tCO_2e) during the first crediting period	588,910
Total number of crediting years	7
Annual average of estimated reductions over the crediting period(tCO_2e)	84,130

A.4.5. Public funding of the project activity:

There is no public funding 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:

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

Version 03 of the tool for demonstration and assessment of additionality

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

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

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

[1] http://cdm.unfccc.int/methodologies/approved

- Geothermal sources;
- Solar sources; and
- Wave and tidal sources.

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

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

Applying both methodologies to the proposed project is justified because:

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

- The geographic and system boundary of the East China Grid can be clearly identified and information on the characteristics of the grid is available;

- The proposed project does not involve switching from fossil fuels to renewable energy at the site of the project activity.

- The monitoring methodology is used in conjunction with the approved baseline methodology ACM0002, and the proposed project has adopted the baseline methodology ACM0002.

Therefore, the approved methodology ACM0002 is applicable to the proposed project.

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

	Source	Gas	Included?	Justification/Explanation
Baseline	Electricity generation in fossil fuel fired power that is dispatched due to the project activity	CO_2	Yes	Main emission source and the only gas identified in the baseline methodology
		CH_4	No	Unidentified in the baseline methodology
		N_2O	No	Unidentified in the baseline methodology
Project Activity	Proposed project	CO_2	No	Zero-emissions grid-connected electricity generation from renewable energy
		CH_4	No	Zero-emissions grid-connected electricity generation from renewable energy
		N_2O	No	Zero-emissions grid-connected electricity generation from renewable energy

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

According to the description in the approved baseline methodology ACM0002, 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.

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

> Electricity delivered to the grid by the proposed 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 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.

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):

CDM has been considered before the starting date of the project activity, which is evidenced by the stakeholder questionnaires and a support letter from NGO. These evidences are available for DOE.

The project uses the *Tool for the Demonstration and Assessment of Additionality*(version 3) to further demonstrate its additionality. The tool includes the following steps:

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

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

Alternative(s) available to the proposed project that provides outputs or services comparable with the proposed CDM project activity include:

a) The proposed project itself, but not undertaken as a CDM project activity
b) Construction of a coal-fired power plant with equivalent installed capacity or annual electricity generation.
c) Construction of a power plant using other renewable energy with equivalent installed capacity or annual electricity generation.
d) Equivalent electricity service provided by the East China Grid.

In terms of alternative c), other renewable energy basically refers to hydro energy. China's hydro resources are so unevenly distributed that 90 percent of exploitable installed capacity of hydropower is concentrated in the western region. In the eastern region that the East China Grid covers, hydro resources are relatively limited. Moreover, precipitation and seasonal drought period can have large impacts on the stability of the hydropower supply. For instance, Fujian Province experienced severe power shortage in 2004, the driest year on record. It is analyzed that too large percentage of hydro in the energy mix is the main cause for the unpredictable power supply in Fujian Province. For these reasons, c) is not a realistic and credible alternative and should be eliminated from further consideration.

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

a) The proposed project itself, but not undertaken as a CDM project activity

The Chinese Government encourages and promotes wind power development through a series of laws, regulations and preferential policies. Alternative a) is in compliance with legal and regulatory requirements.

b) Construction of a coal-fired power plant with equivalent installed capacity or annual electricity generation.

As the annual operation hours of a coal-fired power plant and a wind farm differs considerably, the annual electricity generation and associated supply reliability for the two, which has equivalent installed capacity, remain incomparable. Normally, a coal-fired power plant which provides equivalent annual electricity generation would require an installed capacity lower than 25MW. According to Chinese power regulations, coal-fired power plants of less than 135MW are prohibited for construction in the areas covered by large grids[2]. Alternative b) is not in compliance with Chinese regulations. Therefore, b) is not a realistic and credible alternative.

d) Equivalent electricity service provided by the East China Grid.

Alternative d) is in compliance with legal and regulatory requirements.

Based on the above analysis, the proposed project activity is not the only alternative amongst the ones identified that is in compliance with legal and regulatory requirements. Therefore, the proposed CDM project activity may be additional.

Step 2. Investment Analysis

The purpose of investment analysis is to determine whether the proposed project activity is economically or financially less attractive than other alternatives without the revenue from the sale of certified emission reductions (CERs). To conduct the investment analysis, use the following sub-steps:

Sub-step 2a. Determine appropriate analysis method

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

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

The proposed Wind Power Project generates financial and economic benefits through the sales of electricity other than CDM related income therefore the simple cost analysis (Option I) cannot be taken. And the investment comparison analysis (Option II) is only applicable to projects where alternatives should be similar investment projects. The alternative baseline scenario of the proposed project is the East China Grid rather than a new investment project. Out of the investment comparison analysis (Option II) and the benchmark analysis (Option III), the benchmark analysis (Option III) shall be chosen.

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

In accordance with *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects* issued by former State Power Corporation of China, there is not yet such a financial internal rate of return (IRR) as benchmark in China's power generation industry to date. However, the project IRR shall not be lower than 8 percent considering economic assessments of hydropower projects, fossil fuel fired projects, transmission and substation projects, especially the interest rate of commercial loans over five years[3]. Nowadays many of China's existing wind power projects have applied it as the benchmark IRR.

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

1) Parameters needed for calculation of key financial indicators

According to the feasibility study of proposed project, parameters needed for calculation of key financial indicators are as follows:

Table B-1 Parameters for calculation of key financial indicators

Installed capacity	45 MW
Grid-connected output	95,602 MWh
Total static investment	RMB 418.96 million YUAN
Expected tariff	RMB 0.5485 Yuan/kWh (excl. VAT)
Crediting period	7*3 years (renewable)
Expected CERs price	EUR 8/ tCO_2e

2) Comparison of IRR and NPV for the proposed project and the financial benchmark

[3] State Power Corporation of China. *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects*. Beijing: China Electric Power Press, 2003

In accordance with benchmark analysis (Option III), if the financial indicators of the proposed project, such as the project IRR[4], are lower than the benchmark, the proposed project is not considered to be financially attractive.

Table B-2 shows the project IRR and NPV of the proposed project with and without the sales of CERs. Without the sales of CERs the project IRR is 6.33 percent which is lower than the financial benchmark and NPV of the proposed project is RMB -44.08 million Yuan at the discount rate of 8 percent. Thus the proposed project is not considered to be financially attractive.

However, taking into account the CDM revenues, the project IRR is 8.62 percent, which is higher than the financial benchmark. And NPV of the proposed project is RMB 17.11 million Yuan at the discount rate of 8 percent. Therefore the CDM revenues enable the project to overcome the investment barrier and demonstrate the addtionality of the proposed project.

Table B-2 Project IRR and NPV of the proposed project

	Project IRR	NPV
Without CERs	6.33%	RMB -44.08 million YUAN
With CERs	8.62%	RMB 17.11 million YUAN

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. For the proposed project, three parameters were selected as sensitive factors to check out the financial attractiveness:

1) Static total investment

2) Annual O&M cost

3) Expected tariff (excl. VAT)

4) Annual operating hours

The results of sensitive analysis are shown in Table B-3 and Figure B-1 below.

Table B-3 Sensitivity analysis of the proposed project

	-10.00%	*-7.50%*	*-5.00%*	*-2.50%*	*0.00%*	*2.50%*	*5.00%*	*7.50%*	*10.00%*
Total Investment	7.76%	7.38%	7.02%	6.67%	6.33%	6.01%	5.69%	5.39%	5.10%
Annual O&M Cost	6.79%	6.67%	6.56%	6.44%	6.33%	6.21%	6.10%	5.98%	5.86%
Tariff (excl.VAT)	4.60%	5.04%	5.47%	5.90%	6.33%	6.69%	7.06%	7.44%	7.80%

[4] For the benchmark analysis, the IRR shall be calculated as project IRR.

Annual Operating Hours	4.60%	5.04%	5.47%	5.90%	6.33%	6.69%	7.06%	7.44%	7.80%

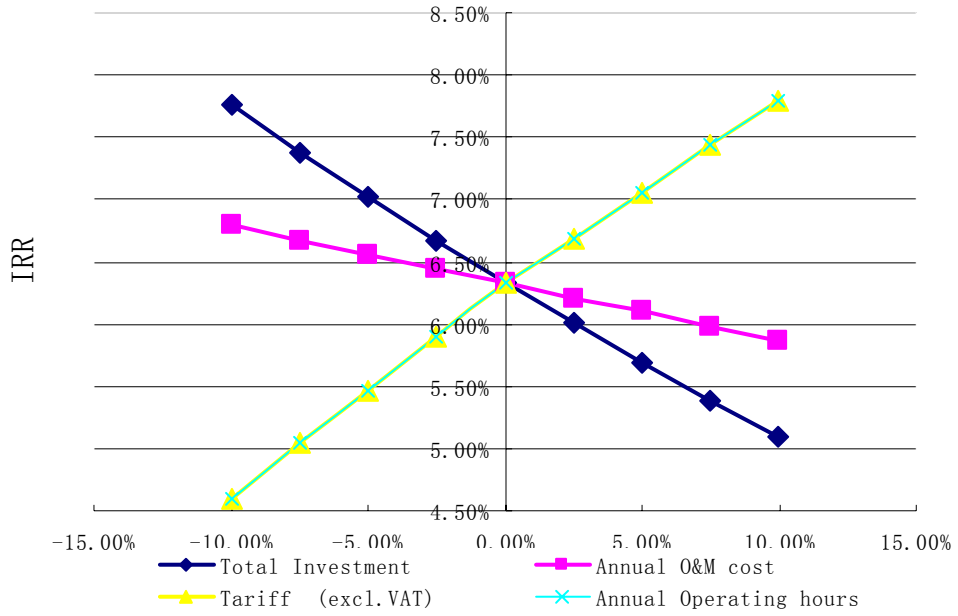

Figure B-1 Sensitivity analysis of the proposed project

The project IRR of the proposed project varies to different degrees in accordance with the fluctuation of three parameters within the range of negative 10 percent to positive 10 percent. The annual O&M cost has little effect on the impact of IRR. Thus, it is an insensitive factor. In comparison, total investment and expected tariff are sensitive factors. However, the project IRR is still lower than benchmark IRR when the expected tariff increases by 10 percent or the total investment drops by 10 percent.

Step 3. Barrier analysis

This step is used to determine whether the proposed project activity faces barriers that:
(a) Prevent the implementation of this type of proposed project activity; and
(b) Do not prevent the implementation of at least one of the alternatives.

Use the following sub-steps:

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

Establish that there are barriers that would prevent the implementation of the type of proposed project activity from being carried out if the project activity was not registered as a CDM activity. Such barriers may include, among others:

Investment/financing Barrier

In China the approximate investment costs of the wind farm is about 8000-10000 RMB/kW, which is about 40% higher than that of the coal-fired power plant, furthermore the utilization hours of wind farm are about 2000 -2500 hours, which is about one third of that of the coal-fired power plant[5]. Therefore, developing wind projects needs much more capital and revenue than those of same scale coal-fired power plant.

International development aid, e.g. from the World Bank, Asian Development Bank, and KfW, as well as government tariff support have been used in China since 1993 to encourage the development of the wind power industry. However, in recent years, the provisions of such soft loans and financial support have gradually decreased, the wind farm developers now have to apply for more commercial loans with higher interest rates and shorter payback periods, furthermore, for a wind project only with attractive financial expectation, can the commercial loan be obtained in time successfully.

Without the CDM revenues, despite the preferential feed-in tariffs for grid-connected wind projects, which came from really optimistic expectation, as mentioned in Step 2 financial indicators of these projects remain poor(IRR: 6.33%) and loan repayment capability remains weak, so the project would face financing barriers because of the difficulties in obtaining commercial loan or attracting foreign capital. However, with the CDM revenues, the indicator will be improved, and then investment/financing barriers can be overcome effectively.

Technology Barrier

The technology risks associated with wind power in China are high due to the fact that the equipment is often imported and highly advanced, and there is no local spare parts supply. Therefore, larger operation and maintenance reserves would need to be maintained for such eventualities. This is true for the 1250kW wind turbine to be used by the project. The CDM revenues can be used as guarantee fund for the operation and maintenance of the wind turbines hence mitigating technology risks. In addition, this is the first time for the project owner to implement wind project, without related experience, plentiful technical training is necessary to staffs. Training has been provided to the staffs on-site at the early stage of the project and on-going technical training will also be provided.

Sub-step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity)

d) Equivalent electricity service provided by the East China Grid

The above identified barriers would not prevent the implementation of alternative d). Therefore, d) is the only viable alternative.

As analyzed above, the proposed project activity faces barriers that prevent the implementation of this type of proposed project activity and do not prevent the implementation of at least one of the alternatives. Hence, the proposed project activity may be additional.

Step 4 Common practice analysis

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

[5] http://cppcc.people.com.cn/GB/34961/45560/45565/3262150.html

There are three grid-connected wind farms in Fujian Province, see details in Table B-5.

Table B-5. Existing wind farms in Fujian Province[6]

Project Name	Project owner	Model	Per unit capacity (kW)	Number of units	Date of connecting to grid	Total Installed Capacity(kW)
Fujian Pingtan Windfarm (phase 1)	Fujian Power Co., Ltd.	Spanish Bazan	600	10	Sep. 2000	6000
Fujian Dongshan Windfarm	Fujian Power Co., Ltd.	Spanish Bazan	600	10	Sep. 2000	6000
Fujian Zhangpu Liuao 30.6 MW Wind Power Project	Datang Zhangzhou Wind Power Co., Ltd	Spanish Gamesa Eolica	850	36	Jan. 2006	30600

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

The two projects, which are connected to the grid prior to the reform of the Chinese electric power market starting in 2002, receive quite high feed-in tariffs. Through the reform that enforced the separation of power plants from grids and introduced a competition system, the feed-in tariffs are determined through competitive bidding. Therefore, it is not possible for the proposed project to receive such high tariffs that were common for similar projects prior to the reform. Besides, the project has not received any international financial assistance or soft loan. Therefore, the project faces a number of barriers mentioned above as Fujian Zhangpu Liuao 30.6 MW Wind Power Project. But the latter has been registered as a CDM project, so that the barriers can be well overcome.

From the analysis and discussion mentioned above, there are essential distinctions between proposed project and other wind farm projects. Therefore, the proposed project activity is not a common practice in the region, it may be additional.

To summarize, it can be proved that the proposed project activity is additional and not (part of) baseline scenario. Without the CDM revenues, the project activity would not be implemented smoothly. Instead, the equivalent electricity service will be provided by the East China Grid. As a result, the reduction of GHG emissions would not be realized. The above additionality analysis provides sufficient evidence that the registration of the CDM revenues can enable the project to overcome the barriers it faces.

B.6 Emission Reductions

[6] Wang Chengxu, Zhang Yuan. Appendix 1: Overview of windfarms in China. *Wind Power Generation.* China Electric Power Press.

B.6.1. Explanation of methodological choices:

Emission reductions from the proposed project can be calculated based on the ACM0002 consolidated methodology. According to the ACM0002, it is required to estimate the Operating Margin (OM) and 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 Grid can be obtained and then the emission reductions from CDM project activity can be estimated. The details are shown below:

1. Baseline emissions

The following is the process of calculating the baseline CO_2 emission of the grid, according to the steps provided by the approved baseline methodology ACM0002.

STEP 1. Calculate the Operating Margin emission factor(s) ($EF_{OM,y}$)

$EF_{OM,y}$ will be calculated based on one of the four following methods:

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch Data Analysis OM, or
(d) Average OM.

The method (c) requires the detailed operation and dispatch data of power plants in the grid. But there is no publicly available dispatch data for the East China Grid. Therefore, the method (c) is not applicable.

The method (b), simple adjusted OM, needs the annual load duration curve of the grid. Based on the same reason stated in the above paragraph, the necessary data for the method (b) are difficult to obtain, so the method (b) is not applicable.

The Simple OM method (a) is used when low-cost/must run resources constituted less than 50% of the total grid generation in an average of 5 most recent years. According to the data from *China Power Yearbook 2001~ 2005*, the share of the low-cost/must run resources in the East China Grid are 10.47% (2000), 11.49% (2001), 11.86% (2002), 10.96% (2003), and 9.77% (2004), respectively. Therefore, it is reasonable to select the method (a) to calculate the OM emission factor.

The method (d), average OM, is used when low-cost/must run resources[7] constitute more than 50% of total amount of power generation in the grid. Based on the above data, the method (d) is not applicable.

The Simple OM can be calculated using either of the two following data vintages for years(s) y:
- (ex-ante) the full generation-weighted average for the most recent 3 years for which data are available at the time of PDD submission, if or,
- the year in which project generation occurs, if $EF_{OM,y}$ is updated based on ex-post monitoring.

[7] Low operating cost and must run resources typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. If coal-fired power is obviously a must-run, it should also be included in this list, i.e. excluded from the set of plants.

Here ex-ante vintage is chosen, and EF_{OM} is fixed during the crediting period.

According to the ACM0002, the Simple OM emission factor ($EF_{OM, simple,y}$) is calculated as the generation-weighted average emissions per electricity unit (tCO2/MWh) of all generating sources that serve the system, excluding low-operating cost and must-run power plants. The formula of $EF_{OM,simple,y}$ calculation is

$$EF_{OM,simple,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j,y}}{\sum_{j} GEN_{j,y}} \quad (1)$$

Where:

$F_{i,j,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources j in year(s) *y*, while *j* refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports to the grid[8];

$COEF_{i,j,y}$ is the CO_2 emission coefficient of fuel *i* (tCO_2 / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources *j* and the percent oxidation of the fuel in year(s) *y*;

And $GEN_{j,y}$ is the electricity (MWh) delivered to the grid by the source *j*.

The CO_2 emission coefficient $COEF_{i,j,y}$ is obtained as

$$COEF_{i,j,y} = NCV_i \cdot EF_{CO2,i} \cdot OXID_i \quad (2)$$

Where:

NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel *i;*

$OXID_i$ is the oxidation factor of the fuel *i*,

$EF_{CO2,ii}$ is the CO_2 emission factor per unit of energy of the fuel *i.*

If available, local values of NCV_i and $EF_{CO2,i}$ shall be used. If not, country-specific values are preferable to IPCC default values. In this PDD, NCV_i of different fuels are obtained from *China Energy Statistical Yearbook 2005*. With regard to the fuel types where NCV_i fluctuate in a certain range, the floor values of the fluctuation range are used for conservatism. $EF_{CO2,i}$ of fossil fuel comes from IPCC default values.

The Simple OM Emission Factor ($EF_{OM, simple,y}$) of the proposed project is calculated on the basis of the fuel consumption data for electricity generation of the East China Grid, excluding those of low-operating cost and must-run power plants, such as wind power, hydropower and nuclear etc. These data are obtained from the *China Electric Power Yearbook* (2003~2005, published annually) and *China Energy Statistical Yearbook* (2000~2005). Based on these data, the Simple OM Emission Factor ($EF_{OM, simple,y}$) of the East China Grid is calculated as 0.917 tCO_2e/MWh (see Annex 3 for details).

[8] As described above, imports from a connected electricity system should be considered as one power source j.

For the proposed project, the renewable crediting period, i.e. 7*3 years, is adopted.

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

According to ACM0002, $EF_{BM,y}$ is determined by the formula as follow:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m,y}}{\sum_{m} GEN_{m,y}} \quad (3)$$

where $F_{i,m,y}$, $COEF_{i,m}$ and $GEN_{m,y}$ are analogous to the variables described for the simple OM method in step 1 for plants m.

ACM0002 provides two options for sample group m:

(1) The five power plants that have been built most recently, or

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

The one with larger annual generation should be used.

In the East China Grid, the information on the five power plants built most recently is not available. According to the EB's guidance on DNV deviation request, "Request for clarification on use of approved methodology AM0005 for several projects in China", the EB accepted the following deviation[9]:

- Use of capacity additions during last 1 - 3 years for estimating the build margin emission factor for grid electricity;

- Use the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy, for each fuel type in estimating the fuel consumption to estimate the build margin (BM).

Therefore, this proposed project uses the alternative method to calculate $EF_{BM,Y}$, and the formula is

$$EF_{BM,y} = \left[EF_{BTCA_fire,y} \times CAP_{fire,y-n,y}\right] / \left[\sum_j CAP_{j,y-n,y}\right] \quad (4)$$

Where $CAP_{fire,y-n,y}$ is the incremental installed capacity of fuel-fired power (MW) in *y* year compared to that of *y-n* year;

$\sum_j CAP_{j,y-n,y}$ is the total incremental installed capacity of various power sources in the grid during the years from y to y-n year;

$\left[CAP_{fire,y-n,y}\right] / \left[\sum_j CAP_{j,y-n,y}\right]$ represents the share of incremental installed capacity of fuel-fired power in the whole incremental installed capacity.

[9] http://cdm.unfccc.int/Projects/Deviations

where, *n* is fixed by:

Starting from *y* year, the differences of installed capacity between *y* year and *y-1* year, y year and *y-2* year,…*y* year and *y-n* year, *y* year and *y-n-1* year, …are calculated respectively, and then divided by the installed capacity of *y* year. The year that can make the left-hand side of the following formula greater than 20% will be regarded as *n*. The formula is as follows:

$$\frac{\sum_j CAP_{j,y-n}}{\sum_j CAP_{j,y}} \geq 20\% \qquad (5)$$

$EF_{BTCA_fire,y}$ is the emission factor of fuel-fired power with best technology commercially available (BTCA). It represents the trend of decreased coal consumption in the fuel-fired power generation brought by technology advancement in the coming years. Compared with the method for $EF_{BM,y}$ provided by ACM0002 Methodology, the value of $EF_{BTCA_fire,y}$ is lower than that of other types of fuel-fired power plants to be built in the grid, because the emission factor of the alternative method reflects the fuel efficiency of the fuel-fired power plants which use the best technology commercially available. Therefore, the building margin factor through this method is conservative.

The following section describes the process of calculating $EF_{BTCA_fire,y}$ for the East China Grid. According to the data from *China Power Yearbook 1999-2005*, and with the year 2004 regarded as the most recent year of *y*, the incremental installed capacity between year 2001and year 2004 are used for $EF_{BM,y}$ calculation.

The calculation for value of $EF_{BTCA_fire,y}$ is based on the 320g/kWh of standard coal consumption for fuel-fired power generation. According to statistic information in China, the standard coal consumption for fuel-fired power generation in 2000 is 350g/kWh. And if various measures aimed at improving energy efficiency can be carried out, the value of 350g/kWh is expected to reduce to 320g/kWh by 2010. As the gas/oil consumption in the East China Grid is very small and negligible, emission factor of the best technology (320g/kWh) is treated as $EF_{BTCA_fire,y}$.

By multiplying the value of $[CAP_{fire,y-n,y}]/[\sum_j CAP_{j,y-n,y}]$ with the value 0.886 of $EF_{BTCA_fire,y}$, the value of $EF_{BM,y}$ is 0.770. (See Annex 3 for details)

Step3. Calculate the baseline emission factor EF_y

Based on ACM0002, the baseline emission factor EF_y should be calculated as the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor($EF_{BM,y}$), where the weights w_{OM} is 0.75 and w_{BM} is 0.25 by default, and ($EF_{OM,y}$) and ($EF_{BM,y}$) are calculated as described in Step 1 and 2.

$$EF_y = 0.917*0.75+0.770*0.25=0.880\ (tCO_2e/MWh) \qquad (6)$$

Step4. Calculate the baseline emissions (BE_y)

Therefore, baseline emissions can be calculated as below:

$$BE_y = EG_y * EF_y \quad (7)$$

2. Project emissions (PE_y)

The emissions of the proposed project activity is zero, PE_y=0

3. 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.

4. 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(L_y), as follows:

$$ER_y = BE_y - PE_y - L_y \quad (8)$$

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

$$ER_y = BE_y = EG_y * EF_y \quad (9)$$

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

Data / Parameter:	$F_{i,j,y}$
Data unit:	Mtons, Mm^3
Description:	the amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources j in year(s) *y*
Source of data used:	China Energy Statistical Yearbook（2000~2005）
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:	GEN_y
Data unit:	MWh

Description:	the electricity generation of each source in year(s) *y*
Source of data used:	China Power Yearbook（2003~2005）
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:	NCV_i
Data unit:	*TJ/ mass or volume unit of a fuel*
Description:	the net calorific value (energy content) per mass or volume unit of a fuel *i*
Source of data used:	China Energy Statistical Yearbook（2005）
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Local values
Any comment:	

Data / Parameter:	$OXID_i$
Data unit:	*%*
Description:	the oxidation factor of the fuel *i*
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 :	IPCC default value
Any comment:	

Data / Parameter:	$EF_{CO2,i}$
Data unit:	tCO2/TJ
Description:	Effective CO2 Emission Factor
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	IPCC default value

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

Data / Parameter:	BTCA
Data unit:	*g/kWh*
Description:	fuel consumption for best technology commercially available
Source of data used:	*Fuel-fired Power Generation*. http://www.ccchina.gov.cn/source/fa/fa2002082803.htm
Value applied:	320g/kWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to China's statistical data, the standard coal consumption for fuel-fired power generation in 2000 is 350g/kWh. And if various measures aimed at improving energy efficiency could be carried out, the value of 350g/kWh is expected to reduce to 320g/kWh by 2010[10]. Therefore, the value of $EF_{BTCA_fire,y}$ is conservative.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

According to the description in B.6.1 and B.6.2, both project emissions and leakage are zero, therefore $PE_y + L_y$ =0.

As calculated before, the baseline emission factor of the first crediting period is 0.880 tCO_2e /MWh, i.e. EF_y = 0.880 tCO_2e /MWh (more information are shown in Annex 3).

According to the feasibility study of the proposed project, the net electricity generated is approximately 95,602MWh, i.e. EG_y =95,602MWh

As per calculation formulae of baseline emission, the estimated anthropogenic emission of the first crediting period is as follows:

$BE_y = EG_y * EF_y$ =84,130 tCO2e

With the emissions from the proposed project being zero, the emission reductions of the project activity are equivalent to the emissions of the baseline. The annual emission reduction of the first crediting period is about 84,130 tCO2e.

$ER_y = BE_y = EG_y * EF_y$ =84,130 tCO2e

[10] *Fuel-fired Power Generation*. http://www.ccchina.gov.cn/source/fa/fa2002082803.htm

B.6.4 Summary of emission reductions:

Year	Estimation of project activity emissions (tCO_2e)	Estimation of baseline emissions (tCO_2e)	Estimation of leakage (tCO_2e)	Estimation of emission reductions (tCO_2e)
2007 (the last one month)	0	7,011	0	7,011
2008	0	84,130	0	84,130
2009	0	84,130	0	84,130
2010	0	84,130	0	84,130
2011	0	84,130	0	84,130
2012	0	84,130	0	84,130
2013	0	84,130	0	84,130
2014 (the first eleven months)	0	77,119	0	77,119
Total(tCO_2e)	0	588,910	0	588,910

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

B.7.1 Data and parameters monitored:

Data / Parameter:	EGy
Data unit:	MWh
Description:	Net 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: 95,602 MWh
Description of measurement methods and procedures to be applied:	Hourly measurement and monthly recording

QA/QC procedures to be applied:	According to national standard, meters will be calibrated periodically. Data measured by meters will be cross checked by electricity sales receipt.
Any comment:	

B.7.2 Description of the monitoring plan:

The approved monitoring methodology ACM0002 is used for developing the monitoring plan. Monitoring tasks must be implemented according to the monitoring plan in order to ensure that the real, measurable and long-term greenhouse gas (GHG) emission reduction for the proposed project is monitored and reported.

1. Responsibility

Overall responsibility for daily monitoring and reporting lies with the project owner. A CDM group will be established within the owner company to carry out the monitoring work. Its staffs will be trained by the experts of the project consultancy-CWEME.

2. Installation of meters

The metering equipment will be properly configured and checked annually 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.

A pair of meters with an accuracy of 0.2s is installed for the measurement of gross electricity delivered to the grid. The main meter will be owned, operated and maintained by East Power Grid, and the backup meter will be owned, operated and maintained by the owner company. Another pair of meters with an accuracy of 0.2s is installed for the measurement of imported electricity from the grid for internal consumption. When the main meters are out of order, the readings from the backup meters will be used for reference. Electricity delivered to the grid is the gross electricity delivered to the grid from which imported electricity is deducted.

3. Reporting

The specific steps for data collection and reporting are listed below:
Grid company, together with the project owner reads the main meter and records data on the last day of every month.
Project owner reads the backup meter and records data on the last day of every month
Grid company supplies readings to the project owner and provides invoice.
Project owner records the data of net electricity delivered to the grid
Project owner provides two meters' readings and photocopies of invoices to DOE for verification.

Should any previous months reading of the main meter be inaccurate by more than the allowable error, or otherwise functioned improperly, the grid-connected electricity generated by the proposed project shall be determined by:
First, by reading the backup meter, unless a test by either party reveals it is inaccurate;
If the backup system is not with acceptable limits of accuracy or is otherwise performing improperly the proposed project owner and grid company shall jointly prepare an estimate of the correct reading; and

If the proposed project owner and the grid company fail to agree the estimate of the correct reading, then the matter will be referred for arbitration according to agreed procedures.

4. Calibration

The Power Interchange Agreement between the Project Owner and East Power Grid Company Limited defines the metering arrangements and the required quality control procedures to ensure accuracy.

The metering equipment are calibrated and checked annually for accuracy. The metering equipment shall have sufficient accuracy so that any error resulting from such equipment shall not exceed 0.5% of full-scale rating. Calibration is carried out by the grid company with the records being supplied to the project owner, and these records will be maintained by the project owner and the appointed third party. Both meters shall be jointly inspected and sealed on behalf of the parties concerned and shall not be interfered with by either party except in the presence of the other party or its accredited representatives.

All the meters installed shall be tested by a third party within 10 days after:
(a) Detection of a difference larger than the allowable error in the readings of both meters;
(b) The repair of all or part of meter caused by the failure of one or more parts to operated in accordance with the specifications.

5. Data management system

Physical document such as paper-based maps, diagrams and environmental assessments will be collected in a central place, together with this monitoring plan. In order to facilitate auditors' reference of relevant literature relating to the project, the project material and monitoring results will be indexed. All paper-based information will be stored by the technology department of the project owner and all the material will have a copy for backup. And all data including calibration records is kept until 2 years after the end of the total credit time of the CDM project.

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 study of the proposed project was completed on Dec. 30, 2006 by CWEME (China National Water Resources & Electric Power Materials & Equipment Co., Ltd.)

The persons involved in baseline study are listed as follows:
1） Ms. Xia Xiaoshu, CDM Office of CWEME, E-mail: xiaxiaoshu@cweme.com, TEL: +86 10 51967892;
2) Mr. Zheng Xipeng, CDM Office of CWEME, E-mail: zhengxipeng@cweme.com, TEL: +86 10 5196 7749;
3) Ms. Bian Jing, CDM Office of CWEME, E-mail: bianjing@cweme.com, TEL: +86 10 51967720;

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:

December 28, 2006

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

25 years

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:

December 1, 2007

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:

The project was approved by the Environmental Protection Bureau of Fujian Province in Nov, 2005. The environmental impacts of the proposed project are analyzed as the following:

Land Use

The construction work of the project will have some influences on the local ecological environment such as intensified soil erosion, decline of soil fertility, and weakening of the anti-eclipse ability of the regolith.

Although the overall area of the wind farm is quite large, the actual construction area of the project is comparatively small. By strictly managing the construction action, building bulkheads at the slope faces, backfilling the excavated soil and rock, and restoring the destroyed ground and vegetation, we could limit the disturbance and damage of the land surface to a minimal scope, and enforce the ecological environment protection for the project operation and the sustainable development.

Noise

The noise pollution mainly comes from the instantaneous demolition noise, manual drills, cement mixers, and transportation vehicles during construction period, and aerodynamic interaction between the wind and turbine blades during operation period. Since the demolition times are limited and all equipments will be operated during daytime hours, the noise levels will be controlled and naturally attenuated by ambient conditions within the standards set as Chinese environmental guidelines (GB 12348-90, and GB 12523-90).

Waste water and sewage

The sewage is mainly composed of the water produced by flushing and maintaining the construction machinery, and daily life waste generated by the operation staff. Since the wind farm operation system is relatively independent and assembly automated, we could collect and process the construction sewage by setting up the constructor battalion, and septic tank in living regions, and sedimentation and separating-oil pond in the construction region. Before the waste water and sewage for irrigating the farmland and forest land is discharged, they will be processed to reach the class one of Chinese environmental standard specified as “Sewage Discharge Standard” (GB8978-1996), which shows no impact on the surrounding environment.

Dust and Air Quality

The air impact during the construction period mainly comes from flying dust produced by excavating land and transportation vehicles, and some exhaust discharge from using and moving construction machinery. Regarding this problem, the project owner will use enclosed or semi-enclosed transportation vehicles with strictly managed schedule and route. Moreover, by strengthening the construction control, advocating civilized construction, and regularly spraying and cleaning the branch roads, material dump sites and other construction work surfaces, the influences could be reduced under the construction standards set by governments and environmental protection departments.

Ecological environment

Based on the investigation of the project site and Liuao town’s related records, there are no protected animals, birds’ migratory routes or habitat. Thus, the project is unlikely to affect birds' flight and migration. Meanwhile, the arrangement of air blowers and transmission lines, and the design of the blades’ shape, color, quantity and size will also be considered to match the periphery natural landscape and local construction style.

Interference with Communications

The communication interference mainly comes from turbine blades and power transmission and distribution. Electromagnetic wave and microwave generated by wind power blades may disturb television and broadcast signals, cellular wireless communication, and various navigational and air traffic control systems. But at present, the most commonly used blade materials, fiberglass and wood, have very weak disturbance on communication, which could be adjusted by the inexpensive direction receiver/transmitter.

Corona noise produced from the power transmission and distribution mainly interferes with the low frequency signals used for AM wireless broadcast, especially during storms. All the routes and layouts of transmission and distribution are designed to keep enough distances with the sensitive region, such as inhabited areas and telecommunication lines. According to the investigation on all the transmission, distribution, and transformer substations, the calculated values of field intensity fall within the Chinese standards. There is no interference expected.

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

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

A stakeholder meeting was held in Liuao Town in December 2006. Representatives from various government departments and local residents were identified as the stakeholders to the project and were invited to the meeting. During the meeting, a survey was conducted and all 23 questionnaires were returned. The questionnaire includes the following sections:

1) Project introduction
2) Respondent's basic information and education level
3) Questions on:
- Do they have any knowledge or understanding about wind farm projects?
- Will the Project bring improvements to their livelihoods?
- Will the Project have negative impacts on their livelihoods?
- What would the overall influence be for the construction and implementation of the Project?
- Do they agree with the construction of the Project?
- What other comments and suggestions do the respondents have for the company regarding the Project?

4) Space for the respondents' signature and date

E.2. Summary of the comments received:

The survey shows that the proposed project receives strong support from local people. 100% of the respondents support the development of the project. The consensus is that the project can bring many

positive impacts to the local economy and livelihoods of local people with increased job opportunities, more stable power supply and stimulated economy. Among the likely negative impacts, the main issues concerned are noise during construction (52.2%) and land use (30.4%). However, as the environmental impact assessment demonstrates, these impacts only occur during construction period, and accompanied by mitigating measures stated in the EIA report, the impacts will be minimized after the construction.

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

Based on the comments received, there is no need to modify the project. In the meanwhile, mitigating measures will be properly undertaken.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding for the proposed project.

Annex 3

BASELINE INFORMATION

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

Table A3-1-A3-4 are the basic statistical data on installed capacities of the East China Grid in 2001, 2002, 2003 and 2004.

Table A3-1 **Installed capacities of 5 provinces (2001)**

		Installed Capacity(2001)			
2001	Hydro	Coal	Nuclear	Other	Total
JiangSu	33.7	19667.8	0	0	19701.5
Shanghai	0	11232.7	0	0	11232.7
Anhui	608.8	8960.3	0	0	9569.1
Zhejiang	5732.5	12736.2	300	0	18768.7
Fujian	6180	6424	0	0	12604
Total	12555	59021	300	0	71876
%	0.175	0.821	0.004	0.000	1.000

Source: China Electric Power Yearbook 2002, page 616

Table A3-2 **Installed capacities of 5 provinces (2002)**

		Installed Capacity(2002)			
2002	Hydro	Coal	Nuclear	Other	Total
JiangSu	137.2	20599	0	0	20736.2
Shanghai	0	11382.6	0	0	11382.6
Anhui	649.1	9056.3	0	0	9705.4
Zhejiang	5866.8	13082.4	1678	50.2	20677.4
Fujian	6394.2	6999.9	0	12	13406.1
Total	13047.3	61120.2	1678	62.2	75907.7
%	0.172	0.805	0.022	0.001	1.000

Source: China Electric Power Yearbook 2003, page 593

Table A3-3 **Installed capacities of 5 provinces (2003)**

		Installed Capacity(2003)			
2003	Hydro	Coal	Nuclear	Other	Total
JiangSu	137.8	22245	0	0	22382.8
Shanghai	0	11092.6	0	0	11092.6
Anhui	649.1	9284.9	0	0	9934
Zhejiang	6054.5	15321.2	2406	39.7	23821.4

Fujian	6761.1	7092.8	0	12	13865.9
Total	13602.5	65036.5	2406	51.7	81096.7
%	0.168	0.802	0.030	0.001	1.000

Source：China Electric Power Yearbook 2004, page 708

Table A3-4 **Installed capacities of 5 provinces (2004)**

		Installed Capacity(2004)			
2003	Hydro	Coal	Nuclear	Other	Total
JiangSu	126.5	28289.5	0	17.5	28433.5
Shanghai	0	12014.9	0	3.4	12018.3
Anhui	692.8	9364.5	0	0	10057.3
Zhejiang	6418.4	21439.8	3056	39.7	30953.9
Fujian	7180.1	8315.4	0	12	15507.5
Total	14417.8	79424.1	3056	72.6	96970.5
%	0.149	0.819	0.032	0.001	1.000

Data source: China Electric Power Yearbook 2005, page 473

Tables A3-5-A3-7 show the data and calculation process of simple operating margin emission factor of the East China Grid in 2002, 2003, 2004. It should be noted that:

1) The data of electricity generation and its fuel consumption in 2002, 2003 and 2004 used in the calculation of simple OM emission factor are from China Electricity Yearbook and China Energy Statistical Yearbook respectively, excluding electricity generation from the low-operating/must-run power plants.

2) The data of electricity imported to the East China Grid are from China Electric Power Yearbook (2003~2005).

3) NCV of each type of fossil-fuel comes from P301 of 2000-2002 China Energy Statistical Yearbook. The physical unit of energy is tone or cubic meter, while the unit of energy is Joule.

4) Default values of IPCC are adopted for emission factors of different types of fossil fuel.

5) OM emission factor of the East China Grid = Total emission of the East China Grid/ (fuel-fired power generation delivered to the East China Grid + electricity imported to the Grid).

Table A3-5 Calculation of Simple OM Emission Factor of the East China Grid (in 2002)

Fuel types	unit	Provinces in the Regional Grid					Subtotal	Effective CO2 Emission Factor	average low Caloric value	CO_2 emisson
		Jiangsu	Shanghai	Anhui	Zhejiang	Fujian		(tCO2/TJ)	(MJ/t,m^3,tce)	(tCO_2e)
		A	B	C	D	E	F	G	H	=F*G*H
Raw coal	Mtons	56.7469	23.86	20.2505	29.2366	13.3649	143.4589	94.6	20908	283746899.2
Cleaned coal	Mtons	0	0	0	0	0	0	94.6	26344	0
Other washed coal	Mtons	0	0	0	0	0	0	94.6	8363	0
Coke	Mtons	0	0	0	0	0	0	94.6	28435	0
Coke oven gas	$10^{10}m^3$	0.0002	0.0223	0	0	0	0.0225	44.4	16726	16709.274
Other coal gas	$10^{10}m^3$	0	0.6682	0	0	0	0.6682	44.4	5227	155075.0542
Crude oil	Mtons	0	0	0	0	0	0	73.3	41816	0
Gasoline	Mtons	0.0007	0	0	0	0	0.0007	69.3	43070	2089.3257
Kerosene	Mtons	0	0	0	0	0	0	71.5	43070	0
Diesel oil	Mtons	0.1345	0.0121	0	0.3	0	0.4466	74.1	42652	1411485.195
Fuel oil	Mtons	0.0119	0.532	0.0109	0.9138	0.126	1.5946	77.4	41816	5161016.025
LPG	Mtons	0	0	0	0	0	0	63.1	50179	0
Refinery gas	Mtons	0	0.0084	0	0	0	0.0084	57.6	46055	22283.2512
Natural gas	$10^{10}m^3$	0	0	0	0	0	0	56.1	38931	0
Other petroleum products	Mtons	0.0347	0.1	0	0	0	0.1347	73.3	41816	412870.6942
Other Coking Products	Mtons	0	0	0	0	0	0	107	29271.2	
Fired electricity generated	TWh	109.607996	58.2943488	42.7962892	65.1644235	28.78922	304.652277			
Electricity imported	TWh						7.38		Total tCO2e Emission	290928428.1
	a. Total CO2 emission in East China Grid(tCO2e)							290928428.1		
Result	b. Total generation in East China Grid(TWh)							312.0322771		
	c. OM emission factor (tCO2/MWh) (a/b/10^6)							0.932366455		

Table A3-6 Calculation of Simple OM Emission Factor of the East China Grid (in 2003)

Fuel types	unit	Provinces in the Regional Grid					Subtotal	Effective CO2 Emission Factor	average low Caloric value	CO_2 emisson
		Jiangsu	Shanghai	Anhui	Zhejiang	Fujian		(tCO2/TJ)	(MJ/t,m^3,tce)	(tCO_2e)
		A	B	C	D	E	F	G	H	=F*G*H
Raw coal	Mtons	64.1774	26.18	26.6967	34.424	17.54	169.0181	94.6	20908	334300359.1
Cleaned coal	Mtons	0	0	0	0	0	0	94.6	26344	0
Other washed coal	Mtons	0	0	0	0	0	0	94.6	8363	0
Coke	Mtons	0	0	0	0	0	0	94.6	28435	0
Coke oven gas	$10^{10}m^3$	0.0006	0.0199	0	0	0	0.0205	44.4	16726	15224.0052
Other coal gas	$10^{10}m^3$	0	0.6634	0	0	0	0.6634	44.4	5227	153961.0759
Crude oil	Mtons	0	0	0	0	0	0	73.3	41816	0
Gasoline	Mtons	0	0	0	0	0	0	69.3	43070	0
Kerosene	Mtons	0	0	0	0	0	0	71.5	43070	0
Diesel oil	Mtons	0.1471	0.0126	0	0.1399	0	0.2996	74.1	42652	946889.7547
Fuel oil	Mtons	0.0076	0.9549	0	1.7448	0.1889	2.8962	77.4	41816	9373720.438
LPG	Mtons	0	0	0	0	0	0	63.1	50179	0
Refinery gas	Mtons	0.0096	0.0049	0	0	0	0.0145	57.6	46055	38465.136
Natural gas	$10^{10}m^3$	0	0	0	0	0	0	56.1	38931	0
Other petroleum products	Mtons	0.053	0.1891	0	0.1504	0	0.3925	73.3	41816	1203056.774
Other Coking Products	Mtons	0	0	0	0	0	0	107	29271.2	0
Fired electricity generated	TWh	125.413657	65.8745784	50.8741464	78.6769741	40.0091978	360.8485537		Total	346031676.3
Electricity imported	TWh						16.2			
	a. Total CO2 emission in East China Grid(tCO2e)							346031676		
Result	b. Total generation in East China Grid(TWh)							377.048554		
	c. OM emission factor (tCO2/MWh) (a/b/10^6)							0.91773771		

Table A3-7 Calculation of Simple OM Emission Factor of the East China Grid (in 2004)

Fuel types	unit	Provinces in the Regional Grid					Subtotal	Effective CO2 Emission Factor	average low Caloric value	CO_2 emisson
		Jiangsu	Shanghai	Anhui	Zhejiang	Fujian		(tCO2/TJ)	(MJ/t,m^3,tce)	(tCO_2e)
		A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*=F*G*H*
Raw coal	Mtons	76.019	27.796	29.062	40.089	21.837	194.803	94.6	20908	385300230.3
Cleaned coal	Mtons	0	0	0	0	0	0	94.6	26344	0
Other washed coal	Mtons	0.0546	0	0	0	0.0463	0.1009	94.6	8363	79826.00582
Coke	Mtons	0	0	0	0	0	0	94.6	28435	0
Coke oven gas	$10^{10}m^3$	0	0.0259	0	0	0	0.0259	44.4	16726	19234.23096
Other gas	$10^{10}m^3$	0	0.7246	0	0	0	0.7246	44.4	5227	168164.2985
Crude oil	Mtons	0	0	0	0	0	0	73.3	41816	0
Gasoline	Mtons	0	0	0	0	0	0	69.3	43070	0
Kerosene	Mtons	0	0	0	0	0	0	71.5	43070	0
Diesel Oil	Mtons	0.2717	0.0269	0	0.0623	0	0.3609	74.1	42652	1140629.214
Fuel oil	Mtons	0.5507	0.5852	0	2.0289	0.2326	3.3974	77.4	41816	10995883.51
LPG	Mtons	0	0	0	0	0	0	63.1	50179	0
Refinery gas	Mtons	0.0055	0.0077	0	0	0	0.0132	57.6	46055	35016.5376
Natural gas	$10^{10}m^3$	0.0014	0	0	0	0	0.0014	56.1	38931	3057.64074
Other Petroleum Products	Mtons	0.0137	0.2122	0	0.2489	0	0.4748	73.3	41816	1455315.557
Other Coking Products	Mtons	0	0	0	0	0	0	107	29271.2	0
Fired electricity generated	TWh	153.846782	67.4141706	56.2645375	89.844516	47.425257	414.7952626		Total	399197357.3
Electricity imported	TWh						25.688			
	a. Total CO2 emission in East China Grid(tCO2e)							399197357.3		
Result	b. Total generation in East China Grid(TWh)							440.4832626		
	c. OM emission factor (tCO2/MWh) (a/b/10^6)							0.906271342		

Data Source: Effective CO2 Emission Factor: 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Fuel Consumption, Fire Generated Electricity Data and Average Low Caloric Value: China Energy Statistical Yearbook
Electricity Imported: China Electric Power Yearbook

Table A3-8 Calculation of Average Simple OM Emission Factor of the East China Grid

OM 2002	0.932
OM 2003	0.918
OM2004	0.906
average (/tCO2MWh)	0.917

The conservative alternative calculation method of the BM emission factor of the East China Grid has been explained in section B of the PDD. The data, sources and calculation process of the BM emission factor and combined emission factor of the East China Grid are shown in Table A3-9, A3-10, A3-11.

Table A3-9 Calculation of Emission Rate

A	B	C	D	E	F
CO_2 Emission Factor tCO_2/GJ	Fuel Energy Value GJ/tSCE	CO_2 Emission Factor $tCO_2/tSCE$	Coservative efficiency factor (gce/kWh)	Coservative efficiency factor (tce/MWh)	Emissions Rate tCO_2/MWh
2006 IPCC GuideDlines for National Greenhouse Gas Inventories	The General Code for Comprehensive Energy Consumption Calculation (Chinese National Standard GB2589-81)	A x B	Average fuel consumption for best technology commercially available for coal fired power plants in the system	=D/1000; g->ton; kWh->MWh;	=C*E
0.094600	29.270000	2.768942	320.000000	0.320000	0.886061

Table A3-10 Calculation of BM Emission Factor of the East China Grid

A	B	C	D	E	F	G	H	I	J	K	L
Installed Capacity 2001	Installed Capacity 2002	Installed Capacity 2003	Installed Capacity 2004	New Capacity Additions 2004-2003	Split of New Capacity	New Capacity Additions 2004-2002	Split of New Capacity	New Capacity Additions 2004-2001	Split of New Capacity	Emissions Factor	Weighted Average Build Margin Emissions Factor
MW	MW	MW	MW	MW	%	MW	%	MW	%	tCO2/MWh	tCO2/MWh
				=D-C		*=D-B*		*=D-A*		*From Table A3-9*	*=J *K*
12555.0	13047.3	13,602.5	14,417.8	815.3	5.14%	1,370.5	6.51%	1,862.8	7.42%	0.000	0.000
59021.0	61120.2	65,036.5	79,424.1	14,387.6	90.64%	18,303.9	86.90%	20,403.1	81.31%	0.886	0.770
300.0	1678.0	2,406.0	3,056.0	650.0	4.09%	1,378.0	6.54%	2,756.0	10.98%	0.000	0.000
0.0	62.2	51.7	72.6	20.9	0.13%	10.4	0.05%	72.6	0.29%	0.000	0.000
71876.0	75907.7	81096.7	96970.5	15,873.8	**16.4%**	21,062.8	**21.7%**	25,094.5	**25.9%**		**0.770**

Table A3-11 Calculation of Baseline Emission Factor of the East China Grid

		Units	Equation or Source	
A	Operating Margin emissions factor	tCO_2/MWh	Table A3-8	0.917
B	Build Margin emissions factor	tCO_2/MWh	Table A3-10	0.770
C	Baseline emissions factor	tCO_2/MWh	0.75*A+0.25*B	**0.880**

Annex 4

MONITORING INFORMATION

No additional information.