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:

Heilongjiang Fuyuan Wind Power Project
Version: 2.0
Date: 10/04/2009
Revision history of the PDD:

Version	Date	Comments
Version 1.0	10 March 2008	First complete version of the PDD, prepared for the pre-evaluation meeting as part of the host country approval process
Version 2.0	10/04/2009	Version revised for registration.

A.2. Description of the project activity:

Heilongjiang Fuyuan Wind Power Project (hereafter referred as the proposed project) is to generate electricity from wind resources using advanced wind power generation technology on a commercial basis and to deliver the electricity to the Northeast China Power Grid (NECPG). The implementation of the proposed project will achieve CO_2 emission reduction by replacing electricity generated by fossil fuel fired power plant.

The proposed project is located in Fuyuan County, Heilongjiang Province, and Northeast China. The proposed project proposes to install 21 sets of 1500KW wind turbines, for a total installed capacity of 31.5 MW. Fuyuan county area where the proposed project is located has relative rich wind resources, it is estimated that the annual generation of the proposed project will be 64,200MW·h.

The proposed project is the installation of a new grid-connected wind power plant, the scenario existing prior to the start of the implementation of the project activity is the same as the baseline scenario that the NECPG would provide the same electricity service as the proposed project. As a result, 73,232 tonnes of CO2 emission reduction will be generated.

Being as an environmentally sound energy supply technology, the contributions of the proposed project are summarized as follows:

- ♦ Being located in a power grid dominated by coal-fired power plants, development of the proposed project will not only reduce GHG emissions but also mitigate local environmental pollution caused by air emissions from coal-fired power plants.
- ♦ The proposed project could be helpful to diversify power structure of China Northeast Power Grid and reduce the dependence on exhaustible fossil fuels for power generation.
- ♦ Heilongjiang province the proposed project located is the main heavy industry base of China, and the electricity demand increases rapidly; Development of the proposed project could contribute to meet local electricity demand, therefore boost the economy in the local region.
- ♦ For the local civilization, they can benefit from the job opportunity due to the construction and operation of the proposed project.

A.3. Project participants:

Name of Party involved (*)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to

((host) indicates a host Party)		be considered as project participant (Yes/No)
China (host)	Fuyuan Longyuan Wind Power Co., Ltd.	No
Austria	Kommunalkredit Public Consulting GmbH	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

China

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

Heilongjiang Province

A.4.1.3. City/Town/Community etc:

Jiamusi city, Fuyuan County

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

The proposed project is located in Fuyuan County, Jiamusi City, Heilongjiang Province, Northeast China, its geographical coordinates are between north latitude 47°25′30″ and 48°27′40″, east longitude 133°40′45″ and135°5′20″, and its altitude is from 160m to 270m. The detailed location of the proposed project is shown below.

Figure 1 Location of the proposed project

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

This category would fall within sectoral scope 1: energy industries (renewable energy).

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

The purpose of the proposed project is to generate wind power and deliver it to Northeast China Power Grid. For the proposed project,

(a) The scenario existing prior to the start of the implementation of the project activity is NECPG providing the same electricity service as the proposed project;
(b) The project scenario is the implementation of the proposed project, the installation and operation of 21 sets of wind turbines with a total capacity of 31.5MW which will supply an average annual generation of 64,200MW·h to NECPG and replace the same amount of electricity generated by fossil fuel fired power plants connected to NECPG;
(c) The baseline scenario is the same as the scenario existing prior to the start of implementation of the project activity.

For the proposed project, the wind speed at 65m is around 7.27 m/s which is suitable for wind turbines of IECIII class and above. The wind turbine finally adopted by the proposed project is Gold wind77/1500. This type wind turbine has been installed in many wind farms, the performance proved its high quality and technical advantage. The average annual operation hour of the proposed project is 2038h, and the PLF is 0.2326.

The Gold wind 77/1500kW is a three bladed, upwind, pitch regulated and active yaw wind turbine. It uses the Ingecon-W control system concept that enables the wind turbine to operate in a broad range of variation of rotor speed and maximizes the power output by choosing the combination of rotor speed and pitch angle.

The main technical specifications are as follows:

Nominal Capacity (kW)	1500
Diameter (m)	77
Hub Height (m)	65
Nominal Wind Speed (m/s)	11.8
Cut-in Wind Speed (m/s)	3
Cut-out Wind Speed (m/s)	22
Estimated life time (year)	20

Each wind turbine will have a 0.69/10kV transformer, from which a 10 kV line will link into the on-site 66kV transformer at the substation which will be constructed for the proposed project. The proposed project will connect with the Qianshao substation through the 66kV line, where the power generation of the wind farm can be easily transmitted to the NECPG grid, replace partial power generated from fossil fuels and reduce GHG emissions.

The project owner has conducted a series of training process to guarantee the successful implementation of the wind farm. These training processes can guarantee the project will be operated by qualified staff.

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

The renewable crediting period is adopted for the proposed project. The estimation of emission reductions over the first crediting period is shown in table below.

Years	Annual estimation of emission reductions in tonnes of CO2 e
01/11/2009-31/10/2010	73,232
01/11/2010-31/10/2011	73,232
01/11/2011-31/10/2012	73,232
01/11/2012-31/10/2013	73,232
01/11/2013-31/10/2014	73,232
01/11/2014-31/10/2015	73,232
01/11/2015-31/10/2016	73,232
Total estimated reductions (tonnes of CO_2e)	512,624
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	73,232

A.4.5. Public funding of the project activity:

No public funds from Annex I countries is involved in the proposed project.

SECTION B. Application of a baseline methodology

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

Approved consolidated baseline and monitoring methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"- ACM0002 Version 08

The methodology also refers to the latest approved versions of the following tools:

◆Tool to calculate the emission factor for an electricity system (version 01.1);
◆Tool for the demonstration and assessment of additionality (version 05.2);

For more information regarding the methodology and the tools as well as their consideration by the Executive Board please refer to http://cdm.unfccc.int/goto/MPappmeth.

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

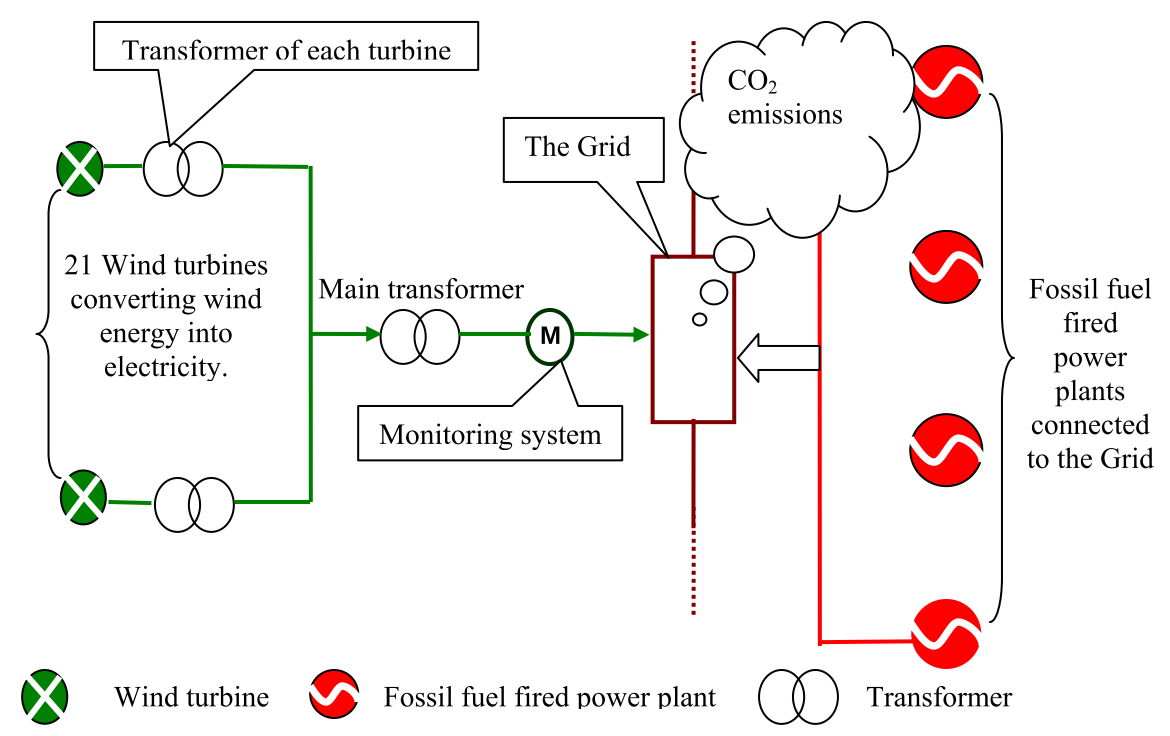
The proposed project can meet the applicability criteria of the baseline methodology ACM0002 (Version 08). Therefore, the methodology is applicable to the proposed project.

- The proposed project is the installation of a grid-connected renewable power generation activity from wind source that involve electricity capacity additions;
- The proposed project is not an activity that involves switching from fossil fuels to renewable energy at the proposed project site;
- The geographic and system boundary for the Northeast China Power Grid which the proposed project is to be connected to is clearly identified and information on the characteristics of this grid is publicly available;

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

According to the methodology (ACM0002 version 08), the spatial extent of the project boundary includes the proposed project and all power plants connected to the Electricity System that the proposed project is connected to. The Northeast China Power Grid is the project Electricity System, which is defined by the spatial extent of the power plants that are connected through transmission and distribution lines to the project activity and that can be dispatched without significant transmission constrains. Using the boundary definitions of the Chinese DNA[1], the Northeast China Power Grid consists of independent province-level electricity systems including Liaoning, Heilongjiang and Jilin power grids.

[1]http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=3239



The flow diagram of the project boundary

	Source	Gas	Included?	Justification / Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity.	CO_2	Yes	Major emission sources
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Project Activity	project source	CO_2	No	According to ACM0002, the project emission of wind power project activity is excluded.
		CH_4	No	According to ACM0002, the project emission of wind power project activity is excluded.
		N_2O	No	According to ACM0002, the project emission of wind power project activity is excluded.

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

The proposed project is the installation of a new grid-connected renewable power plant that does not modify or retrofit an existing electricity generation facility. The proposed project connected to

Heilongjiang Grid, which is an integrated part of Northeast China Power Grid. Therefore the baseline scenario of the proposed project can be identified as 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 (version 01.1)".

According to ACM0002, baseline emissions are calculated as the power generation delivered to the NECPG by the project multiplying the baseline emission factor of NECPG.

The analysis and description in B.5 and B.6 will support the baseline scenario selected 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):

The CDM incentive was seriously considered in the Feasibility Study Report of the proposed project, which clearly states that "To ensure a successful implementation of the proposed project, the project developer should apply for CDM registration according to the related regulation of the State, and improve the financial return rate of the proposed project through GHG emission reduction trading"[2].

No.	Timeline	Milestone
1	July, 2007	Feasibility study of the proposed project finished. The plan of the CDM application was listed in the FSR.
2	16th October 2007	The meeting of the board of directorates was conducted. According to the conclusion of the FSR, the project is financially unattractive. In order to increase the FIRR of the proposed project, the project owner made a decision of CDM application.
3	20th March 2008	Letter of Intent signed with CER buyer.
4	05th May 2008	The CDM consultancy contract signed.
5	22nd May, 2008	The construction contract signed.
6	25th May, 2008	Date of the project construction permitted.
7	10th June 2008	The wind turbine purchasing contract signed.
8	15th October 2008	PDD was published on the UNFCCC website for global stakeholder consultation.
9	14th January 2009	Letter of Approval was issued by Chinese DNA.

According to the FSR, the IRR of the proposed project is lower than the benchmark, but will exceed benchmark with the income of CER sale. The meeting minute show that the project owner decided to proceed with the project and undertake the project as a CDM project. In order to secure the successful implementation of the proposed project, the project owner signed a consultant contract to start CDM development in parallel with its implementation at 5th May 2008. The construction of the project started at 25th May 2008.

2 Feasibility Study Report of the proposed project

The following steps are used to demonstrate the additionality of the proposed project according to "Tools for the demonstration and assessment of additionality (version 05.2)" agreed by Executive Board and requested by ACM0002 (version 08).

Step1. Identification of alternatives to the project activity consistent with current laws and regulations.

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

To provide the same output or services comparable with the proposed CDM project activity, these alternatives are to include:

Alternative 1: The proposed project not undertaken as a CDM project activity.
Alternative 2: The fossil-fired plant with the same annual electricity supply as the proposed project.
Alternative 3: Other renewable energy project with the same annual electricity supply as the proposed project.
Alternative 4: No construction of the proposed project, and the Northeast China Power Grid as the provider for the same electricity supply.

Alternative 1 is in compliance with China's current regulations and laws. However, it should be eliminated from the following consideration because the investment analysis in step 2 will show that the proposed project not undertaken as a CDM project is financially unattractive without CERs income. Alternative 1 will not become the baseline scenario and should be eliminated.

Besides wind energy, other kinds of energy like solar PV, geothermal, biomass and hydro are the possible grid-connected renewable energy technologies that could be applied in china. Due to the technology development status and the cost for power generation, solar PV, geothermal and biomass power project of the similar electricity generation as the proposed project are alternatives far from being attractive investment in the grid in China[3]. The place where the proposed project located is plain with altitude of 100m, so there is no adequate exploitable hydro resource available for construction of a hydro power utility to provide the same generation as the proposed project[4]. As a further demonstration, the increased hydro power capacity from 2004 to 2006 in Heilongjiang Grid is no more than 10MW[5]. In conclusion, alternative 3 is unrealistic and should be eliminated.

Step1b. Consistency with mandatory laws and regulations.

For alternative 2, since the annual operation hour for thermal power plant in Heilongjiang Grid in 2006 is 5404h, while the one for the proposed project is 2038h, to provide the same output as the proposed project, the capacity of the alternative fossil-fired power plant will be about 12MW. However current Chinese regulations prohibit the construction of fossil fuel-fired power plants with capacity lower than

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[3] High Cost Hinder the Development of Renewable Source of Energy, Economic Press, 27th February 2007.

[4] Www.shuidianzhan.net/snzy/250.html

[5] According to China Electric Year Book, the installed capacity in Heilongjiang province from 2004 to 2006 is 844.6MW, 846.7MW and 853MW respectively.

135MW in areas served by provincial and/or regional grid systems (*Notice On Prohibition of 135MW and Smaller-scale Coal-fired Power Plants*, General Office of State Council[6]). Thus, Alternative 2 will not become the baseline scenario and should be eliminated.

In conclusion, alternative 4 is the only realistic, feasible alternative which is in compliance with all applicable legal and regulations, and thus is considered as the baseline scenario of the proposed project.

Step2. Investment analysis.

Sub-step 2a. Determine appropriate analysis method.

Three options can be applied for the investment analysis: the simple cost analysis, the investment comparison analysis and the benchmark analysis.

The simple cost analysis is not applicable for the proposed project because the project activity will have revenue (from electricity sales) other than CDM related income. The investment comparison analysis is also not applicable for the proposed project because the baseline scenario, providing the same annual electricity output by the Northeast China Power Grid, is not an investment project.

To conclude, the benchmark analysis will be used to identify whether the financial indicators (IRR in this case) of the proposed project is better than relevant benchmark value.

Sub-step 2b Apply benchmark analysis.

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

The IRR of the proposed project is calculated and compared as follows.

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

Table 2 Main parameters for calculation of IRR of the proposed project

Items	Unit	value	Source
Capacity	MW	31.5	FSR
Static Total Investment	Million RMB	256.49	FSR
Annual output	MWh/year	64,200	FSR
Annual O&M cost	Million RMB	8.74	FSR
Tariff (excl. VAT)	RMB/kWh	0.5622	FSR
VAT	%	8.5	FSR
Income tax	%	25	FSR
Residual rate	%	5	FSR
Project lifetime (including	Year	21	FSR

6 http://www.gov.cn/gongbao/content/2002/content_61480.htm

construction period)			
Expected CER price	EUR/tCO_2	11.7	Market price

The project IRR of the proposed project without income from CERs is 7.12%, which is lower than the benchmark IRR, and 10.15% with income from CERs which is higher than the benchmark. So the proposed project is financially unacceptable.

Sub-step 2d. Sensitivity analysis.

The objective of this sub-step is to show the conclusion regarding the financial attractiveness is robust to reasonable variations of the critical assumptions.

Four factors are considered in following sensitivity analysis:

1) Average Annual Output (the electricity supplied to the grid by the proposed project).
2) Total investment.
3) Tariff.
4) Annual operation and maintenance cost.

When the above four factors vary, the IRR of the proposed project (without income from selling CERs) varies to different extent as analysed below.

IRR range / Parameters	-10%	-6.3%	0%	5%	10%
Total investment	8.55%	**8.00%**	7.12%	6.49%	5.90%

IRR range / Parameters	-10%	-5%	0%	5%	6.1%	10%
Tariff (Average Annual Output)	5.63%	6.39%	7.12%	7.84%	**8.00%**	8.55%

IRR range / Parameters	-26%	-10%	0%	5%	10%
O&M cost	**8.00%**	7.46%	7.12%	6.95%	6.78%

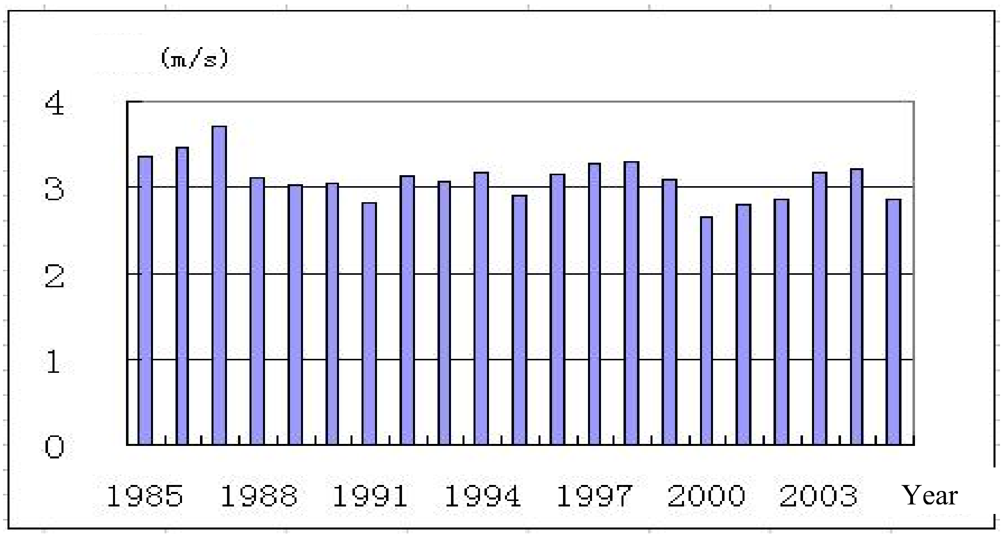
In the case that the tariff increases by 6.10%, the IRR of the proposed project begins to exceed the benchmark. However there is extremely unlikely for the tariff of the proposed project to have an increase of 6.10%. Firstly, the tariff (0.5622 Yuan/kWh, excluding VAT) used in FSR of the proposed project is in line with the tariff for the similar projects in Heilongjiang province[7]. Secondly, the guiding tariff for the

[7] http://www.hebwj.gov.cn/upfiles/xy_col32gjc___20070718164220007126.htm
http://jgs.ndrc.gov.cn/zcfg/t20080218_192021.htm, http://jgs.ndrc.gov.cn/zcfg/t20080813_230722.htm

proposed project issued by NDRC on 23rd July 2008 will act as an important indicative reference for the PPA signed between the project owner and the grid company. Moreover, once the tariff was determined in PPA, it will be legally valid, neither the project owner nor the grid company can change it. Therefore it is impossible that the expected tariff of the proposed project could increase 6.10%, so the proposed project is always lack of financial attractiveness.

The next important factor for financial attractiveness is the total investment. In the case that total investment decreases by about 6.3%, the IRR of the proposed project begins to exceed the benchmark. Considering the majority of total investment is due to wind turbine which is consisted 88.6% of total statistic investment[8], and whose price has increased nearly 25% in recent years.[9] At the same time, recently the material price (especially the steel price) is gradually increasing in China[10]. Hence, it is impossible to lower the total investment of the proposed project, the proposed project is always lack of financial attractiveness.

In the case that the Average Annual Output increases by 6.10%, the FIRR of the proposed project begins to exceed the benchmark. The annual generation output of the proposed project is almost positive correlation with the average wind speed at the project site for a specific wind turbine. According to the feasibility study report of the proposed project, the annual output is estimated basing on the long term (from 1985 to 2005) weather statistic data provided by local meteorological station and wind resources measurement, which at first using professional software WAsP to select the rich wind source area, then using software Wind Farmer to optimize the location of each turbine for maximizing power generation. The estimated average annual output in FSR is the most credible quantity for the proposed project. Moreover, annul average output is positive correlation with the wind speed, and the annual average wind speed at the project site is stable over the past 20 years as shown in Figure 2. Therefore, the probability that Average Annual Output is 6.10% higher than the estimated value is very small.



[8] The feasibility study report (P13-5)

[9] China Government Establish Policy to Promote Wind turbine Manufactory, reported by China New Energy Website, http://www.gzkj.gov.cn/kjxx/newsDetail.jsp?infoId=79934

[10] The price for construction material and manpower inflation, reported by Economic Observation Press, June 18th, 2006 http://www.china.com.cn/chinese/EC-c/1246238.htm

Figure 2 The Average Wind speed provided by local meteorological station

The impact of the annual O&M cost is the slightest. The FIRR of the proposed project could reach the benchmark when the annual O&M cost decreases by 26%. However, according to the Feasibility Study Report of the proposed project, the detailed operation costs is composed of four kinds of costs - maintenance costs, annual salaries for the employees, insurance premium of fixed assets and other costs. Moreover, the price of material and salaries of the employees are gradually increasing in China, which leads annual O&M cost gradually increasing[11]. Furthermore, The FSR was finished by a qualified consultant company dedicated in wind power engineering and had been approved by NDRC. Therefore, it is impossible that the annual O&M cost could decrease 26%, so the proposed project is always lack of financial attractiveness within the reasonable range of annual O&M cost.

Outcome of Step 2: as illustrated above, without income from selling CERs, the IRR on total investment of the proposed project is lower than the benchmark IRR and the proposed project is financially unacceptable because of its low profitability. While considering such income, the financial acceptance will be changed, the project IRR of the proposed project is better than the benchmark and the proposed project is financially acceptable. Under the reasonable variation in the critical assumptions, the conclusion regarding the financial additionality is robust and supported by sensitivity analysis.

Step 3. Barrier analysis.

No barrier analysis has been applied.

Step 4. Common practice analysis

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

According to the definitions of other activities similar to the proposed project activity in "Tool for the Demonstration and Assessment of Additionality", the activities similar to the proposed project activity were selected according to the follow three rules:

1. The activities should locate in the same province, because the wind power project was implemented under the administration of provincial level government. The activities in the same province have the similar wind resource, grid structure, geological and transportation conditions, economic developing status[12], the former two factors affected the estimated average annual output and the later three ones affected the total investment respectively.
2. The capacity of the similar projects should be 15MW and above.
3. The activities should be implemented after 2002. The wider power sector reforms happened in China after 2002 leaded to diversification in the ownership of generation capacity. As a result, new generation, including wind power, was expected to compete under more commercial conditions. Moreover, the Chinese Government launched the Wind Concession Program In 2002, which was designed to bring wind power development in China onto a new commercial footing (source: China Wind Power Industry Development Report (2006), Shi Peng Fei, China Electric Year Book 2007).

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[11] http://www.china.com.cn/chinese/EC-c/1246238.htm

http://www.chinadaily.com.cn/hqcj/2007-09/03/content_6075777.htm

[12] China Wind Power Industry Development Report (2006), Shi Peng Fei, China Electric Year Book 2007.

The similar wind farms were listed in the following table (the registered projects or the projects under CDM application are not included):

Table 3 similar wind farms in Heilongjiang Province

Wind farm	Installed Capacity(MW)	Date when wind turbines totally installed	Note
Huafu Fujin	24.3	2004.09	Financed from Asia Development Bank (Re. source No.1)

Sources:
1. Notice of loan on Huafu Fujin wind power project by China Development Bank, 2002.

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

According to Statistics on China Wind Farm Installed Capacity by Shi Pengfei (Deputy Director, Chinese Wind Energy Association), there is only one project selected following the above three rules. The name of the project is Huafu Fujin Wind Farm, which was financed by Asia Development Bank.

So the selected wind farm project do not call into question the claim that the proposed project is financially unattractive as discussed in Step 2 because there are essential distinctions between them.

As the four steps described above, the proposed project activity passed all criteria of "Tool for the demonstration and assessment of additionality". In conclusion, the proposed project is additional and not the baseline scenario.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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".

Project emissions

For wind power project activities, $PE_y = 0$

Baseline emissions

Baseline emissions include only CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity, calculated as follows:

$$BE_y = (EG_y - EG_{baseline}) \times EF_{grid,CM,y} \quad (1)$$

Where:
BE_y = Baseline emissions in year *y* (tCO2/yr).
EG_y = Electricity supplied by the project activity to the grid (MWh).
$EG_{baseline}$ = Baseline electricity supplied to the grid in the case of modified or retrofit facilities (MWh). For new power plants this value is taken as zero.
$EF_{grid,CM,y}$ = 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".

Parameter

The methodological tool "Tool to calculate the emission factor for an electricity system" provides procedures to determine the following parameters:

Parameter	SI Unit	Description
$EF_{grid,CM,y}$	tCO2/MWh	Combined margin CO_2 emission factor for grid connected power generation in year y
$EF_{grid,BM,y}$	tCO2/MWh	Build margin CO_2 emission factor for grid connected power generation in year y
$EF_{grid,OM,y}$	tCO2/MWh	Operating margin CO_2 emission factor for grid connected power generation in year y

The operating margin refers to a cohort of power plants that reflect the existing power plants whose electricity generation would be affected by the proposed CDM project activity. The build margin refers to a cohort of power units that reflect the type of power units whose construction would be affected by the proposed CDM project activity.

The following six steps are applied to calculate the emission factor for an electricity system:

STEP 1: Identify the relevant electric power system.
STEP 2: Select an operating margin (OM) method.
STEP 3: Calculate the operating margin emission factor according to the selected method.
STEP 4: Identify the cohort of power units to be included in the build margin (BM).
STEP 5: Calculate the build margin emission factor.
STEP 6: Calculate the combined margin (CM) emissions factor.

Step1: Identify the relevant electric power system.

Using the boundary definitions of the Chinese DNA[13], Northeast China Power Grid is defined as the **project electricity system** , which consists of independent province-level electricity systems including, Heilongjiang, Jilin, Liaoning, East Inner Mongolia province that can be dispatched without significant transmission constraints.

The **connected electricity system** is North China Power Grid, which is connected by 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.

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 Northeast China Power Grid has net electricity exports to the North Power Grid.

For the purpose of determining the build margin emission factor, the spatial extent is limited to the project electricity system (Northeast China Power Grid), since there are no net electricity imports from North China Power Grid.

Step2: Select an operating margin (OM) method

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 [14] 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: 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, without requirement to monitor and recalculate the emissions factor during the crediting period, or
- Ex post option: 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

[13] http://cdm.ccchina.gov.cn/web/index.asp.
[14] 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.

year (y-2) may be used. The same data vintage (y, y-1 or y-2) should be used throughout all 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.

For the proposed project, the simple Operating Margin emission factor was chosen based on the following two reasons:

1. In China, the State Grid Corporation runs the interregional dispatch system and each regional grid corporation run the intraregional dispatch system. The dispatch information is regarded as business secrets and not available to the public.
2. For the most recent 5 years (2002-2006), the low-cost/must run resources of total electricity generation in Northeast China Power Grid constitute 5.44%, 4.72%, 6.45% 7.98% and 5.25% of total generation of Northeast China Power Grid, respectively (China Electric Power Yearbooks 2003-2007), which is much less than 50% (detailed data s are shown in Annex 3).

As a result, the simple OM method can be used.

In conclusion, the Ex ante option of the data vintages is chosen to calculate the emission factor of the Northeast China Power Grid by using the simple OM method (option a) for the proposed project.

Step 3: Calculate the operating margin emission factor according to the selected method

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO2/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units. It may be calculated:

- ◆ Based on data on fuel consumption and net electricity generation of each power plant / unit (Option A), or

- ◆ Based on data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit (Option B), or

- ◆ Based on data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system (option C)

Option A should be preferred and must be used if fuel consumption data is available for each power plant / unit. In other cases, option B or option C can be used. For the purpose of calculating the simple OM, Option C should only be used if the necessary data for option A and option B is not available and can only be used if only nuclear and renewable power generation are considered as low-cost / must-run power sources and if the quantity of electricity supplied to the grid by these sources is known.

For the proposed project, the data on fuel consumption, net electricity generation and the average efficiency of each power unit are unavailable, thus option A and option B 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, therefore, Option C can be used.

On Option C, 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:

$$EF_{grid,OMsimple,y} = \frac{\sum_{i} FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_y} \quad (2)$$

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 three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option)

Regarding parameter selection, local values of $NCV_{i,y}$ and $EF_{CO2,i,y}$ should be used where available. If no such values are available, IPCC world-wide default values are preferable. The Net Calorific Value ($NCV_{i,y}$) of each type of fossil fuel used in the calculation comes from China Energy Statistic Yearbook 2007. Emission factors ($EF_{CO2,i,y}$) of each type of fossil fuel come from IPCC 2006 default values.

As chosen in step 2, the simple OM emission factor is calculated by using Ex-ante option of data vintages, i.e. 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, without requirement to monitor and recalculate the emissions factor during the crediting period.

The data of installed capacity, electricity generation and fuel consumptions are all from China Energy Statistical Yearbooks 2005-2007 and China Electric Power Yearbooks 2005-2007.

Given the above, the simple operating margin CO2 emission factor ($EF_{grid,OMsimple,y}$) of Northeast China Power Grid is **1.256099tCO2/MWh.** The detailed calculations and data are listed in the annex 3 (The baseline emission factor OM is same as that provided by Chinese DNA, the website is http://cdm.ccchina.gov.cn/web/index.asp).

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

The sample group of power unit *m* used to calculate the build margin consists of either:

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

(b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently[15].

The set of power units that comprises the larger annual generation should be used.

A power unit is considered to have been built at the date when it started to supply electricity to the grid.

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.

Capacity additions from retrofits of power plants should not be included in the calculation of the build margin emission factor.

In terms of vintage of data, one of the following two options can be chosen:

Option 1: For the first crediting period, 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 CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2: For the first crediting period, 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. For the second crediting period, the build margin emissions factor shall be calculated ex-ante, as described in option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

For the proposed project, option 1 is chosen to calculate Build Margin emission factor.

Step 5: Calculate the build margin emission factor

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[15] If 20% falls on part capacity of a unit, that unit is fully included in the calculation

The build margin emissions factor is the generation-weighted average emission factor (tCO2/MWh) of all power units *m* during the most recent year *y* for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (3)$$

Where:

$EF_{grid,BM,y}$ =Build margin CO2 emission factor in year y (tCO2/MWh)

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

$EF_{EL,m,y}$ = CO2 emission factor of power unit *m* in year y (tCO2/MWh)

m = Power units included in the build margin

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

The CO_2 emission factor of each power unit m ($EF_{EL,m,y}$) was determined as Tool to Calculate the Emission Factor for an Electricity System (version 01.1) in step 3(a) for the simple OM, using options B2.

For the proposed project, option 1 in step 4 was chosen to determine the vintage of data. Since the power plant capacity additions in the electricity system from 2000 to 2006 comprise 20% of the system generation (in MWh), so the sample group *m* consists of the power plants that have been built from 2000 to 2006.

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

Currently, it is very difficult to get the capacity margin data of power plants in China, since these data as well as electricity generation delivered to the grid and fuel consumption data of each power plant are regarded as commercial secrets and only for internal usage. According to the guidance from EB, the following deviation was adopted to calculate the Build Margin emission factor. Firstly calculate the proportion of incremental installed capacity and electricity generation technology, secondly calculate the weights of new installed capacity of all electricity generation technology, and finally calculate emission factors based on maximum energy efficiency level of new technology commercially. To be conservative, zero emission factors were selected for hydropower capacity and other capacity.

Currently, it is difficult to separate different kinds of electricity generation technology of coal, oil and gas on the base of statistic data available. This project adopts following method: First, based on the energy balance which has been published recently, calculate the emission weights of total CO2 emissions which corresponds to solid, liquid and gas fuels for electricity generation, Secondly, based on the emission factors of maximum energy efficiency level of new technology commercially available, calculate thermal power emission factors making use of emission weights, finally, BM can be calculated by thermal power emission factors timing weights of thermal power of 20% installed capacity addition.

The detailed calculation as following:

(1) With the energy balance sheet in China Energy Statistical Yearbook for the most recent year, calculating the respective percentages of CO2 emissions from coal fired power generation, oil fired power generation, and gas fired power generation against total CO2 emissions from fossil fuel fired power generation:

$$\lambda_{Coal} = \frac{\sum_{i \in COAL, j} FC_{i,j} \times COEF_{i,j}}{\sum_{i,j} FC_{i,j} \times COEF_{i,j}} \qquad (4)$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL, j} FC_{i,j} \times COEF_{i,j}}{\sum_{i,j} FC_{i,j} \times COEF_{i,j}} \qquad (5)$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS, j} FC_{i,j} \times COEF_{i,j}}{\sum_{i,j} FC_{i,j} \times COEF_{i,j}} \qquad (6)$$

Where:

$FC_{i,j}$ = The amount of fuel i (in a mass or volume unit) consumed by province j ;

$COEF_{i,j}$ =The CO2 emission coefficient of fuel i (tCO2/ mass or volume unit of the fuel), taking into account the carbon content of the fuels consumed by province,

$$COEF_i = NCV_i \times EF_{CO_2,i} \qquad (7)$$

Where:

NCV_i =Net calorific value (energy content) of fossil fuel type i (GJ/ mass or volume unit）;

$EF_{CO_2,i}$ = CO2 emission factor of fossil fuel type i in year y (tCO2/GJ)

$COAL, OIL, and\ GAS$ = The aggregation of various kinds of coal, oil, and gas as fossil fuels.

(2) Calculating the corresponding emission factor for fossil fuel fired power generation:

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \qquad (8)$$

Where:

$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ are the emission factors for the best commercially available technology of coal fired power generation, oil fired power generation, and gas fired power generation respectively.

(3) Using the share of different type of capacity in total capacity addition as weight, the weighted average of emission factors of different type capacity is calculated as the Build Margin emission factor $EF_{grid,BM,y}$ of Northeast China Power Grid (See Annex 3 for detailed calculation):

$$EF_{grid,BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \quad (9)$$

Where:

CAP_{Total} = The total capacity addition

$CAP_{Thermal}$ =The fossil fuel fired capacity addition

Following the four steps above, the build margin emission factor $EF_{grid,BM,y}$ of the Northeast China Power Grid is calculated to be **0.7946tCO2/MWh.** The detailed calculations and data are listed in the annex 3 (The build margin emission factor BM is same as that provided by Chinese DNA, the website is http://cdm.ccchina.gov.cn/web/index.asp.)

Step 6: Calculate the combined margin emissions factor

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \quad (10)$$

Where:

$EF_{grid,BM,y}$ =Build margin CO2 emission factor in year y (tCO2/MWh)

$EF_{grid,OM,y}$ =Operating margin CO2 emission factor in year y (tCO2/MWh)

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

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

Wind project activities: w_{OM} = 0.75 and w_{BM} = 0.25 (owing to their intermittent and non dispatchable nature) for the first crediting period and for subsequent crediting periods.

The default weights are adopted for the proposed project, the baseline emission factor is:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} = \mathbf{1.1407tCO2/MWh}$$

Leakage

For wind power project activities, $LE_y = 0$

Emission reductions

Emission reductions are calculated as follows:

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

Where:

ER_y = Emission reductions in year y (t CO2e/yr).
BE_y = Baseline emissions in year y (t CO2e/yr).
PE_y = Project emissions in year y (t CO2/yr).
LE_y = Leakage emissions in year y (t CO2/yr).

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

Data / Parameter:	$FC_{i,y}$
Data unit:	Mass or volume unit
Description:	Amount of fossil fuel type i (in a mass or volume unit) consumed by power plant/unit in year y
Source of data used:	China Energy Statistical Yearbook 2005-2007
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Since the detailed fuel consumption data by power plants are not publicly available, therefore the aggregated data by fuel types are used instead, which have been published by the Chinese authorities.
Any comment:	

Data / Parameter:	EG_y, $EG_{m,y}$
Data unit:	MWh
Description:	Net electricity generated and delivered to the grid by power plant in year y
Source of data used:	China Electric Power Yearbook 2005-2007
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Since the detailed generation data by power plants are not publicly available, therefore the aggregated data by fuel types are used instead.
Any comment:	

Data / Parameter:	$NCV_{i,y}$
Data unit:	GJ/ mass or volume unit
Description:	Net calorific value (energy content) of fossil fuel type i in year y
Source of data used:	China Energy Statistical Yearbook 2006
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	These data are the best data available, and have been published by the Chinese authorities.
Any comment:	

Data / Parameter:	$EF_{CO_2,i,y}$
Data unit:	tCO_2/GJ
Description:	CO_2 emission factor of fossil fuel type i in year y
Source of data used:	2006 IPCC default values
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The country specific values of fuel CO_2 emission factor in China are not available. Thus IPCC default values are used instead, which have been published by the Chinese authorities.
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/web/index.asp
Value applied:	37.28
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/web/index.asp
Value applied:	48.81
Justification of the choice of data or description of measurement methods	Following the EB guidance

and procedures actually applied :	
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/web/index.asp
Value applied:	48.81
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:	Installed capacity connected to the grid in year y
Source of data used:	China Electric Power Yearbook 2005-2007
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Following the EB guidance
Any comment:	

B.6.3. Ex-ante calculation of emission reductions:

According to the baseline methodology ACM0002, the GHG emission of the proposed project within the project boundary is zero, i.e. PE_y=0.
According to the baseline methodology ACM0002, the leakage of the proposed project is not considered, i.e. L_y=0.
Therefore, the proposed project activity emissions are zero, i.e. $PE_y + LE_y$=0.

According to the descriptions and formulas in section B.6.1, the combined baseline emission factor of the Northeast China Power Grid is: $EF_{grid,CM,y}$ **=1.1407 tCO_2/MWh.**

According to the Feasibility Study Report of the proposed project, the estimated annual electricity generation delivered to the power grid will be: EG_y**=64,200 MWh.**
The annual emission of baseline scenario is: $BE_y = EG_y \times EF_{grid,CM,y}$ **=73,232 tCO_2.**

The annual emission reductions of the proposed project during the first crediting period are estimated to be:
$ER_y = BE_y - PE_y - L_y = BE_y$ **=73,232 tCO_2**.

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

Year	Estimation of Project activity Emission (tonnes of CO_2e)	Estimation of baseline emission (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of Emission reductions (tonnes of CO_2e)
01/11/2009-31/10/2010	0	73,232	0	73,232
01/11/2010-31/10/2011	0	73,232	0	73,232
01/11/2011-31/10/2012	0	73,232	0	73,232
01/11/2012-31/10/2013	0	73,232	0	73,232
01/11/2013-31/10/2014	0	73,232	0	73,232
01/11/2014-31/10/2015	0	73,232	0	73,232
01/11/2015-31/10/2016	0	73,232	0	73,232
Total (t CO2e)	**0**	**512,624**	**0**	**512,624**

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

B.7.1. Data and parameters monitored:

Data / Parameter:	EG_y
Data unit:	MWh
Description:	Net electricity delivered to the grid by the proposed project
Source of data to be used:	Electricity meter reading at project site
Value of data applied for the purpose of calculating expected emission reductions in section B.5	64,200 MWh
Description of measurement methods and procedures to be applied:	There are two multifunctional and bidirectional meters installed in the project site and the Qianshao substation respectively, through which the exported and imported generation can be measured. The metering instruments will be properly configured and calibrated annually according to the requirement from Technical administrative code of electric energy metering (DL/T448 —2000). The readings of electricity meter will be hourly measured and monthly recorded. The designated person of the project will read and aggregate the number of the meter. Data will be archived for 2 years following the end of the crediting period by means of electronic and paper backup.
QA/QC procedures to be applied:	The net electricity used for the calculation of the emission reduction is obtained through the exported generation subtract the imported generation. The record of the electricity transaction between the project and the grid will be obtained to ensure the consistency.
Any comment:	See also section B.7.2 for more details.

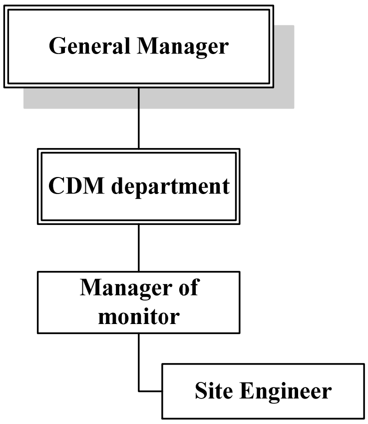
B.7.2. Description of the monitoring plan:

1. Introduction
The Project owner adopts the approved consolidated monitoring methodology ACM0002 to determine the emission reductions due to the net electricity generation from the proposed project.

This monitoring plan, implemented by Fuyuan Longyuan Wind Power Co., Ltd., describes the parameters and variables, monitoring practices, QA and QC procedures, data storage etc. Project participants implement this monitoring plan when the proposed project put into operation.

1. The management structure

The general manager makes the overall policy decision while the CDM department is responsible for the concrete implementation of the Monitoring Plan. The monitor manager is responsible for supervising and checking the whole date record process and the calibration of meters. Another main task of the monitor manager is facilitating the verification through providing the DOE with all required necessary information. The site engineer will collect monitoring data (e.g. electric meter data), keep receipt of sales, calculate emission reduction and prepare the monitor report.



2. Monitoring parameters

All relevant parameters listed in Section B 7.1 will be monitored according to the methodology requirements and description of measurement methods and procedures described in part 4 Monitor Practice. The results and data will be recorded and well documented. The data and meter reading will be readily accessible for DOE. The main monitoring work is listed below:

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long is archived data kept?	Comment
1.EG_y	Electricity supplied to the grid by the project	Meters installed on the site of the proposed	MWh	*m*	Hourly measurement and monthly recording	100%	Paper/ electronic	During the crediting period and two	Electricity supplied by the project activity to

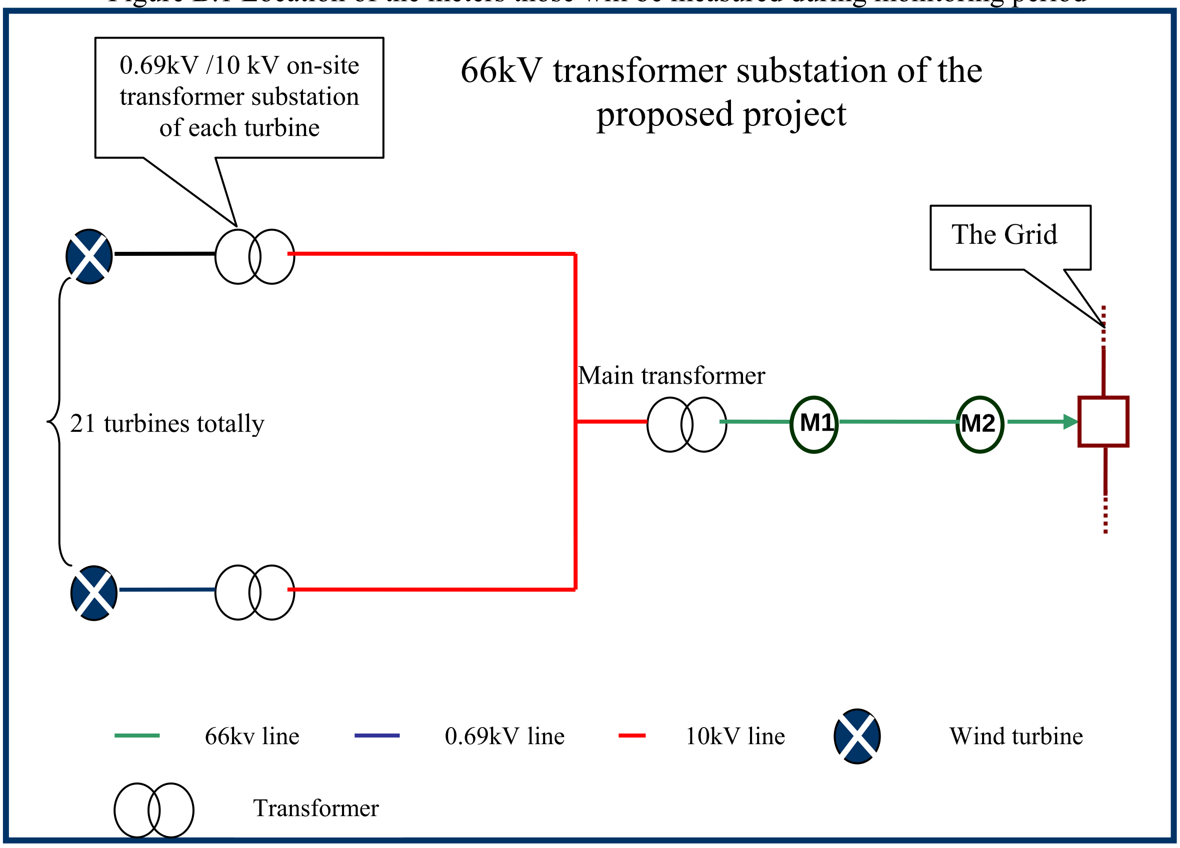
		project						years after	the grid. Double checked by receipt of sales.

3. Arrangement of Meters

An agreement should be signed between the proposed project owner and Heilongjiang Electric Power Company that defines the metering arrangements and the required quality control procedures to ensure accuracy.

The project is connected to the grid through an on-site transformer station that increases the voltage to 66 kV and then connected to the Qianshao substation which is part of the NECPG. The power line supplying electric power to the grid can also deliver power from the grid to the wind farm in case of emergencies. As the figure below shown, the electricity exported can be accurately measured by the bidirectional meter M1 (accuracy degree is 0.2S) installed in the on-site transformer station. The electricity imported can be measured by the meter M1 too. The reading of M2 (accuracy degree is 0.2S) is used for crosschecking against the reading of M1, and as a backup measurement when M1 malfunctioned.

Figure B.1 Location of the meters those will be measured during monitoring period



4. Monitor Practice

The project owner is responsible for the operation of M1, and Power Grid Company responsible for the operation of the M2, to ensure that all meters are in good conditions. If the M1 is within the limit of error, the electricity supplied to the grid monitored by the M1 will be used in emission reductions calculation. In this case, the specific steps for data collection and reporting are listed below:

1) Power Grid Company and the project owner read the M1 and the M2 respectively and record readings on a fixed day of every month;
2) Power Grid Company supplies readings to the project owner and provides relevant documents (i.e. the confirmed electricity quantity sheet).
3) Project owner keeps the receipt, and supplies the invoice to Power Grid Company and keep a copy of the invoice;
4) Project owner provides the meter's readings, the confirmed electricity quantity sheet, and photocopies of invoices to DOE for verification.

5. Quality Assurance and Quality Control

The Power Purchase Agreement should be signed between the project owner and Heilingjiang Electric Power Company that defines the metering arrangements and the required quality control procedures to ensure accuracy.

- The metering equipment will be properly configured and calibrated annually according to the requirement from Technical administrative code of electric energy metering. The metering equipment will be checked by the project owner and Heilongjiang Electric Power Company before operation.

- The calibration of electric energy meter should be periodically carried out according to national electric industry standards (DL/T448 －2000). After calibration, the meter should be sealed. The meter shall be jointly inspected and sealed on behalf of the parties concerned and shall not be accessible by either party except in the presence of the other party or its accredited representatives.

- The meter installed shall be tested by the qualified metrical organization co-authorized by the Northeast China Power Grid and the project owner after:
  1) The detection of a difference larger than the allowable error in the reading of the main meter and backup meter, when considering the reactive loss of electrical wire,
  2) The repair of all or part of the meter caused by the failure of one or more parts to operate in accordance with the specifications,

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

If reading of the meter be inaccurate by more than the allowable error, or otherwise functioned improperly, the electricity supplied to the grid by the proposed project shall be determined according to agreed procedures under the signed agreement (PPA).

6. Data Management System

Overall responsibility for monitoring of GHG emissions reduction will rest with the CDM responsible person of the proposed project. The CDM manual sets out the procedures for tracking information from the primary source to the end-data calculations in paper document format. Physical documentation such

as paper-based maps, diagrams and environmental assessment will be collated in a central place, together with this monitoring plan. All paper-based information will be stored by the project participants and kept at least one copy.

All parameters monitored under the monitoring plan will be archived electronically and be kept at least for 2 years after the end of last crediting period. The monitored data will be presented to the verification agency or DOE to whom verification of emission reductions is assigned. Necessary formats / tables / log sheets etc. will be developed by the project participants for monitoring and recording of the data. The table below listed the key documents relevant to monitoring and verification.

No	Document Title	Main Content	Source
1	PDD, including the electronic spreadsheets and supporting documentation(assumptions, estimations, measurement, etc)	Calculation procedure of emission reduction and monitoring items	The project owner
2	The report on monitoring and checking of electricity supplied to the grid	Record based on monthly meter reading and electricity sale receipts	The project owner
3	Report on maintenance and calibration of metering equipment	Reasons for maintenance and calibration and the precision after maintenance and calibration	The project owner

7. Verification and Monitoring Results

The verification of the monitoring results of the project is a mandatory process required for all CDM projects. The main objective of the verification is to independently verify that the project has achieved the emission reductions as reported.

The responsibilities for verification of the project are as follows:

● Sign a service agreement about verification with specific DOE and agree to a time framework set by the EB for carrying out verification activities while taking into account the buyer’s schedule. The proposed project owner will make the arrangements for the verification and will prepare for the audit and verification process to the best of its abilities.

●The proposed project owner will facilitate the verification through providing the DOE with all required necessary information, before, during and, in the event of queries, after the verification.

●The project owner will fully cooperate with the DOE and instruct its staff and management to be available for interviews and respond honestly to all questions from the DOE.

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

The application of the methodology to the project activity was completed on 10/03/2008.

The persons involved in baseline study are listed as follows:

Chenghao LIANG
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Telephone: +8610-66091328
Email: leungseungho@hotmail.com

Bingzhi SUN
Address: Room 816, International Investment Edifice, No.6-9 Fuchengmen North Street, Xicheng District, Beijing 100034, China
Telephone: +8610-66091345
Email: sunsunng1019@sina.com

(Not the project participants listed in Annex 1)

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:

22/05/2008 (Date when the construction contract signed)

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

20 years and 0 month.

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

C.2.1. Renewable crediting period

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

01/11/2009 or the date of registration whichever is later. .

C.2.1.2. Length of the first crediting period:

7 years and 0 month.

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

N/A

C.2.2.2. Length:

N/A.

SECTION D. Environmental impacts

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

In accordance with relevant environmental laws and regulations, an environmental impact assessment (EIA) report of the proposed project was completed and approved by the Environmental Protection Bureau of Heilongjiang Province. The potential environmental impacts of the proposed project include:

- **Main Potential Environmental Impacts Associated with the project**
  - Impacts from the construction, including wastewater, garbage, noise, dust as well as water and soil loss etc;
  - Impacts from noise and the electromagnetism pollutions of the wind turbines during the operation period;
  - Impacts on local vegetation and environment as a result of construction activities for wind turbine towers, transformers and access roads;
  - Impacts on socio-economy from the construction and operation of the proposed project.

- **Impacts of Dust**

Wind power generation is known as a zero emission technology due to no fossil fuel combustion is involved during any stage of the wind farm operation. Generally speaking, the sources of air pollution are mainly dust from the construction activities including material transportation, road construction and improvement, and infrastructure construction etc. The impacts of dust on air environment are temporary and will disappear when the construction is completed. Meanwhile, several measures are recommended to address the temporary dust, including prohibiting construction under strong wind weather, minimizing the area of construction, spraying water when undertaking construction, and reducing the speed of vehicles in the field. Therefore, the proposed project will not cause significant air pollution to the surrounding environment.

- **Impacts of Noise**

The noise of the proposed project during construction is from dig blasting, concrete mixing, material procession and vehicles on-site. According to the feasibility study report of the proposed project, the noise level is below 80 dB on day at 15 m from the proposed project, which comply with national regulation for construction (GB12523-90). And here are no residents within 1km around the proposed project. Moreover, the noise during construction only exists temporarily until the end of construction. Therefore, the noise during construction will have little impacts on local residents.

The noise during operation is from wind turbines. The noise from wind turbines is 102 dB, but is reduced to below 45 dB at a distance of 200m from the wind turbines which comply with national regulation for urban area (GB3096-93). Furthermore, there are no residents within 1km around the proposed project, so the noise from wind turbines will have no impact on local residents.

- **Impacts of Wastewater and Solid Waste**

The proposed project does not consume any water, nor does it generate any wastewater during operation.

The possible negative impacts are the household wastewater and solid waste produced by builders and staff, and the waste earth from digging of the foundation during construction. The household wastewater will be first treated in a septic tank, and then be disinfected before discharge. The household solid waste will be very little in quantity, and will be collected and moved to the nearby landfill site. The waste earth from the digging will be all used for refilling and building roads. Therefore, the solid waste will have no impact on local environment.

- **Impacts of electromagnetism**

According to the *Regulation on Electromagnetic Radiation Environmental Protection* (http://www.jincao.com/fa/05/law05.12.htm) issued by State Environmental Protection Administration of China on 25 March 1997, only the electricity transformation and transmission systems above 100 kV should undertake electromagnetism impact assessment. The transformation and transmission system of the proposed project is 10 kV and 66 kV. Therefore, no electromagnetism impact assessment is necessary.

- **Impacts on Ecosystem Environment**

A potential concern for wind power projects is their impact on local vegetation, animals and migrating birds. According to the EIA report of the proposed project, the site of the proposed project is mainly wasteland with a little grassland and forestland. The construction of the proposed project will damage the vegetation (a little grass and trees) on the site, but will be recovered with the vegetation recovery and compensation measures to be taken after the construction is completed, which will minimize the impact on local vegetation of the proposed project. Moreover, there are no endangered species on the site of the proposed project, which is not on the migratory path of birds either. Therefore, the proposed project will have no significant impact on local ecological environment.

- **Socio-Economic Impacts**

The project is estimated to product GHG emission reduction through delivering electricity to the grid. So the project generates eco-friendly, GHG free power that contributes to sustainable development of the region. Moreover, the locals have benefited economically through land sales and revenues. The project activity not only helps the uplift of skilled and unskilled manpower in the region, but also improves employment rate and livelihood of local populace in the vicinity of the project.

- **Conclusion**

The proposed project will have no significant negative impacts on environment during its construction and operation.

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:

Not applicable, since the construction and operation of the proposed project will have no significant environmental impacts.

SECTION E. Stakeholders' comments

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

Invitation and preparation

To ensure that all interested parties could participate in the meeting, the stakeholder consultation meeting was announced well in advance. Fuyuan Longyuan Wind Power Co., Ltd. published a bulletin on the bulletin board in the public place of the village around the wind farm in May 2008. Through the bulletin, all potential stakeholders could obtain the detailed information about the project and CDM. Meanwhile the project owner has established a mail box at the gate of their office building to accept comments from any stakeholders.

On 16th May, 2008, under the support of local government, the project owner successfully held a stakeholder meeting in Fuyuan County. The Fuyuan Longyuan Wind Power Co, Ltd. invited totally 9 stakeholder representatives to participate in the meeting, respectively from the Development and Reform Bureau of Fuyuan County, the Renewable Energy Development Office, the Environmental Protection Bureau of Fuyuan County, the Electricity supply bureau of Fuyuan County, and the Majiadian Village, Nandigou village, Yushudi village, Donggou village and Hongtudingzi village.

Meeting:

Time of the meeting: 15:00-16:30 pm, 16th May, 2008
Place of the meeting: Meeting room of Fuyuan Longyuan Wind Power Co, Ltd., Fuyuan County, Heilongjiang Province.
Process of the meeting:
First, the project owner gave a short introductory statements about the project construction, and the consultant to the project made a brief explanation of the Clean Development Mechanism, emphasized the importance of the CDM against the global warming disaster. After these introductory statements, the project owner and the consultant invited the participants in the meeting to express their comments and concerns about the project. At this stage, no critical comments were made; the overall finding was that the local residents and local government officials expected that the local people would benefit from the project. To further determine there are no negative impacts by the project, the consultant distributed 20 copies of questionnaire among the local residents before the meeting.

E.2. Summary of the comments received:

Comments on the meeting:

Every stakeholder representative expressed the comments for the proposed project. No opposite comment was received. The summary of the comments is as follows:
Comments from the local government: The proposed project has been approved by the Development and Reform Commission of Heilongjiang Province and Environmental Protection Administration of Heilongjiang Province, which shows that the construction and operation of the proposed project will have little impacts on the local environment. Moreover, wind power is renewable energy and is helpful in diversifying power mix of local power grid. So the local municipal government supports the development of the proposed project, and expects the increase of local financial incoming and new employment opportunity through the implementation of the proposed project.

Comments from villager and forestry worker representatives: The proposed project site is located at wasteland. There are no residents with 1km around the proposed project. Therefore, there is no issue on noise disturbance and residents migration. Moreover, the project owner has made compensation for the land occupied by the proposed project. The local residents also benefit from the employment opportunities for construction and operation of the proposed project.

Questionnaire:

To collect more stakeholders' comments, a one page questionnaire was designed to be easily filled in with the following questions:

1) Project introduction
2) Respondent's basic information and education level
3) Questions on:

- What is their opinion on their living environment?
- 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 special issues should be considered to reduce the negative impacts during construction and operation of the project?
- What improvement will the Project bring in terms of noise?
- 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

The survey had a 100% response rate (30 questionnaires returned out of 30) and the following is a summary of the key findings:

Education level of the respondents: primary level (53%), middle level (27%), high level (20%).
The occupation of the respondents: peasant (39%), worker (25%), student (18%), others (18%).
93% of the respondents are satisfied with their life conditions and surrounding environment.
93% of the respondents have some knowledge and understandings about wind farm projects.
100% of the respondents not disagree with the development of the Project, and 100% of the respondents support the development of the project. About 100% of them believe that the project will have overall positive impacts, such as "increase of job opportunities", "improvement of living standard", on their livelihoods, while the others believe there will be little impact on their livelihoods or do not know the impacts.

Among the negative impacts mentioned, the main concerns are infield occupation and plants damage (20%), trash amount increase during construction period (3%), waste water (7%), noise (5%) and others (12%).

The main additional comments or suggestions on the Project construction is "decreasing the electricity tariff", which would make the IRR of the project even lower.

Conclusion

The conclusion of the Questionnaire Survey is as follows:

The survey shows that the proposed project receives strong support from local people, which is closely linked to the fact that the majority of local villagers have some understandings with wind power projects.

Most of the respondents believe that the project will have overall positive impacts on their livelihoods with better standard of living. Among the negative impacts, the two main issues concerned are land use and environmental pollution. However, as the environmental impact assessment demonstrates, both impacts only occur during construction period, and accompanied by mitigating measures such as enclosed operation, waste landfill, and restored vegetation, the impacts will be minimized after the construction. The project owner has made compensation for the occupied land and promises adopting measures to strengthen environment protection, with which the local villagers are satisfied.

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

Focused on the negative comments received, for the infield occupation and plants damage, the project owner has provided compensation to the local residents. For the noise, trash amount increase and waste water, as the EIA approval shown, the environmental protection method listed in EIA make the project construction minimized this type of negative impact on the local people and the ecological environment. So it’s no need to make adjustment on design, construction and operation of the proposed project.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding from Annex I countries is involved in the proposed project.

Annex 3

BASELINE INFORMATION

1. OM emission factor calculation of NECPG (Northeast China Power Grid)

Table A-1, A-2, and A-3 provide annual thermal power electricity generation in NECPG from 2004 to 2006. The main data sources come from China Electric Power Yearbook 2005, 2006 and 2007.

Table A- 1 Annual thermal power electricity generation in NECPG in 2004

Province	Electricity generation	Self usage rate	Electricity delivered to the grid
	（MWh)	（%）	（MWh)
Liaoning	84543000	7.21	78447450
Jilin	33242000	7.68	30689014
Heilongjiang	53482000	7.84	49289011
Total			**158,425,475**

Data source：China Electric Power Yearbook 2005.

Table A- 2 Annual thermal power electricity generation in NECPG in 2005

Province	Electricity generation	Self usage rate	Electricity delivered to the grid
	（MWh)	（%）	（MWh)
Liaoning	83697000	7.03	77813101
Jilin	35294000	6.59	32968125
Heilongjiang	58000000	7.96	53383200
Total			**164,164,426**

Data source：China Electric Power Yearbook 2006.

Table A- 3 Annual thermal power electricity generation in NECPG in 2006

Province	Electricity generation （MWh)	Self usage rate （%）	Electricity delivered to the grid （MWh)
Liaoning	96282000	6.62	89908132
Jilin	38576000	6.78	35960547
Heilongjiang	62964000	7.85	58021326
Total			**183,890,005**

Data source：China Electric Power Yearbook 2007.

The key parameters in OM and BM calculation include the net caloric values (NCV_s) and CO2 emission factor per unit of energy (EF_{CO2s}) of various types of fuels, which are shown in the table below:

Table A-4: NCV_s and EF_{CO2s} of various types of fuels

Fuel	NCV_s	EF_{CO2s} (tc/TJ)
Coal	20908 kJ/kg	25.80
Washed coal	26344 kJ/kg	25.80
Other Washed Coal[16]	8363 kJ/kg	25.80
Coke	28435 kJ/kg	29.20
Crude oil	41816 kJ/kg	20.00
Gasoline	43070 kJ/kg	18.90
Kerosene	43070 kJ/kg	19.60
Diesel	42652 kJ/kg	20.20
Fuel oil	41816 kJ/kg	21.10
Other petroleum products[17]	38369 kJ/kg	20.00
Other coked products	28435 kJ/kg	25.80
Natural gas	38931 kJ/m3	15.30
Coke oven gas[18]	16726 kJ/m3	12.10
Other gas[19]	5227 kJ/m3	12.10
LPG	50179 kJ/kg	17.20
Refinery gas	46055 kJ/kg	15.70

Data sources:
NCV_s are from China Energy Statistical Yearbook 2007, p287

[16] Other washed coal includes middlings and slimes. The NCV value of middlings is adopted here, which is conservative because the NCV value of slimes is higher than that of middlings.

[17] The NCV value of other petroleum products are not provided in China Energy Statistical Yearbooks. This Annex calculates it as 38369 kJ/kg, i.e., 1.3108 tce/t, on the basis of Energy Balance Sheets (physical quantity) and conversion factor against SCE.

[18] The NCV value here adopts the lower limit of the NCV value range, i.e., 16726-17981 kJ/m^3, for coke oven gas provided in China Energy Statistical Yearbook 2007, P 287.

[19] The NCV value here adopts the lowest NCV value among those for gas by furnace, gas by heavy oil catalytic cracking, gas by heavy oil catalytic thermal cracking, gas by pressure gasification, and water coal gas, which are provided in China Energy Statistical Yearbook 2007, P 287.

EF_{CO2s} is from 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Chapter 1, table 1-3, table 1-4.

Table A-5: The fuel consumption and total emissions of Northeast Power Grid in 2004

Fuel types	unit	Liaoning	Jilin	Heilongjiang	Sub-Total	EF_{co2}	Net caloric value	CO_2 emission（tCO_2e）
						（tc/TJ）	（MJ/t,km3）	G=D*E*F*44/12/100(quantity)
		A	B	C	D=A+B+C	E	F	G=D*E*F*44/12/10(volume)
Coal	10^4t	4144.2	2310.9	3084.8	9539.9	25.8	20908	188689377
Washed coal	10^4t	84.75	1.09	4.88	90.72	25.8	26344	2260872
Other Washed Coal	10^4t	577.67	14.26	61	652.93	25.8	8363	5165589
Coke	10^4t				0	29.2	28435	0
Coke oven gas	10^8M^3	4.83	2.91		7.74	12.1	16726	574367
Other gas	10^8M^3	57.33	4.19		61.52	12.1	5227	1426677
Crude oil	10^4t				0	20	41816	0
Gasoline	10^4t				0	18.9	43070	0
Diesel	10^4t	2.04	1.16	0.24	3.44	20.2	42652	108673
Fuel oil	10^4t	12.81	1.78	2.86	17.45	21.1	41816	564536
LPG	10^4t	2.19			2.19	17.2	50179	69305
Refinery gas	10^4t	9.79		1.14	10.93	15.7	46055	289780
Natural gas	10^8M^3		0.03	2.53	2.56	15.3	38931	559111
Other oil product	10^4t				0	20	38369	0
Other coked product	10^4t				0	25.8	28435	0
Other energy	10^4t	26.97	5.07		32.04	0	0	0
Total								199,708,287

China Energy Statistical Yearbook 2005

Table A-6: The fuel consumption and total emissions of Northeast Power Grid in 2005

Fuel types	unit	Liaoning	Jilin	Heilongjiang	Sub-Total	EF_{co2}	Net caloric value	CO_2 emission（tCO_2e）
						（tc/TJ）	（MJ/t,km3）	G=D*E*F*44/12/100(quantity)
		A	B	C	D=A+B+C	E	F	G=D*E*F*44/12/10(volume)
Coal	10^4t	4305.41	2446.13	3383.21	10134.75	25.8	20908	200454896
Washed coal	10^4t				0	25.8	26344	0
Other Washed Coal	10^4t	524.74	19.26	24.16	568.16	25.8	8363	4494940
Coke	10^4t				0	29.2	28435	0
Coke oven gas	10^8M^3	1.03	3.57	0.68	5.28	12.1	16726	391817
Other gas	10^8M^3	12.62	8.37		20.99	12.1	5227	486768
Crude oil	10^4t	1.16			1.16	20	41816	35571
Gasoline	10^4t				0	18.9	43070	0
Diesel	10^4t	1.18	1.48	0.57	3.23	20.2	42652	102039
Fuel oil	10^4t	9.32	2.46	1.55	13.33	21.1	41816	431247
LPG	10^4t	0.12			0.12	17.2	50179	3798
Refinery gas	10^4t	5.48		1.32	6.8	15.7	46055	180284
Natural gas	10^8M^3		0.84	2.24	3.08	15.3	38931	672681
Other oil product	10^4t				0	20	38369	0
Other coked product	10^4t				0	25.8	28435	0
Other energy	10^4t	16.18			16.18	0	0	0
Total								207,254,040

China Energy Statistical Yearbook 2006

Table A-7: The fuel consumption and total emissions of Northeast Power Grid in 2006

Fuel types	unit	Liaoning	Jilin	Heilongjiang	Sub-Total	EF_{co2}	Net caloric value	CO_2 emission（tCO_2e）
						（tc/TJ）	（MJ/t,km3）	G=D*E*F*44/12/100(quantity)
		A	B	C	D=A+B+C	E	F	G=D*E*F*44/12/10(volume)
Coal	10^4t	4681.99	2738.24	3698.29	11118.52	25.8	20908	219912851
Washed coal	10^4t	0.03			0.3	25.8	26344	748
Other Washed Coal	10^4t	674.74	17.83	96	788.57	25.8	8363	6238691
Coke	10^4t	3.32			3.32	29.2	28435	101075
Coke oven gas	10^8M^3	2.68	0.16	1.44	4.28	12.1	16726	317609
Other gas	10^8M^3	55.26	1.43		56.69	12.1	5227	1314667
Crude oil	10^4t	0.49			0.49	20	41816	15026
Gasoline	10^4t				0	18.9	43070	0
Diesel	10^4t	0.75	0.39	0.3	1.44	20.2	42652	45491
Fuel oil	10^4t	11.73	0.45	1.44	13.62	21.1	41816	440629
LPG	10^4t				0	17.2	50179	0
Refinery gas	10^4t	8.55		4.27	12.82	15.7	46055	339888
Natural gas	10^8M^3		0.19	2.1	2.29	15.3	38931	500143
Other oil product	10^4t				0	20	38369	0
Other coked product	10^4t				0	25.8	28435	0
Other energy	10^4t	12.16	17.6	82.77	112.53	0	0	0
Total								229,226,818

China Energy Statistical Yearbook 2007

Table A-8: OM factor of Northeast Power Grid

Years	Thermal generation delivered to NEPG (MWh)	The emissions from NECPG (tCO2)	OM (tCO2/MWh)
	A	**B**	**C=B/A**
2004	158425475	199708287	1.260582
2005	164164426	207254040	1.262478
2006	183890005	229226818	1.246543
Average OM	506479906	636189145	**1.256099**

2. BM emission factor calculation of NECPG.

Table A-9 Emission factor of the unit applying best commercially available technology

Technology	Electricity supply efficiency	EF_{co2} (tc/TJ)	Emission factor (tCO2/MWh)
	A	**B**	**C=3.6/A/1000*B*44/12**
Coal fired plant	37.28%	25.8	$EF_{Coal,Adv}$ =**0.9135**
Gas fired plant	48.81%	15.3	$EF_{Gas,Adv}$ =**0.4138**
Oil fired plant	48.81%	21.1	$EF_{Oil,Adv}$ =**0.5706**

Table A-10 Calculation of the respective percentages of CO2 emissions from coal fired power generation, oil fired power generation, and gas fired power generation against total CO2 emissions from fossil fuel fired power generation

Fuel types	unit	Liaoning	Jilin	Heilongjiang	Sub-Total	EF_{co2}	Net caloric value	CO_2 emission（tCO_2e）
						（tc/TJ）	（MJ/t,km3）	G=D*E*F*44/12/100(quantity)
		A	B	C	D=A+B+C	E	F	G=D*E*F*44/12/10(volume)
Coal	10^4t	4681.99	2738.24	3698.29	11118.52	25.8	20908	219912851
Washed coal	10^4t	0.03			0.03	25.8	26344	748
Other Washed Coal	10^4t	674.74	17.83	96	788.57	25.8	8363	6238691
Coke	10^4t	3.32			3.32	29.2	28435	101075
Sub-total								**226,253,365**
Crude oil	10^4t	0.49			0.49	20	41816	15026
Diesel	10^4t	0.75	0.39	0.3	1.44	20.2	42652	45491
Fuel oil	10^4t	11.73	0.45	1.44	13.62	21.1	41816	440629
Other oil product	10^4t					20	38369	0
Sub-total								**501,146**
Natural gas	10^7M^3		1.9	21	22.9	15.3	38931	500143
Coke oven gas	10^7M^3	26.8	1.6	14.4	42.8	12.1	16726	317609
Other gas	10^7M^3	552.6	14.3		566.9	12.1	5227	1314667
LPG	10^4t					17.2	50179	0
Refinery gas	10^4t	8.55		4.27	12.82	15.7	46055	339888
Sub-total								**2,472,307**
Total								**229,226,818**

China Energy Statistical Yearbook 2007

With the above table and formula (5), (6), and (7), the following results are achieved:

λ_{coal} =98.70% λ_{oil} =0.22% λ_{gas} =1.08%

$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv}$ =**0.9074 tCO2/MWh**

Table A-11: Capacity addition in the Northeast Power Grid

	Installed capacity in 1999（MW）	Installed capacity in 2000（MW）	Installed capacity in 2006（MW）	Addition capacity（MW）	Addition share（%）
	A	**B**	**C**	**C-B**	
Thermal	27136.9	28932.5	36216	7283.5	87.57%
Hydro	5522.7	5600	6126	526	6.32%
Other	22.9	43.9	552	508.1	6.11%
Total	32682.5	34576.4	42894	8317.6	100%
Share of 2006 installed capacity	76.19%	80.61%	100%		

Data sources: China Electric Power Yearbook 2000-2007

$EF_{grid,BM,y} = EF_{Thermal,Adv} \times CAP_{Thermal,addition} / CAP_{Total,,addition}$ = 0.9074×87.57%=**0.7946 tCO2/MWh**

3. The combined emission factor calculation of the Northeast Power Grid

Table A-12: Combined emission factor of Northeast Power Grid

OM factor (tCO2/MWh)	1.256099
BM factor (tCO2/MWh)	0.7946
CM factor (tCO2/MWh) **CM**=0.75***OM**+0.25***BM**	**1.1407**

4. Installed capacity and annual electricity generation of each power source in the NECPG

Table A-11 Installed capacity in the Northeast China Power Grid in 1999

	Installed capacity (MW)			
	Total	**Hydro power**	**Thermal Power**	**Other**
Liaoning	**13688.6**	1240.0	12425.7	22.9
Jilin	**8091.3**	3508.2	4583.1	0
Heilongjiang	**10902.6**	774.5	10128.1	0
Total	**32682.5**	5522.7	27136.9	22.9

Data source：China Electric Power Yearbook 2000.

Table A-12 Installed capacity in the Northeast China Power Grid in 2000

	Installed capacity (MW)			
	Total	**Hydro power**	**Thermal Power**	**Other**
Liaoning	**15230.3**	1248.5	13937.9	43.9
Jilin	**8461.4**	3536.7	4924.7	0
Heilongjiang	**10884.7**	814.8	10069.9	0
Total	**34576.4**	5600	28932.5	43.9

Data source：China Electric Power Yearbook 2001.

Table A-13 Installed capacity in the Northeast China Power Grid in 2006

	Installed capacity (MW)			
	Total	**Hydro power**	**Thermal Power**	**Other**
Liaoning	**18338**	1401	16721	216
Jilin	**11132**	3872	7039	221
Heilongjiang	**13424**	853	12456	115
Total	**42894**	6126	36216	552

Data source：China Electric Power Yearbook 2007.

Annex 4

MONITORING PLAN

No more information.