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

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

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The title of the project: Huadian Ningxia Ningdong Yangjiayao 45MW Wind-farm Project
Version: 04
Date: 22/05/2008

A.2. Description of the project activity:

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Huadian Ningxia Ningdong Yangjiayao 45MW Wind-farm Project (hereafter referred to as "the project") is a new built wind-farm project, located in the Yangjiayao Village, Majiatan Town, Lingwu City, Ningxia Hui Autonomous Region, P. R. China. The project construction was commenced in April 2007. The total installed capacity of the project is 45MW (1.5MW×30). The annual net electricity generation of the project is forecast to be 95,110 MWh. The generated electricity will be delivered to regional power grid, i.e. Northwest China Power Grid.

The purpose of the project is to generate electricity by using clean wind resources to alleviate electricity shortage in Northwest China. The project will contribute to the reduction of GHG emission by displacing part of the electricity from Northwest China Power Grid, which is dominant of fossil fuel fired power plants. The expected annual GHG emission reductions over the first crediting period are 93,938 tCO_2e/yr, which will contribute to the alleviation of climate change. In addition, the project will be beneficial for the following reasons:

(a) The project will provide high quality clean electricity to Northwest China Power Grid. The project activity can increase more than 200 temporary and more than 20 permanent employment opportunities for local residents during construction and operation of the project, which will increase income of the local residents. It is beneficial to local socio-economic development.

(b) The project is located in poor area of Ningxia Hui Autonomous Region, which is a Minority Resident Area in Northwest China. The project is beneficial to economic promotion of minority resident area.

(c) The project will promote local economic development and alleviate local poverty.

A.3. Project participants:

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Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
People's Republic of China (Host)	Huadian Ningxia Ningdong Wind Power Generation Co., Ltd.	No
Sweden	Carbon Asset Management Sweden AB	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 refer to Annex 1 for more detailed information.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

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A.4.1.1. Host Party(ies):

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People's Republic of China (Host)

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

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Ningxia Hui Autonomous Region

A.4.1.3. City/Town/Community etc:

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Yangjiayao Village, Majiatan Town, Lingwu City

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

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The project is located in the Yangjiayao Village, Majiatan Town, Lingwu City, Ningxia Hui Autonomous Region, P. R. China. The project is 35 km away from Lingwu City. The geographical coordinates of project are 106°38′01″ E and 37°53′09″ N. Figure 1 below shows the location of the project.

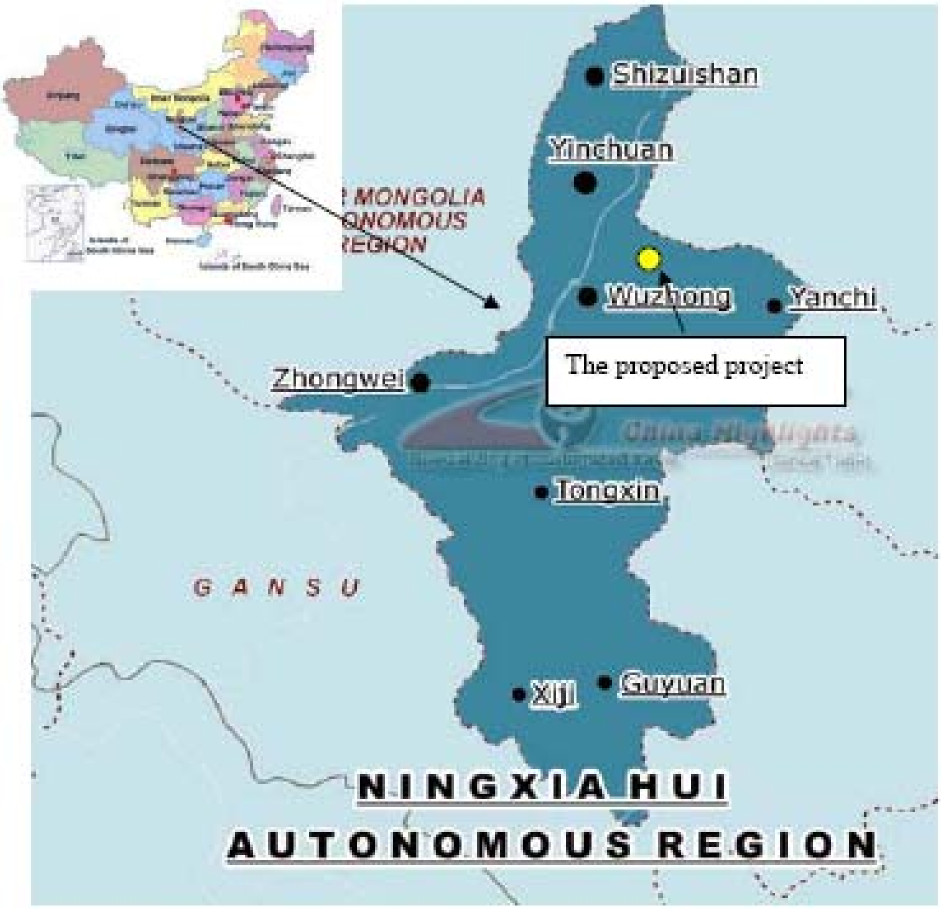

Figure 1 Location of the project

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

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The project falls into:
Sectoral Scope 1: energy industries (renewable sources)

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

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Totally 30 wind turbines (FL77-1500 Model) manufactured by Huarui Wind Power Science and Technology Co., Ltd are employed in the project. The unit capacity of the turbine is 1.5MW, the total installed capacity of the project is 45MW. The height of the wind turbines is 65m and the diameter of the impeller is 77m.

The wind turbines used by the project are turbines with variable pitch. The performance of the turbines with variable pitch is better than that of the turbines with fixed pitch. The wind turbines with variable pitch can automatically align the tip angle of the blades to an optimum position according to the wind speed, and is therefore appropriate for operating in unstable wind conditions. It has higher wind utilization efficiency, higher energy conversion efficiency, and a better performance in terms of start-up and shutdown of the wind turbine. However, the variable pitch mechanism makes the structure more complicated and therefore costs higher.

The main equipments, such as the turbines and other equipments are made in China. There is no international technology transfer for the project. The Chinese domestic manufacturers have the ability to produce the turbines and relevant facilities.

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

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The renewable crediting period is chosen for the proposed project. The ex-ante estimated amount of emission reductions over the first crediting period of the project is listed in Table 1 below:

Table 1 Ex-ante estimation of emission reductions over the first crediting period

Years	Annual estimation of emission reductions in (tCO_2e)
01/04/2008-31/03/2009	93,938
01/04/2009-31/03/2010	93,938
01/04/2010-31/03/2011	93,938
01/04/2011-31/03/2012	93,938
01/04/2012-31/03/2013	93,938
01/04/2013-31/03/2014	93,938
01/04/2014-31/03/2015	93,938
Total estimated reductions (tones of CO_2e)	657,566
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tones of CO_2e)	93,938

A.4.5. Public funding of the project activity:

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There is no public funding for the project.

SECTION B. Application of a baseline and monitoring methodology

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

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Title of the approved baseline methodology: ACM0002-Consolidated baseline methodology for grid-connected electricity generation from renewable sources (Version 06, 19 May 2006)

Title of the approved monitoring methodology: ACM0002-Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources (Version 06, 19 May 2006)

Reference: Tool for the demonstration and assessment of additionality (Version 03, 16 February 2007)

Please click on following link for more information about the methodology and reference: http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

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

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The project is a grid-connected renewable power generation project activity, which meets all the applicability criteria stated in methodology:

1. The project is a new built wind-farm project that uses clean wind resources to generate electricity that is delivered to Northwest China Power Grid.

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

3. The geographic and system boundaries for Northwest China Power Grid can be clearly identified and information on the characteristics of the grid is available.

So the baseline and monitoring methodology ACM0002 are applicable to the project.

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

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According to methodology ACM0002, the project boundary includes the physical site of the wind turbines. The spatial extent of the project boundary also includes the project power, the project site and all power plants physically connected to the electricity system that the proposed project is connected to. For this project, the delineation of grid boundaries is used as provided by the DNA of P.R. China. The generated electricity of the project will be delivered to Northwest China Power Grid, which covers Shaanxi Province, Gansu Province, Qinghai Province, Ningxia Hui Autonomous Region and Xinjiang Weiwuer Autonomous Region[1]. The main emission sources and type of GHGs in the project boundary are listed in Table 2 below:

[1] Chinese DNA's Guideline of emission factors of Chinese grids, August 2007: http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=1889

Table 2 Sources and gases in the project boundary

	Source	Gas	Included?	Justification/Explanation
Baseline	Fuel-fired Power Plants in Northwest China Power Grid	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification, it is conservative.
		N_2O	Excluded	Excluded for simplification, it is conservative.
Project Activity	The Project	CO_2	Excluded	Power generation from wind resources, the CO_2 emissions are not to be considered.
		CH_4	Excluded	Power generation from wind resources, the CH_4 emissions are not to be considered.
		N_2O	Excluded	Power generation from wind resources, the N_2O emissions are not to be considered.

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

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In order to provide the same service as the proposed project, there are 4 baseline scenarios for the project:

Scenario 1: The project activity not undertaken as CDM project activity
Scenario 2: Construct a fossil fuel-fired power plant with equivalent annual power supply
Scenario 3: Construct a power plant using other renewable energy with equivalent annual power supply
Scenario 4: Equivalent annual electricity supplied by Northwest China Power Grid

The analysis of above scenarios is as follow:

Scenario 1: The project activity not undertaken as CDM project activity

In this scenario, the project will generate zero-emission power with renewable wind resources and cause the emission reduction by displacing equivalent power supply from Northwest China Power Grid. However, the project can not be implemented due to the internal return rate (after tax) of total investment of the project is 6.54%, which is below of benchmark IRR (8%). Therefore, the scenario 1 is not a possible baseline scenario.

Scenario 2: Construct a fossil fuel-fired power plant with equivalent annual power supply

This scenario is to construct a fossil fuel-fired power plant with equivalent annual power supply as the project. For the average annual utilization hours of the fossil fuel plants are larger than the average annual utilization of the project. Thus, the installed capacity of the fossil fuel-fired plants with equivalent annual power supply as the project will be lower than 45 MW. However, according to the current laws and regulations in China, the thermal power plants with installed capacity of 135 MW or below are prohibited for construction in the areas covered by large power grids[2]. Therefore, the alternative 2 is not a possible baseline scenario.

Scenario 3: Construct a power plant using other renewable energy with equivalent annual power supply

The scenario is to construct renewable power plants whose annual power supply is equivalent to the projects. However, those kinds of renewable power plants, such as photovoltaics, tidal/wave, hydro, geothermal and renewable biomass etc., are strongly dependent on climate and natural resources. There are not exploitable renewable resources and biomass energy source at the project site since the project is located in dry land site. Therefore, the scenario 3 is not a possible baseline scenario.

Scenario 4: Equivalent annual electricity supplied by Northwest China Power Grid

Under this scenario, the increasing demand of electricity would be met from Northwest China Power Grid by operation of grid-connected power plants and by the addition of new generation sources without the project according to the current Chinese laws and regulations. So the scenario 4 is realistic and credible choice.

So, the baseline scenario of the project is Equivalent annual electricity supplied by Northwest China Power Grid, which is the continued operation of the existing power plants and the addition of new generation sources on the Northwest China Power Grid to meet the electricity demand. The project involves constructing a wind-farm by using wind resources for power generation. The emission reductions of the project are equal to the baseline emissions since the project emissions and leakage is zero respectively.

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

Parameter	Unit	Value
EF_{OM}	tCO_2e/MWh	1.12559
EF_{BM}	tCO_2e/MWh	0.57395
EF_y	tCO_2e/MWh	0.98768

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

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

[2] General Office of the State Council [Decree No. 2002-6]: <Notice on Strictly Prohibiting the Construction of Thermal Power Plants with Installed Capacity of 135 MW or Below>

According to “Tool for the demonstration and assessment of additionality”, the additionality of the project is demonstrated and assessed through the following steps:

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

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

There are 4 realistic and credible baseline scenario alternatives identified for the project:

Alternative 1: The project activity not undertaken as CDM project activity
Alternative 2: Construct a fossil fuel-fired power plant with equivalent annual power supply
Alternative 3: Construct a power plant using other renewable energy with equivalent annual power supply
Alternative 4: Equivalent annual electricity supplied by Northwest China Power Grid

As analyzed in Section B.4 above, the alternative 3 is not feasible due to there are not exploitable renewable resources and biomass energy source at the project site.

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

As analyzed in section B.4 above, the alternatives 1, 3 and 4 are in compliance with all current applicable laws and regulations in China. The alternative 2 is not consistent with mandatory laws and regulations in China.

Outcome of Step 1: The proposed project is not the only one that complies with current regulations and laws.

Step 2. Investment analysis

The following sub-steps are used for determining 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).

Sub-step 2a. Determine appropriate analysis method

According to “Tool for the demonstration and assessment of additionality”, there are three analysis methods recommended, including simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III).

Option I: Simple cost analysis. This analysis method can be used if the project activity produces no economic benefits other than CDM related income. However, this option is not applicable to the project because the project activity generates the revenue from the sale of generated electricity.

Option II: Investment comparison analysis. This analysis method can only be used if the alternatives to the project are similar investment projects. However, this option is not applicable here as the alternative to the proposed project is equivalent annual electricity supplied by Northwest China Power Grid, which is not a new investment project.

Option III: Benchmark analysis. According to *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Project,* the financial benchmark internal rate of return (after tax) of total investment for Chinese power industry is 8%. Thus, the benchmark analysis is applicable to the project.

Sub-step 2b. –Option III. Apply benchmark analysis

According to *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Project,* the financial benchmark internal rate of return (after tax) of total investment for Chinese power industry is 8%, which is used widely in China.

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

The main assumptions for the investment analysis are shown in Table 3 below:

Table 3 Basic parameters for financial evaluation

Parameter	Unit	Value	Data source
Installed capacity	MW	45	Feasibility Study Report
Net electricity generation	MWh	95,110	Feasibility Study Report
Total investment	RMB￥10,000	41132.20	Feasibility Study Report
Electricity tariff (VAT Incl.)	RMB￥/kWh	0.53	Feasibility Study Report
Annual O&M costs[3]	RMB￥10,000	334.80	Feasibility Study Report (For the first two years of operation period)
	RMB￥10,000	539.79	Feasibility Study Report (For the third year of operation period)
	RMB￥10,000	744.77	Feasibility Study Report (For the fourth to sixth year of operation period)
	RMB￥10,000	949.76	Feasibility Study Report (For the seventh year to fourteenth year of operation period)
	RMB￥10,000	1154.74	Feasibility Study Report (For the fifteenth year onwards of operation period)
Value added tax (VAT)	/	8.5%	Feasibility Study Report
City maintenance & construction tax	/	7%	Feasibility Study Report (Based on VAT)
Surtax for education expenses	/	3%	Feasibility Study Report (Based on VAT)
Income tax	/	33%	Feasibility Study Report (Income tax is free for first three years of operation period and half for the fourth to fifth year of operation period)

[3] The O&M costs differences are due to the Repairs Fee is different for different phase of operation period according to Feasibility Study Report.

Without CERs revenue, the project IRR is only 6.54%, which is lower than benchmark IRR of 8%. The project is not financially attractive. With CERs revenue, the project IRR is 8.75%. The project is financially attractive.

Sub-step 2d. Sensitivity analysis

The sensitivity analysis is used to show whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions. For the project, three parameters are selected as sensitive factors to check out the financial attractiveness, the sensitivity analysis is shown in Table 4 and Figure 2 below:

Table 4 Sensitivity analysis

Change scope / Critical assumption	-10%	+10%
Total investment	7.74%	5.47%
Sales revenue	5.25%	7.70%
Annual O&M costs	6.74%	6.34%

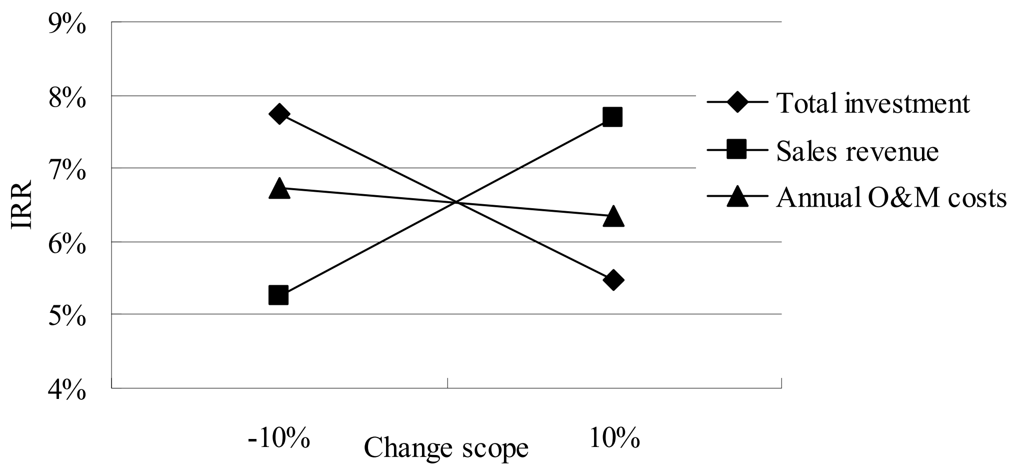

Figure 2 Sensitivity analysis

It can be found from Table 4 and Figure 2 that when total investment, sales revenue and annual O&M costs fluctuate within the range of –10% to +10% (without CERs revenue), the project IRR varies to different extent. The fluctuation of total investment and sales revenue have great impact on project IRR and the total investment is considered to be the most sensitive factor to impact the project. However, the project IRR is always lower than benchmark IRR of 8% whatever the critical assumptions vary.

In conclusion, the project is not financially attractive when CERs revenue is not considered.

Step 3. Barrier analysis

Not applied.

Step 4. Common practice analysis

Common practice analysis is a credibility check to complement the investment analysis. The common practice analysis is identified and discussed through the following sub-steps:

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

The other wind-farms implemented previously or currently underway that are similar in Ningxia, scale, comparable environment with respect to regulatory framework, investment climate, access to technology and access to financing with the proposed project are listed in Table 5 below:

Table 5 Wind-farm projects list in Ningxia (With installed capacity below 100 MW)[4]

Project name	Installed capacity (MW)	CDM project? [5]
Ningxia Tianjing Shenzhou 30.6MW Wind-farm Project	30.6	Yes
Ningxia Tianjing 50.25MW Wind-farm Project	50.25	Yes
Ningxia Yinyi 49.50MW Wind-farm Project	49.50	Yes
Ningxia Yinyi Hongsibao 49.50MW Wind-farm Project	49.50	Yes
Ningxia Dalisi 40.5MW Wind-farm Project	40.5	Yes
Ningxia Taiyangshan 45 MW Wind-farm Project	45	Yes
Ningxia Helanshan Wind-farm Project	111.9	Yes

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

At present, there are five wind-farms that have been built or that are currently under construction in Ningxia and all of them are developed as CDM projects. Furthermore, other wind-farms in the project boundary are also applying CDM now, such as Wulumuqi Tuoli 30 MW wind-farm in Xinjiang Weiwuer Autonomous Region, Jieyuan Yumen 88.4 MW wind-farm in Gansu Province.

Thus, the project is not a common practice.

In conclusion, the project is additional. In order to implement the project, the CDM was considered during design phase. The project owner signed the CDM Development Consultation Contract with Ningxia CDM Service Centre on 23 October 2006. The CDM was even discussed when the project

[4] From the project list provided by Ningxia Electric Power Dispatching Centre, there are only 3 wind farms connected to Ningxia Power Grid up to mid April, 2007. These 3 projects are Ningxia Helanshan Wind-farm Project, Ningxia Tianjing Shenzhou 30.6MW Wind-farm Project and Ningxia Tianjing 50.25MW Wind-farm Project. It means only these 3 wind-farm projects are operational in Ningxia up to the mid April, 2007. The rest in Table 5 are under construction in mid April, 2007.

[5] The information is derived from

http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1386.pdf

owner interviewed the Vice Director of Ningxia Development and Reform Commission. The CDM was specified in Feasibility Study Report and its Approval Letter. The FSR was completed and approved in December 2006. The evidences have been provided to DOE during on-site interview. It is obviously that it is due to the CDM incentives the project proceed the project. The timeline of CDM consideration of the project is as follow:

Time	Event
23/10/2006	CDM Development Contract signed
16/11/2006	Interview with Vice Director of Ningxia DRC, the CDM was discussed during interview.
December 2006	FSR completed. CDM was specified in FSR.
30/12/2006	FSR approved. The CDM was approved together with the project construction in the approval letter.
23/04/2007	Project construction started.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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Project Emissions

According to ACM0002, the project emission is zero, thus PE_y=0

Baseline Emissions

According to baseline methodology ACM0002, the baseline emissions are the CO_2 emissions from the equivalent electricity generation in Northwest China Power Grid that are displaced by the project activity. So the baseline emissions by the project activity during a given year *y* is obtained from the formula below.

According to ACM0002, the baseline emission should be calculated as:

$$BE_y = EG_y \cdot EF_y \quad (1)$$

Where:

EG_y is electricity supplied by the project activity to the grid in year *y*, in MWh;
EF_y is baseline emission factor in year y, in tCO_2e/MWh.

According to baseline methodology ACM0002, the baseline emission factor (EF_y) is calculated as a Combined Margin (CM), which consists of the weighted average of an ex-ante 3 year data vintage on Operating Margin (OM) emission factor and Build Margin (BM) factor for the Northwest China Power Grid. The data and method used for power grid calculation are derived from Chinese NDRC[6], the data have been cross checked by project participant in this PDD.

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[6] Chinese DNA's Guideline of emission factors of Chinese grids, August 2007: http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=1889

Step 1. Calculating the Operating Margin emission factor（$EF_{OM,y}$）;
Step 2. Calculating the Build Margin emission factor（$EF_{BM,y}$）;
Step 3. Calculating the baseline emission factor（EF_y）.

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

According to baseline methodology ACM0002, there are four methods of calculating the $EF_{OM,y}$:

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

Method (c) should be the first methodological choice. However, this method requires the detailed dispatch data of the Northwest China Power Grid, which is confidential information and is not available to the public. Thus, method (c) is not applicable. Due to the same reasons, method (b) is not applicable.

Method (a) can be used where low-cost/must run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term normals for electricity production. It can be found from Table 6 that installed capacity of low-cost/must run resources constitute less than 50% of Northwest China Power Grid during year 2001 to 2005. Thus, method (a) is applicable to calculate $EF_{OM,y}$. And method (d) can only be used where low-cost/must run resources constitute more than 50% of total grid generation, therefore, method (d) is not applicable to calculate $EF_{OM,y}$.

Table 6 Constitution of low-cost/must run resources in Northwest China Power Grid during year 2001 ~ 2005[7]

Year	2001	2002	2003	2004	2005
Percentage	25.28%	22.83%	19.93%	21.21%	27.44%

Due to the fact that detailed data on the individual power plants connected to the power grid are not available, information by type of generating source is used for OM calculation. According to baseline methodology ACM0002, $EF_{OM,y}$ is calculated by utilizing an *ex-ante* 3 years data vintage for Northwest China Power Grid, in the following formula :

$$EF_{OM,simple,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{j} GEN_{j,y}} \quad (2)$$

Where:

[7] *China Electric Power Yearbook 2002 ~ 2006*

$F_{i,j,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources *j* in year (s) *y*; *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;
$COEF_{i,j,y}$ 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 power sources *j*. The data is not available in *China Electric Power Yearbook,* so the $GEN_{j,y}$ is calculated as follow:

$$GEN_{j,y} = \text{Electricity generation of power plants in Power Grid} \times (1 - \text{Internal use rate of power plants})$$

The CO_2 emission coefficient $COEF_i$ is obtained from the following formula:

$$COEF_i = NCV_i \cdot EF_{CO2,i} \cdot OXID_i \qquad (3)$$

Where:

NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel *i*;
$OXID_i$ is the the oxidation factor of the fuel;
$EF_{CO2,i}$ is the CO_2 emission factor per unit of energy of the fuel *i*.

According to the deviation approach[8] agreed by EB for OM and BM calculation for Chinese power grids, statistical data on aggregated power generation quantity, the internal use rate of power plants and fuel consumption, which are publicly available by the fuel types *i* and by province *j* covered by the power grid, can be used as an alternative if the detailed data at the power plant level of the grids, such as power generation quantity, internal use rate of power plants, fuel types, fuel consumption and fuel emission factors, etc., are not publicly available for the $EF_{OM,y}$ calculation. So, the average power generation efficiencies (gce/kWh) and average emission factors of fuel *i* can be used. The fuel *i* based aggregated power generation and the related fuel consumption data are publicly available in *China Electric Power Yearbook* and *China Energy Statistical Yearbook*. Thus, the data quoted from these two kinds of yearbooks are used for $EF_{OM,y}$ calculation.

Since there is no power exchange between Northwest China Power Grid and other power grids, imports are not taken into account.

$EF_{OM,y}$ is calculated according to the statistics information of recent 3 years (from 2003 to 2005), which is the latest and available at the time of this PDD submission. The detailed calculations are shown in Table A2-Table A7 of Annex 3.

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

According to baseline methodology ACM0002, the Build Margin emission factor ($EF_{BM,y}$) is calculated by utilizing an *ex-ante* 3 years data vintage for Northwest China Power Grid, in the following formula:

[8] http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_QEJWJEF3CFBP1OZAK6V5YXPQKK7WYJ

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m,y}}{\sum_{m} GEN_{m,y}} \qquad (4)$$

Where：

$F_{i,m,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by plants *m* in year (s) *y*;
$COEF_{i,m,y}$ 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 plants *m* and the percent oxidation of the fuel in year (s) *y*;
$GEN_{m,y}$ is the electricity (MWh) delivered to the grid by plants *m*. It is equal to power generation minus power plants self power consumption.

ACM0002 provides the following two options to calculate BM:

1) Calculate the BM emission factor $EF_{BM,y}$ *ex-ante* based on the most recent information available on plants already built for sample group *m* at the time of PDD submission.

2) For the first crediting period, the BM emission factor $EF_{BM,y}$ must be updated annually ex-post for the year in which actual project generation and associated emissions reductions occur. For subsequent crediting periods, $EF_{BM,y}$ should be calculated ex-ante, as described in option 1) above.

Option 1) is chosen by project participants to calculate $EF_{BM,y}$ for this project, and cannot be changed during the crediting period.

For the sample group *m*, it includes two options:

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

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

The project participants should choose sample group that comprises the larger annual generation of the two options.

For the same reasons as data unavailability at the power plant level in China, the EB agreed on the following deviation[9] approaches for $EF_{BM,y}$ calculation:

1) Use the efficiency level of the most advanced commercialized technologies of provincial/regional or national grid of China, as a conservative proxy, for fuel *i* consumption estimation to estimate the $EF_{BM,y}$.

2) Use of capacity additions during last several years for estimating the $EF_{BM,y}$ i.e. the capacity addition over last several years, whichever results in a capacity addition that is closest to 20% of total installed capacity.

[9] http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_QEJWJEF3CFBP1OZAK6V5YXPQKK7WYJ

3) Use of installed capacity to replace annual power generation to estimate weights.

Due to the difficulty of separating the coal-fired, gas-fired or oil-fired installed capacity from the total thermal installed capacity, $EF_{BM,y}$ will be calculated:

1) Based on the most recent years energy balance of the Northwest China Power Grid, calculating the proportions of CO_2 emissions from the coal-fired, oil-fired and gas-fired power plants in total CO_2 emissions of thermal power plants;

2) Based on the most advanced commercialized technologies applied by the coal-fired, oil-fired and gas-fired power plants, calculating the emission factor of thermal power plants in Northwest China Power Grid. This approach is more conservative as it assumes that all recently built plants have the fuel efficiency of the most advanced commercialized technologies;

3) By multiplying the emission factor of thermal power plants by the percentage share of thermal power plants installed capacity addition within all recently built installed capacity. The proper year is selected so that it is the closest time when the last 20% of installed capacity was built.

The above calculation approach has been used by several recently registered China projects. The BM in this PDD is calculated in the following sub-steps.

Sub-Step 2a: Calculating the percentages of CO_2 emissions from the coal-fired, gas-fired and oil-fired power plants in CO_2 emissions from total thermal power plants

$$\lambda_{Gas} = \frac{\sum_{i \in GAS,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad \lambda_{Oil} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad \lambda_{Gas} = \frac{\sum_{i \in GAS,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \qquad (5)$$

Where:

λ_{Gas}, λ_{Oil} and λ_{Coal} are the percentages of the total CO_2 emissions from thermal power plants that come from gas-fired, oil-fired, coal-fired power plants respectively;
$F_{i,j,y}$ is the amount of fuel *i* (tce) consumed by the power sources province *j* in year *y*;
$COEF_{i,j}$ is the CO_2 emission coefficient (tCO_2/tce) of fuel *i*, taking into account the carbon content of the fuels used by the grid and the percent oxidation of the fuel in year *y*.

Sub-Step 2b: Calculating the fuel-fired emission factor ($EF_{Thermal}$)

$$EF_{Thermal} = \lambda_{coal} \times EF_{coal,adv} + \lambda_{oil} \times EF_{oil,adv} + \lambda_{gasl} \times EF_{gas,adv} \qquad (6)$$

Where:

$EF_{Thermal}$ is the emission factor of thermal power plants;
$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ correspond to the emission factors of coal, oil and gas, which are applied by the most advanced commercialized technologies.

Sub-Step 2c: Calculating the Build Margin (BM) emission factor ($EF_{BM,y}$)

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

Where:

$EF_{BM,y}$ is the Build Margin (BM) emission factor with advanced commercialized technologies for year y;
CAP_{Total} is the installed capacity of all recently built power plants;
$CAP_{Thermal}$ is the newly installed capacity of recently built thermal power plants;
$EF_{Thermal}$ is the emission factor of thermal power plants.

$EF_{BM,y}$ is calculated according to the latest available data at the time of this PDD submission, and the detailed calculations are shown in Table A8-Table A11 of Annex 3.

Step 3: Calculating the baseline emission factor (EF_y)

According to baseline methodology ACM0002, baseline emission factor EF_y is calculated as the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$):

$$EF_y = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y} \qquad (8)$$

Where:

The weighs w_{OM} and w_{BM}, by default, are 75% and 25% for wind-farms (i.e., w_{OM}=75%, w_{BM}= 25%), and $EF_{OM,y}$ and $EF_{BM,y}$ are calculated as described in Steps 1 and 2 above and are expressed in tCO_2e/MWh.

The EF_y applied in this PDD is fixed for a crediting period and may be revised at the renewal of the crediting period.

Leakage

According to baseline methodology ACM0002, there is no need for the project to consider leakage (L_y).

Emission Reductions

The annual emission reduction (ER_y) of the project is the difference between baseline emission and project activity emission. The final GHG emission reduction is calculated as follows:

$$ER_y \ (tCO_2e/yr) = BE_y - PE_y - L_y \quad (9)$$

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

Data / Parameter:	NCV_i
Data unit:	kJ/kg or kJ/m^3 or TJ/tce
Description:	The net calorific value (energy content) per mass or volume unit of fuel i

Source of data used:	*China Energy Statistical Yearbook 2006*.
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	Official data, used for OM and BM calculation.

Data / Parameter:	$OXID_i$
Data unit:	/
Description:	Oxidation factor of the fuel *i*
Source of data used:	*Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	100%
Justification of the choice of data or description of measurement methods and procedures actually applied :	No specific local value available, adopt the IPCC default value.
Any comment:	Official data, used for OM and BM calculation.

Data / Parameter:	$F_{i,j,y}$
Data unit:	10^4 t, 10^8 m^3
Description:	The quantity of fuel *i* (in a mass or volume unit) consumed for power generation by the relevant provinces *j* in year(s) *y*
Source of data used:	*China Energy Statistical Yearbook 2004-2006*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	Official data, used for OM and BM calculation.

Data / Parameter:	*Electricity generation of power plants in Northwest China Power Grid*
Data unit:	MWh
Description:	Electricity generated by province *j* in Northwest China Power Grid in year *y*.
Source of data used:	*China Electric Power Yearbook 2004-2006*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods	Data used are from Chinese authorities.

and procedures actually applied :	
Any comment:	Official data, used for OM and BM calculation.

Data / Parameter:	*Internal use rate of power plant*
Data unit:	%
Description:	The internal power consumption rate of power plants in province *j* in Northwest China Power Grid in year *y*.
Source of data used:	*China Electric Power Yearbook 2004-2006*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	Official data, used for OM and BM calculation.

Data / Parameter:	$EF_{CO2,\,i}$
Data unit:	tCO_2/TJ
Description:	The CO_2 emission factor per unit of fuel i
Source of data used:	*Revised 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 :	No specific local value available, adopt the IPCC default value.
Any comment:	Official data, used for OM and BM calculation.

Data / Parameter:	$CAP_{i,\,j,\,y}$
Data unit:	MW
Description:	Installed capacities of power plant category *i* of province *j* in years *y*.
Source of data used:	*China Electric Power Yearbook 2001-2006*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	Official data, used for OM and BM calculation.

Data / Parameter:	$GENE_{best,coal,}$

Data unit:	/
Description:	The power supply efficiency of most advanced commercialized coal-fired power plants
Source of data used:	Chinese DNA's Guideline of emission factors of Chinese grids
Value applied:	35.82%
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	Official data, used for OM and BM calculation.

Data / Parameter:	$GENE_{best,oil/gas}$
Data unit:	/
Description:	The power supply efficiency of most advanced commercialized oil-fired power plants and gas-fired power plants
Source of data used:	Chinese DNA's Guideline of emission factors of Chinese grids
Value applied:	47.67%
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	Official data, used for OM and BM calculation.

B.6.3 Ex-ante calculation of emission reductions:

>>

Project Emissions

According to baseline methodology ACM0002, project emissions, PE_y do not need to be calculated.

Baseline Emissions

According to formula (2)-(8) in section B.6.1, the calculation results of EF_{OM} , EF_{BM} and EF_y are listed in Table 7, the detailed calculation processes are shown in Annex 3.

Table 7 EF_{OM} , EF_{BM} and EF_y of Northwest China Power Grid (tCO_2e/MWh)

EF_{OM}	EF_{BM}	EF_y
1.12559	0.57395	0.98768

According to formula (1) in section B.6.1, the annual baseline emission (BE_y) of the project in a typical year is calculated as follows:

$$BE_y = 95110 \times 0.98768 = 93{,}938 \ tCO_2e/yr$$

Leakage

According to baseline methodology ACM0002, $L_y = 0$

Emission Reductions

According to formula (9) in section B.6.1, the annual emission reductions (ER_y) of the project in typical year is calculated as follows:

$$ER_y\ (tCO_2e/yr) = 93938 - 0 - 0 = 93,938\ tCO_2e/yr$$

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

>>

The summary of the ex-ante estimation of emission reductions are listed in Table 8 below:

Table 8 Summary of the ex-ante estimation of emission reductions

Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
01/04/2008-31/03/2009	0	93,938	0	93,938
01/04/2009-31/03/2010	0	93,938	0	93,938
01/04/2010-31/03/2011	0	93,938	0	93,938
01/04/2011-31/03/2012	0	93,938	0	93,938
01/04/2012-31/03/2013	0	93,938	0	93,938
01/04/2013-31/03/2014	0	93,938	0	93,938
01/04/2014-31/03/2015	0	93,938	0	93,938
Total (tonnes of CO_2e)	0	657,566	0	657,566

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

B.7.1 Data and parameters monitored:

Data / Parameter:	$EG_{Import,y}$
Data unit:	MWh
Description:	Electricity imported from Northwest China Power Grid by the project in year *y*.
Source of data to be	Electricity meter

used:	
Value of data applied for the purpose of calculating expected emission reductions in section B.5	/
Description of measurement methods and procedures to be applied:	The data is measured hourly by bidirectional meter (M_1, installed at project site) and recorded monthly. The data will be kept during the crediting period and two years after.
QA/QC procedures to be applied:	The accuracy of the meter is 0.2s. Electricity import record provided by power grid company will be used for double check to ensure the consistency. The meter will be calibrated at least once a year by a qualified organization to ensure accuracy.
Any comment:	Uncertainty level of the data is low

Data / Parameter:	$EG_{Export,y}$
Data unit:	MWh
Description:	Generated electricity exported to Northwest China Power Grid by the project in year *y*.
Source of data to be used:	Electricity meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	/
Description of measurement methods and procedures to be applied:	The data is measured hourly by bidirectional meter (M_1) and recorded monthly. The data will be kept during the crediting period and two years after.
QA/QC procedures to be applied:	The accuracy of the meter is 0.2s. Sales receipts will be used for double check to ensure the consistency. The meter will be calibrated at least once a year by a qualified organization to ensure accuracy.
Any comment:	Uncertainty level of the data is low

Data / Parameter:	EG_y
Data unit:	MWh
Description:	Net generated electricity delivered to Northwest China Power Grid by the project in year *y*.
Source of data to be used:	Calculated
Value of data applied for the purpose of calculating expected emission reductions in section B.5	95,110

Description of measurement methods and procedures to be applied:	The difference of $EG_{Export,y}$ and $EG_{Import,y}$
QA/QC procedures to be applied:	Please see above QA/QC procedures of $EG_{Export,y}$ and $EG_{Import,y}$
Any comment:	Uncertainty level of the data is low

B.7.2 Description of the monitoring plan:

>>
An overall monitoring plan will be applied to the project. The project owner compiled a monitoring and management manual i.e. *Monitoring and Management Manual of Yangjiayao Wind-farm Plant*. The aim of monitoring plan is to make sure that the net generated electricity monitored and evaluated during the project activity operation period is completed, consistent, and precise. It has identified the duties of the related responsibilities. The details are summarized as follows:

1. Monitoring subject

The main data to be monitored are $EG_{Export,y}$ and $EG_{Import,y}$, the EG_y is calculated as difference of $EG_{Export,y}$ and $EG_{Import,y}$. The monitoring subject also includes the calibration procedure, QA and data management of the project.

2. Monitoring management structure

In order to obtain effective monitored data, the project owner established a monitoring management structure that identified the relative staffs for data recording, collection and preservation. In addition, the project owner will designate a special monitoring director to take charge of supervision. The monitoring director is responsible for the check of monitoring and recording tasks (such as meter reading, sales receipts), emission reductions calculation and monitoring reports preparation etc.. The detailed structure is as follows:

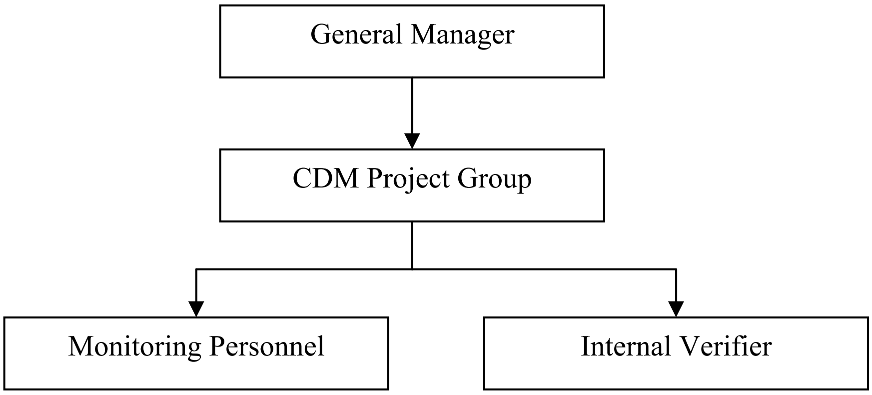

Figure 3. Monitoring and management structure

The responsibilities of the project staff are as follow:

General Manager: To be responsible for the overall management of the project
CDM Project Group: It is consisted of Monitoring Personnel and Internal Verifier, the group is leaded by the Chief Engineering.
Monitoring Personnel: To conduct the monitoring task strictly based on the monitoring manual and registered PDD. To record required monitored parameters. To report the monitoring results to Chief Engineering. To report the abnormal situation of the project to Chief Engineering.
Internal Verifier: To be responsible for internal regular maintenance of monitoring equipment and DCS system. To verify if the monitored data is normal. To calculate the emission reductions regularly and write the monitoring report.

3. Monitoring apparatus and installation:

The meters will be installed in accordance with *Technology & Management Regulations for Power Metering Devices* (DL/T448-2000), the accuracy of the meters must meet the national standard.

A bidirectional meter (M_1) with accuracy of 0.2s is installed at project site to monitor $EG_{Export,y}$ and $EG_{Import,y}$. The EG_y is calculated as difference of $EG_{Export,y}$ and $EG_{Import,y}$. There is a bidirectional meter (M2) with accuracy of 0.2s is installed at high voltage of 110 kV Yongli Substation to be the backup meter of M_1. The wire diagram for the meters is as follow:

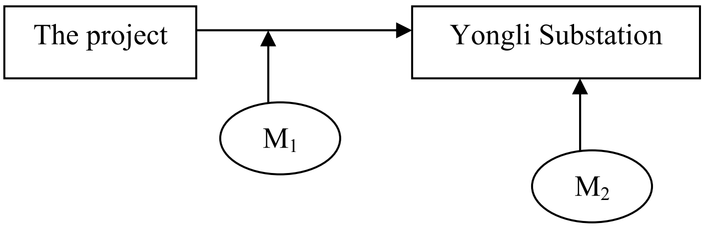

Figure 4 Positions of the monitoring meters

4. Data monitoring

The EG_y is used for calculating the emission reductions when the meter is in normal operation state. The monitoring steps are as follows:

(1) The readings of M_1 will be measured hourly and recorded monthly. The difference of exported and imported data is the net power generation of the project;
(2) The Power Grid Company provides the project owner with the net electricity generation data and electricity import record;
(3) The project owner provides the Power Grid Company with sales receipts and preserves the copies of the sales receipts.
(4) The project owner provides DOE with readings record of meters and copies of sales receipts.

The principle of the processes is to guarantee that the DOE obtains the actual and precise data of net generated electricity.

5. Quality control

The calibration of meters conducted by qualified organization must comply with national standard and sectoral regulations at least once a year to ensure the accuracy. The meters must be pasted with seal after calibration. The calibration records must be archived together with other monitoring records.

If any errors are detected the party owning the meters shall repair, recalibrate or replace the meter giving the other party sufficient notice to allow a representative to attend during any corrective activity. If the readings of M_1 are beyond allowable error, the data should be determined by (1) The M_2 should be used for monitoring. (2) If both of M_1 and M_2 are beyond allowable error, the project owner and power grid company shall jointly prepare an reasonable and conservative estimate of the correct reading.

After handling of the emergency, the project owner must prepare a report regarding the emergency to explain to DOE that the handling method is reasonable.

6. Data management

All monitoring data and records will be archived in electronic document and paper document. The electronic documents will be backed up in Compact Disc or Hard Disc. The project owners will also keep copies of sales receipts and prepare a monitoring report at the end of each year, which includes the net electricity generation, the calibration records, the emission reductions calculation and meters' corrective action records.

All the electronic and paper documents will be archived during the crediting period and two years after.

7. Training program

The project owner will entrust the professional engineers and experts to train all the relative staffs before operation of generators. The training contains CDM knowledge, operational regulations, quality control (QC) standard flow, data monitoring requirements and data management regulations etc..

More information can be obtained from *Monitoring and Management Manual of Yangjiayao Wind-farm Plant*.

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)

>>

Final Date of completion of the baseline study and monitoring methodology (DD/MM/YYYY)

16/09/2007

The persons and entity completing the application of the baseline and monitoring methodology are:

Hengzhi Xu, Carbon Asset Management Sweden AB, E-mail: hanson.xu@tricorona.se, Tel:+86-10-65981589-105

Carbon Asset Management Sweden AB is the project participant.

Contributor:

Ying Zhao, Ningxia CDM Service Centre

Ningxia CDM Service Centre is not the project participant.

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:

>>
23/04/2007 (Starting date of construction)

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:

>>
01/04/2008 or 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:

Not applicable.

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 owner entrusted a third party to conduct the environmental impact assessment (EIA) on the project and obtained the Approval Letter (Ninghuanbiao [2006] No.13) from Environmental Protection Bureau of Ningxia Hui Autonomous Region in November, 2006.

The EIA report is prepared for future reference, and the main comments of the EIA are as follows:

1. Impacts on air pollution

The wind-farm is estimated to supply clean power to power grid. It is estimated that 46,234.1tce of fuel will be saved per year. This implies annual air pollution emission reductions equal to about 181.4 t SO_2, 208.6 t NO_x, 17.2 t particulate matter and 10,749 t clinker.

The implementation of the project will be beneficial to the protection of environment and resources.

The possible negative environmental impact during the construction period is dust. However, the negative impacts are insignificant and can be reduced to the minimum by taking following measures:

a. Avoid to construct in big wind weather;
b. Limit the speed of vehicles;
c. Minimize the construction land occupation, vegetation destroy is prohibited out side the area of temporary and permanent land occupation;
d. Vegetation must be restored after construction;
e. The raw materials of construction should be covered to avoid raised dust.

The project will not lead to air pollution during operation period.

2. Noise pollution

The noise pollution during construction period mainly comes from manual drills and vehicle transportation. The noise due to the construction has no impact to local residents since there are no residents within 6 km of the project location. According to the monitoring data, the maximum noise is 84 dB in 10 meters. According to the formula of declining of sound from source, it is estimated that the maximum noise declining distance is 35.5 m during daytime and 223.9 m during night.

When the wind-farm is put into operation, the noise caused by the operation of wind turbines will be 102 dB (Rated noise of generator). The estimated noise beyond 200 m complies with the *National Urban Environmental Noise Standard* (GB3096-93). The noise has no impact to local residents.

Therefore, the construction noise imposes no harm to the surrounding area.

3. Impacts on wastewater

The waste water has little impact to environment during construction period. The waste water during construction period are mainly from domestic sewage and machines. The main pollutants are BOD_5, COD_{cr} and SS. The water demand is about 50 m^3/d during construction period. The waste water can be sprayed to road and project site for natural evaporation.

The waste water during operation period are mainly from domestic sewage. The main pollutants are BOD_5, COD_{cr} and SS. The wastewater will be treated in a septic tank, thus causing no environmental impact.

4. Impacts on waste solid and soil

The waste solid and soil have little impact to environment. The soil excavation quantity is bigger than the soil backfill quantity. So it is not necessary to build gravel-soil-taken field. The surplus excavated soil can be used for road construction. So it is not necessary to build soil dump yard. The waste solid during construction period are mainly from construction workers. The garbage should be transported to garbage dump for treatment to avoid the pollution.

5. Impacts on telecommunications and television transmissions

It is concluded that the operation of the wind-farm will not cause any problem to telecommunications and television signals.

6. Impacts on ecology

The proposed project is mainly built in desert. The project will not lead to negative impacts to plants and there is no rare plant in project site. It is suggested the project owner to plant grass near the project site, the measurement is beneficial to improvement of ecology.

When migratory birds fly across the region in autumns and springs, there is no water body where birds can stay near. As a result, birds are seldom seen throughout the year. Therefore the proposed project is unlikely to affect birds' flight and migration. Furthermore, the project will not affect the area bio-diversity.

7. Other impacts

The wind-farm does not consume any water, nor generate any wastewater. It will improve the local environment and is beneficial to natural resource conservation. The possible negative impacts during the proposed project construction include dust, solid waste, etc. However, the pollution will not be severe, and can and will be mitigated to a proper level through taking effective management measures.

Summary

The Environmental Impacts Assessment of the proposed project indicates that the operation of the proposed project will not discharge significant quantity of wastewater, nor air pollutants to the local environment. Noise from the wind turbines will have little impact on the neighbourhood, given that the terrain on which the wind farm is located is uncultivated and unpopulated. The construction site of the proposed project is confined to a small area. The soil extracted will be refilled, which will not damage the vegetation, nor will it cause water and soil degradation.

During the construction period, the proposed project will still have modest impact on the environment, such as on soil and the natural environment. Generally speaking, the proposed project is compatible with the environment, and only the construction of the proposed project shall be subject to strict environmental protection measures.

We therefore conclude that the environmental impacts of the proposed project are minor, and the proposed project is definitely an environment friendly way of providing power.

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:

>>

Both of the host Party and the project owners consider that the proposed project will not bring significant impacts on the environment.

SECTION E. Stakeholders' comments

>>

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

>>

The project entity visited and interviewed the local organizations, such as Ningxia Development and Reform Commission, Ningxia Electric Power Bureau, Environment Protection Science Research & Design Institute of Ningxia, Land and Resources Bureau of Lingwu City, Calligraphy Association of Yinchuan City and Yangjiayao Village Committee to collect stakeholders' comments in November 2006[10]. They are supportive to the proposed project and consider that the wind resources are used effectively by the proposed project. The proposed project location is far away from the enterprises and residential areas etc., and will therefore not bring inconvenience to the enterprises and residents. The construction of the proposed project will have positive impact to local economy and environment. Furthermore, the project owner distributed 30 copies of questionnaires to the local stakeholders and 20 copies were received in September 2007.

The questions listed in questionnaire are as follows:

Multiple Choice:

1. Do you know about the project?
2. Do you uphold the construction of the project?
3. Is the project helpful to local economic development?
4. Does the project have negative impacts on local ecosystem?
5. Does the project bring noise pollution?
6. Does the project influence the migration of birds?
7. Is the project helpful to natural scenery?
8. Dose the project have negative impacts on local residents' life?
9. Will the project improve the local residents' revenue?
10. Will the project improve the local infrastructure construction?

Questions & Answers:

1. What's your suggestion for us regarding the project?
2. What is your most concerned problem?

The results of the survey will be outlined in the next section.

E.2. Summary of the comments received:

>>

The results of Multiple Choice in questionnaire are concluded as follows:

[10] Interview Records about Construction of Ningdong Yangjiayao Wind Farm

Table 9 Results of questionnaire (No. is corresponding to section E.1)

No.	Result		
1	Yes: 20	No: 0	
2	Yes: 20	No: 0	Unconcern: 0
3	Yes: 20	No: 0	Unconcern: 0
4	Yes: 1	No: 19	Unconcern: 0
5	Yes: 1	No: 19	Unconcern: 0
6	Yes: 0	No: 18	Unconcern: 2
7	Yes: 19	No: 0	Unconcern: 1
8	Yes: 0	No: 20	Unconcern: 0
9	Yes: 16	No: 0	Unconcern: 4
10	Yes: 20	No: 0	Unconcern: 0

1. In aspect of social and economic development: The stakeholders consider that the construction of the proposed project will improve the local economy and contributes to the local finance.

2. In aspect of residents' life: There are no residents in the proposed project area, but some of the nearby residents could be employed. The purchase and relevant consumption during the proposed project construction and operation could accelerate local business and trade activity and increase the income of nearby residents.

3. In aspect of environmental impacts: one stakeholder thought the project might have impact on ecology.

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

>>

For the question 4 and 5, the stakeholder worried the project has impact on local ecology and will cause noise pollution. According to EIA, the noise caused by the wind turbine operation of the project will not affect local resident since there is no resident within 6 km of the project location. Furthermore, the noise pollution will be controlled within the national standard. The impact only occurs during construction period, and accompanied by mitigating measures, the impact will be minimized after construction. The project is located in remote desert, it will not cause negative impact to local ecology.

The stakeholders are supportive to the construction of the proposed project and hope the proposed project could be operated as soon as possible.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Project Entity

Organization:	Huadian Ningxia Ningdong Wind Power Generation Co., Ltd.
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding for the project.

Annex 3

BASELINE INFORMATION

The installed capacity, fuel consumption data used for OM and BM calculation are derived from <China Energy Statistical Yearbook>, <China Electric Power Yearbook>.

The low calorific value, CO_2 emission factor and oxidation factor of fuels are listed in Table A1 below.

Table A1 Low calorific values, CO_2 emission factors and oxidation factors of fuels

Fuel	Low Calorific Value	Emission Factor (tC/TJ)	Oxidation Factor
Raw Coal	20908 kJ/kg	25.8	100%
Cleaned Coal	26344 kJ/kg	25.8	100%
Other Washed Coal	8363 kJ/kg	25.8	100%
Coke	28435 kJ/kg	29.2	100%
Crude Oil	41816 kJ/kg	20.0	100%
Gasoline	43070 kJ/kg	18.9	100%
Diesel Oil	42652 kJ/kg	20.2	100%
Fuel Oil	41816 kJ/kg	21.1	100%
Natural Gas	38931 kJ/m^3	15.3	100%
Coke Oven Gas	16726 kJ/m^3	12.1	100%
Other Gas	5227 kJ/m^3	12.1	100%
LPG	50179 kJ/kg	17.2	100%
Refinery Dry Gas	46055 kJ/kg	15.7	100%

Data Source:

The net calorific values are quoted from <China Energy Statistical Yearbook 2006>, Page 287.

The emission factors and oxidation factors are quoted from <Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories >, Table 1.4, Page 1.24, Chapter 1, Volume 2.

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

Table A2 Simple OM Emission Factors Calculation of Northwest China Power Grid for Year 2003

Fuel	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total	EF	Oxidation	Average Low Calorific Value	CO_2 Emission (tCO_2e)
								(tC/TJ)	(%)	($MJ/t,km^3$)	K=G*H*I*J*44/12/10000 (for mass unit)
		A	B	C	D	E	G=A+B+C+D+E	H	I	J	K=G*H*I*J*44/12/1000 (for volume unit)
Raw Coal	10^4 t	2002.26	1479.62	330.67	682	1065.75	5560.3	25.8	100	20908	109976995.77
Cleaned Coal	10^4 t						0	25.8	100	26344	0.00
Other Washed Coal	10^4 t				27	3.64	30.64	25.8	100	8363	242405.23
Coke	10^4 t						0	29.2	100	28435	0.00
Coke Oven Gas	10^8 m^3		1.54				1.54	12.1	100	16726	114279.84
Other Gas	10^8 m^3		0.12				0.12	12.1	100	5227	2782.85
Crude Oil	10^4 t						0	20	100	41816	0.00
Gasoline							0	18.9	100	43070	0.00
Diesel Oil	10^4 t	3.12			0.04	0.4	3.56	20.2	100	42652	112463.66
Fuel Oil	10^4 t		1.19			1.02	2.21	21.1	100	41816	71497.14
LPG	10^4 t						0	17.2	100	50179	0.00
Refinery Dry Gas	10^4 t					3.48	3.48	15.7	100	46055	92262.90
Natural Gas	10^8 m^3	0.1	0.54			5.95	6.59	15.3	100	38931	1439275.18
										Total	**112051962.57**

Data Source: <China Energy Statistical Yearbook 2004>

Table A3 Fuel-fired Electricity Generation of Northwest China Power Grid for Year 2003

Province	Electricity Generation	Electricity Generation	Internal Use Rate	Supplied Electricity
	(10^8 kWh)	(MWh)	(%)	(MWh)
Shaanxi	381.44	38144000	6.94	35,496,806
Gansu	294.94	29494000	6.35	27,621,131
Qinghai	64.46	6446000	4.5	6,155,930
Ningxia	191.75	19175000	5.25	18,168,313
Xinjiang	198.34	19834000	8.19	18,209,595
Total				**105651775.3**

Data Source: <China Electric Power Yearbook 2004>

According to Table A2, the total CO_2 emissions of Northwest China Power Grid is 112051962.57 tCO_2e in year 2003. According to Table A3, the total supplied electricity of Northwest China Power Grid is 105651775.3 MWh. According to formula (2) in section B.6.1, the $EF_{OM,\ Simple,\ 2003}$ is 1.06058 tCO_2e/MWh.

Table A4 Simple OM Emission Factors Calculation of Northwest China Power Grid for Year 2004

Fuel	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total	EF	Oxidation	Average Low Calorific Value	CO_2 Emission (tCO_2e)
								(tC/TJ)	(%)	(MJ/t,km^3)	K=G*H*I*J* 44/12/10000 (for mass unit)
		A	B	C	D	E	G=A+B+ C+D+E	H	I	J	K=G*H*I*J*44/12 /1000 (for volume unit)
Raw Coal	10^4 t	2428.7	1595.9	322.8	1270.1	1240.9	6858.4	25.8	100	20908	135652074.13
Cleaned Coal	10^4 t						0	25.8	100	26344	0.00
Other Washed Coal	10^4 t				102.64	10.5	113.14	25.8	100	8363	895095.57
Coke	10^4 t	0.78					0.78	29.2	100	28435	23746.64
Coke Oven Gas	10^8 m^3		0.3				0.3	12.1	100	16726	22262.31
Other Gas	10^8 m^3	0.74	1.26				2	12.1	100	5227	46380.91
Crude Oil	10^4 t	0.01				0.06	0.07	20	100	41816	2146.55
Gasoline	10^4 t	0.02					0.02	18.9	100	43070	596.95
Diesel Oil	10^4 t	2.16	0.36		0.05	0.41	2.98	20.2	100	42652	94140.93
Fuel Oil	10^4 t	0.01	0.69			0.3	1	21.1	100	41816	32351.65
LPG	10^4 t						0	17.2	100	50179	0.00
Refinery Dry Gas	10^4 t					3.26	3.26	15.7	100	46055	86430.19
Natural Gas	10^8 m^3	1.61	0.59			6.27	8.47	15.3	100	38931	1849872.65
										Total	**138705098.47**

Data Source: <China Energy Statistical Yearbook 2005>

Table A5 Fuel-fired Electricity Generation of Northwest China Power Grid for Year 2004

Province	Electricity Generation	Electricity Generation	Internal Use Rate	Supplied Electricity
	(10^8 kWh)	(MWh)	(%)	(MWh)
Shaanxi	444.39	44439000	7.5	41106075
Gansu	332.42	33242000	6.21	31177671.8
Qinghai	62.08	6208000	7.96	5713843.2
Ningxia	252.98	25298000	5.45	23919259
Xinjiang	227.52	22752000	9.07	20688393.6
Total				122605242.6

Data Source: <China Electric Power Yearbook 2005>

According to Table A4, the total CO_2 emissions of Northwest China Power Grid is 138705098.47 tCO_2e in year 2004. According to Table A5, the total supplied electricity of Northwest China Power Grid is 122605242.6 MWh. According to formula (2) in section B.6.1, the $EF_{OM, Simple, 2004}$ is 1.13131 tCO_2e/MWh.

Table A6 Simple OM Emission Factors Calculation of Northwest China Power Grid for Year 2005

Fuel	Unit	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang	Total	EF	Oxidation	Average Low Calorific Value	CO_2 Emission (tCO_2e)
								(tC/TJ)	(%)	($MJ/t,km^3$)	K=G*H*I*J*44/12/10000 (for mass unit)
		A	B	C	D	E	G=A+B+C+D+E	H	I	J	K=G*H*I*J *44/12/1000 (for volume unit)
Raw Coal	10^4 t	2461.28	1597	345.1	1467.7	1358.09	7229.17	25.8	100	20908	142985522.10
Cleaned Coal	10^4 t	16.22					16.22	25.8	100	26344	404225.50
Other Washed Coal	10^4 t	35.56			101.95	10.2	147.71	25.8	100	8363	1168592.60
Coke	10^4 t	3.23					3.23	29.2	100	28435	98335.43
Coke Oven Gas	10^8 m^3						0	12.1	100	16726	0.00
Other Gas	10^8 m^3						0	12.1	100	5227	0.00
Crude Oil	10^4 t					0.18	0.18	20	100	41816	5519.71
Gasoline		0.02				0.01	0.03	18.9	100	43070	895.43
Diesel Oil	10^4 t	2.24	0.46	0.06		0.5	3.26	20.2	100	42652	102986.38
Fuel Oil	10^4 t	0.01	0.57			0.25	0.83	21.1	100	41816	26851.87
LPG	10^4 t						0	17.2	100	50179	0.00
Refinery Dry Gas	10^4 t					7.71	7.71	15.7	100	46055	204410.05
Natural Gas	10^8 m^3	1.46	0.52	1.33		7.81	11.12	15.3	100	38931	2428640.36
										Total	**147425979.42**

Data Source: <China Energy Statistical Yearbook 2006>

Table A7 Fuel-fired Electricity Generation of Northwest China Power Grid for Year 2005

Province	Electricity Generation	Electricity Generation	Internal Use Rate	Supplied Electricity
	(10^8 kWh)	**(MWh)**	**(%)**	**(MWh)**
Shaanxi	411	41100000	7.16	38157240
Gansu	331.06	33106000	4.23	31705616.2
Qinghai	55	5500000	2.69	5352050
Ningxia	276.43	27643000	5.73	26059056.1
Xinjiang	265.6	26560000	8.8	24222720
Total				125496682.3

Data Source: <China Electric Power Yearbook 2006>

According to Table A6, the total CO_2 emissions of Northwest China Power Grid is 147425979.42 tCO_2e in year 2005. According to Table A7, the total supplied electricity of Northwest China Power Grid is 125496682.3 MWh. According to formula (2) in section B.6.1, the $EF_{OM,\ Simple,\ 2005}$ is 1.12559tCO_2e/MWh.

The Operating Margin (OM) emission factor is the weighted average emission factors of year 2003-2005, as follow:

$$EF_{OM} = 1.12559\ tCO_2e/MWh$$

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

Sub-Step 2a: Calculating of percentages of CO_2 emissions from the coal-fired, gas-fired and oil-fired power plants in total fuel-fired CO_2 emissions

Table A8 Percentages of CO_2 emissions from the coal-fired, gas-fired and oil-fired power plants in total fuel-fired CO_2 emissions

		Shaanxi	**Gansu**	**Qinghai**	**Ningxia**	**Xinjiang**	**Total**	**Average Low Calorific Value**	**Emission Factor (tC/TJ)**	**Oxidation**	**CO_2 Emission (tCO_2e)**
Fuel	Unit	A	B	C	D	E	G=A+…+E	H	I	J	K=G*H*I*J*44/12/100
Raw Coal	10^4 t	2461.28	1597	345.1	1467.7	1358.09	7229.17	20908 kJ/kg	25.8	100%	142985522.10
Cleaned Coal	10^4 t	16.22					16.22	26344 kJ/kg	25.8	100%	404225.50
Other Washed Coal	10^4 t	35.56			101.95	10.2	147.71	8363 kJ/kg	25.8	100%	1168592.60
Coke	10^4 t	3.23					3.23	28435 kJ/kg	29.2	100%	98335.43
Subtotal											**144656675.63**
Crude Oil	10^4 t					0.18	0.18	41816 kJ/kg	20	100%	5519.71
Gasoline	10^4 t	0.02				0.01	0.03	43070 kJ/kg	18.9	100%	895.43
Diesel Oil	10^4 t	2.24	0.46	0.06		0.5	3.26	42652 kJ/kg	20.2	100%	102986.38
Fuel Oil	10^4 t	0.01	0.57			0.25	0.83	41816 kJ/kg	21.1	100%	26851.87
Subtotal											**136253.38**
Natural Gas	10^7 m^3	14.6	5.2	13.3		78.1	111.2	38931 kJ/m^3	15.3	100%	2428640.36
Coke Oven Gas	10^7 m^3						0	16726 kJ/m^3	12.1	100%	0.00
Other Gas	10^7 m^3						0	5227 kJ/m^3	12.1	100%	0.00
LPG	10^4 t						0	50179 kJ/kg	17.2	100%	0.00
Refinery Dry Gas	10^4 t					7.71	7.71	46055 kJ/kg	15.7	100%	204410.05
Subtotal											**2633050.41**
Total											**147425979.42**

Data Source: <China Energy Statistical Yearbook 2006>

According to Table A8 and formula (5) in section B.6.1, the percentages of CO_2 emissions from the coal-fired, oil-fired and gas-fired power plants in total fuel-fired CO_2 emissions are calculated as:

$\lambda_{Coal} = 98.12\%$, $\lambda_{Oil} = 0.09\%$, $\lambda_{Gas} = 1.79\%$

Sub-Step 2b: Calculating the fuel-fired emission factor ($EF_{Thermal}$)

The most advanced commercialized technologies for coal-fired power plants in China are domestic 600 MW sub-critical generators, with the standard coal consumption of power supply of 343.33 gce/kWh. For gas-fired and oil-fired power plants in China, the most advanced commercialized technologies are 200 MW combined cycle generators. The standard coal consumption (equivalent) for power supply of oil-fired and gas-fired power plants are 258 gce/kWh.

Parameters used for calculating fuel-fired emission factor are shown in Table A9 below:

Table A9 Parameters used for calculating fuel-fired emission factor

	Parameter	Efficiency of Power Suppy	Emission Factor of Fuel (tc/TJ)	Oxidation Factor	Emission Factor (tCO2/MWh)
		A	B	C	D=3.6/A/1000*B*C*44/12
Coar-fired Power Plant	$EF_{Coal,Adv}$	35.82%	25.8	100%	0.9508
Gas-fired Power Plant	$EF_{Gas,Adv}$	47.67%	15.3	100%	0.4237
Oil-fired Power Plant	$EF_{Oil,Adv}$	47.67%	21.1	100%	0.5843

According to Table A9 and formula (6) in section B.6.1, the $EF_{Thermal}$ is 0.94100 tCO_2e/MWh

Sub-Step 2c: Calculating the Build Margin (BM) emission factor ($EF_{BM,y}$)

Table A10 Installed Capacities of Northwest China Power Grid

Installed Capacity	Unit	2000	2001	2002	2003	2004	2005
Fuel-fired	MW	39864.6	42569.2	43303.2	46893.5	53744.7	60167.3
Hydro	MW	28637.8	30397	31034.7	36557	34642	38405.1
Nuclear	MW	0	0	0	0	0	0
Wind & Others	MW	0	0	0	0	0	24
Total	MW	**68502.4**	**72966.2**	**74337.9**	**83450.5**	**88386.7**	**98596.4**

Data Source: <China Electric Power Yearbook 2001-2006>

Table A11 Newly Added Installed Capacity from Year 2000-2005

	2003	**2004**	**2005**	**C-A**
	A	**B**	**C**	
Fuel-fired (MW)	20492.7	22247.5	25362.6	4869.9
Hydro (MW)	9382	10835.2	12219.8	2837.8
Nuclear (MW)	0	0	0	0
Wind & Others (MW)	122.9	276	399.5	276.6
Total（MW）	29997.6	33358.7	37981.9	19884.3
Percentage of newly installed capacity to 2005	21.02%	12.17%	0	
Percentage of newly added fuel-fired plants	60.99%			

It can be concluded from Table A11 that capacity additions from year 2003 to 2005 is closer to 20% of the total additions and it is obvious the capacity additions during year 2003 to 2005 are larger than the capacity of five plants, so year 2003 and 2005 are chosen to calculate the BM emission factor of Northwest China Power Grid.

According to Table A11 and formula (7) in section B.6.1, the EF_{BM} is calculated as:

$$EF_{BM} = 0.57395\ tCO_2e/MWh$$

Step 3: Calculating the baseline emission factor (EF_y)

According to formula (8) in section B.6.1, the baseline emission factor of Northwest China Power Grid is calculated as:

$$EF_y = 0.98768\ tCO_2e/MWh$$

The EF_y applied in this PDD is fixed for a crediting period and may be revised at the renewal of the crediting period.

Annex 4

MONITORING INFORMATION

No additional information. Please refer to the section B.7 of the PDD.