**PROJECT DESIGN DOCUMENT FORM**
**FOR CDM PROJECT ACTIVITIES (F-CDM-PDD)**
**Version 04.1**

# PROJECT DESIGN DOCUMENT (PDD)

| | |
|---|---|
| **Title of the project activity** | Xinjiang Hami Southeast Wind Zone Yandun 2nd Wind Power Project |
| **Version number of the PDD** | 02 |
| **Completion date of the PDD** | 24/12/2012 |
| **Project participant(s)** | Beijing Tianrun New Energy Investment Co., Ltd.<br>People's Republic of China |
| **Host Party(ies)** | People's Republic of China |
| **Sectoral scope(s) and selected methodology(ies)** | Sectoral Scope 1: Energy industries;<br>Consolidated baseline methodology for grid-connected electricity generation from renewable sources ---ACM0002 Version 13.0.0 |
| **Estimated amount of annual average GHG emission reductions** | 376,888t$CO_2$/yr |

## SECTION A. Description of project activity

### A.1. Purpose and general description of project activity

>>

Xinjiang Hami Southeast Wind Zone Yandun 2nd Wind Power Project (hereafter referred to as the proposed project) is a new grid-connected renewable power generation project, which is located in Hami City, Xinjiang Uygur Autonomous Region, P.R.China. The project is owned and operated by Beijing Tianrun New Energy Investment Co., Ltd.. The expected commissioning date of the proposed project is dated in June. 2016.

The project will involve the installation and operation of 80 sets of wind turbines with unit capacity of 2.5MW. The total installed capacity of the project will be 200MW, the project activity is expected to operate 2,145 hours per year and the PLF is 24.49%[1], the estimated net power supplied to the grid is 429,050MWh[2] per year. The power generated by the proposed project will be exported to Xinjiang provincial Grid, and finally to the Northwest China Power Grid (hereinafter referred to as "NWCPG").

The electricity generated by the project should have been supplied by the NWCPG prior to the start of the implementation of the project activity, which is the same as the baseline scenario.

The project transmits renewable wind power to the NWCPG, and substitutes relevant power generation by fossil fuel power plants of the NWCPG (main emissions: $CO_2$), and reduce Greenhouse Gas emissions amount to 376,888 $tCO_2e$ annually and 2,638,216 $tCO_2e$ in the first crediting period.

The Project will not only supply renewable electricity to the grid, but also contribute to sustainable development of the local community by means of:

a) Utilizing wind energy to generate electricity, saving power coal and reducing greenhouse gas emissions;
b) Reducing global emissions of greenhouses gases resulting of burning fossil fuel;
c) diversifying power sources and making use of more clean energy;
d) Providing sufficient electricity power for life and manufacture of local residents;
e) Increasing employment opportunities and incomes for local residents, improving the life quality of local residents.

### A.2. Location of project activity

#### A.2.1. Host Party(ies)

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People's Republic of China

#### A.2.2. Region/State/Province etc.

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Xinjiang Uygur Autonomous Region

#### A.2.3. City/Town/Community etc.

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Luotuojuanzi District, Hami City

#### A.2.4. Physical/ Geographical location

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The project is located in Southeast of Luotuojuanzi District, Hami City, Xinjiang Uygur Autonomous

[1] Plant Load Factor (PLF) =Annual utilization hours/8,760 =2,145/8,760=24.49%

[2] The data is sourced from the FSR

Region, P.R.China. The geographical coordinates range of the project are 94.4942°~94.5684°E, 42.3878°~42.4789°N.

The location of the proposed project activity is shown in Figure A1.

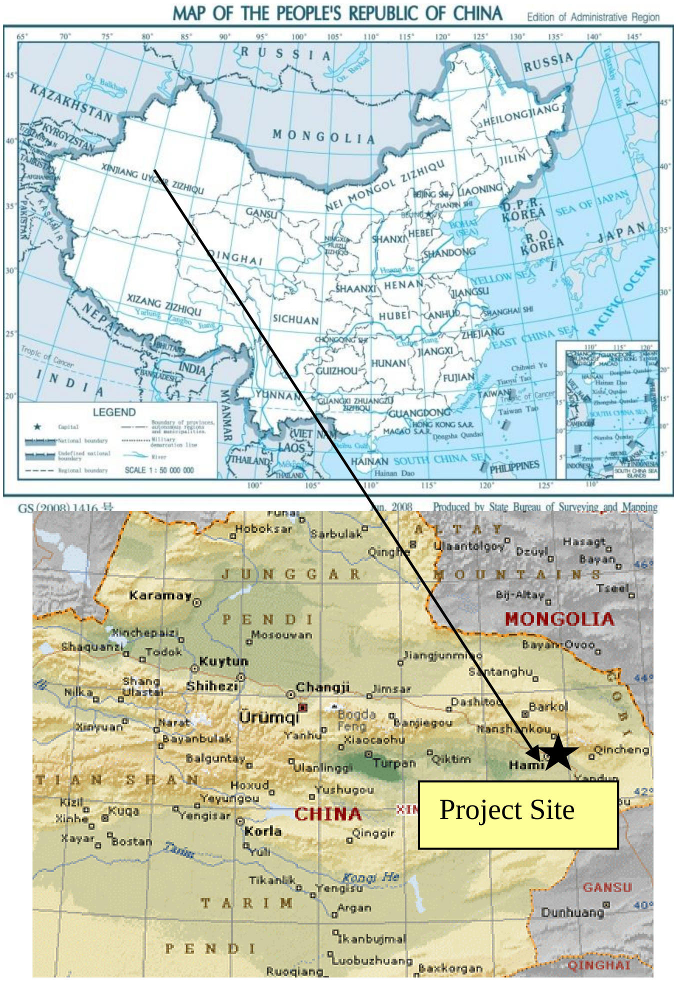


**Figure A1 The location of proposed project**

## A.3. Technologies and/or measures

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***Baseline scenario***

The electricity generated by the project would have been supplied by the NWCPG, prior to the start of the implementation of the project activity, which is the same as the baseline scenario. The NWCPG is dominated by electricity generated by fossil fuel fired power plants, whose by-products are GHGs (main emissions: $CO_2$).

***The Project Activity Scenario***

The project will employ 80 sets of wind turbines with unit capacity of 2.5MW. The total installed capacity of the project is 200MW. The project activity is expected to operate 2,145 hours per year, thus the Power Load Factor is 24.49%. The key technical parameters are provided in Table A.1:

Table A.1 Key Technical Parameters

| **Wind Turbine** | **Unit** | **Value** |
|---|---|---|
| Rated Capacity | kW | 2,500 |
| Number | set | 80 |
| Height Of Wheel Hub | m | 80 |
| Diameter of Blade | m | 106 |
| Number Of Blades | / | 3 |
| Rated Wind Speed | m/s | 12.5 |
| Cut-in Wind Speed | m/s | 3 |
| Cut-out Wind Speed | m/s | 25 |
| Swept Area | $m^2$ | 8,824 |
| **Generators** | | |
| Rated Capacity | kW | 2,600 |
| Rated Voltage | V | 690 |
| Lifetime | year | 20 |

Note: As the equipments purchase contract is not signed yet, the technical parameters are derived from the FSR of the project.

All the equipments will be purchased as new ones, thus the age of the project equipments are 0.

The power generated by the proposed project will be transmitted to the Xinjiang Grid via the 220kV Substation, and finally to the NWCPG.

The project will have a limited impact on the local environment as most of the impacts are temporary and the project will employ a series of measures to minimize the impacts. More detailed information regarding the impact on the environment is provided in Section D.1 of this PDD.

There is no technology transfer related to the project activity since all the technology employed is from domestic manufacturers.

The readings of meters will be used for calculating the emission reductions. The monitoring meter will be installed at the connected point between the proposed project and power grid, this meter measures the power supplied to the grid and the electricity use of power plant supplied by the grid.

The project owner will carry out training to enable staff become familiar with the operation of wind farm project. Besides, the manufacturer of the equipments will also provide on-site trainings regarding the turbines and generators operations.

**A.4. Parties and project participants**

| Party involved (host) indicates a host Party | Private and/or public entity(ies) project participants (as applicable) | Indicate if the Party involved wishes to be considered as project participant (Yes/No) |
|---|---|---|
| People's Republic of China (host) | Beijing Tianrun New Energy Investment Co., Ltd. (as the project owner) | Yes |

**A.5. Public funding of project activity**

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

## SECTION B. Application of selected approved baseline and monitoring methodology

### B.1. Reference of methodology

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Approved consolidated baseline and monitoring methodology ACM0002 (Version 13.0.0): *Consolidated baseline methodology for grid-connected electricity generation from renewable sources.*

*"Tool to calculate the emission factor for an electricity system"* (Version 02.2.1) is applied to calculated emission factors.

*"Tool for the demonstration and assessment of additionality"* (Version 06.1.0) is applied to demonstrate the additionality of the project.

All above methodologies and tools can be found at the UNFCCC website:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

### B.2. Applicability of methodology

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The proposed project can meet the applicability criteria of ACM0002, as described below:
As per the FSR of the proposed project,

- The project is a new grid-connected renewable power generation project activities;
- The project is a new renewable wind power plant at a site where no renewable power plant was operated prior to the implementation of the proposed project (Greenfield plant);
- The project is not an activity that involves switching from fossil fuels to renewable energy sources at the site of the proposed project;

Therefore, the methodology is applicable to the proposed project.

### B.3. Project boundary

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According to the definition of project boundary by ACM0002 (Version 13.0.0), the project boundary includes the project power plant, and all power plants connected physically to the electricity system where the proposed project is connected to.

The electricity system is defined according to "Tool to calculate the emission factor for an electricity system" (Version 02.2.1).

In this specific case, the electricity generated by the project will be transferred to the Xinjiang Grid which is connected to the NWCPG. The space boundary of this project consists of the physical and geological boundary of this proposed project, and all the other power plants connected to the NWCPG. The NWCPG is a large regional grid, which consists of sub-grids: Shaanxi Province, Gansu Province, Qinghai Province, Ningxia Hui Autonomous Region and Xinjiang Uygur Autonomous Region provincial power grids.

The greenhouse gases and emission sources included in or excluded from the project boundary are shown in below table:

Table B.1 Emissions sources included in or excluded from the Project Boundary

| | Source | Gas | Included? | Justification / Explanation |
|---|---|---|---|---|
| Baselin | | $CO_2$ | Included | Main emission source |

| | | | | |
|---|---|---|---|---|
| | $CO_2$ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity | $CH_4$ | Excluded | Minor emission source |
| | | $N_2O$ | Excluded | Minor emission source |
| Project Activity | Proposed Project | $CO_2$ | Excluded | Minor emission source |
| | | $CH_4$ | Excluded | Minor emission source |
| | | $N_2O$ | Excluded | Minor emission source |

The project boundary is shown in Figure B-1.

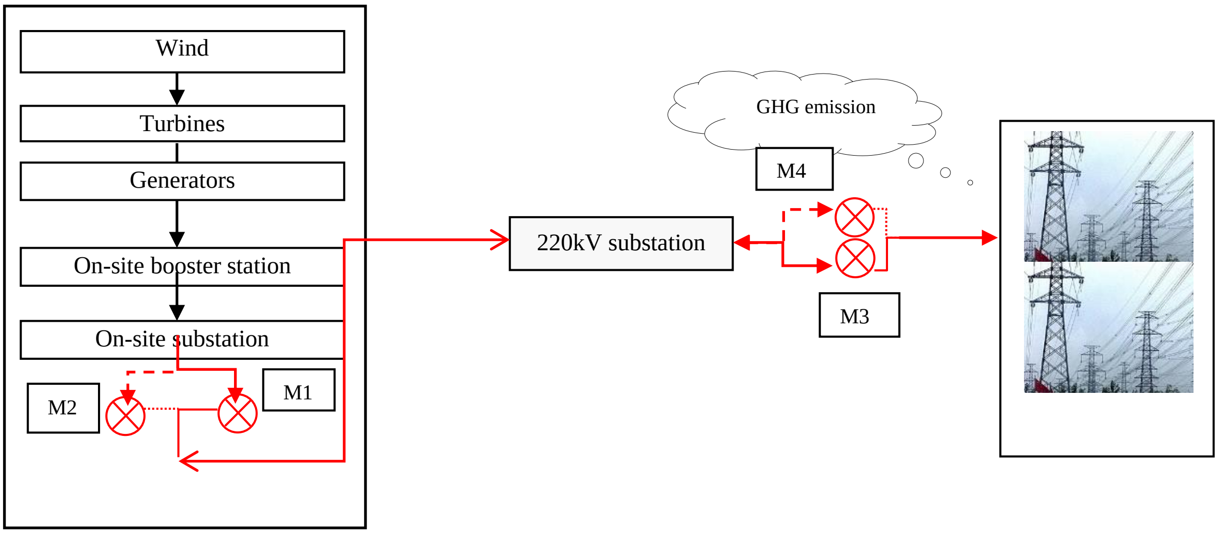


Figure B-1. Flow diagram of the project boundary

In the diagram, two monitoring systems are shown. One monitoring system installed at the project site includes the main meter M1 and backup meter M2; another monitoring system installed at the grid company includes the main meter M3 and backup meter M4. Which one of two monitoring systems will be applied by the project owner will be determined according to the future actual situation.

**B.4. Establishment and description of baseline scenario**

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The proposed project is the installation of a new grid-connected renewable power plant, and the baseline scenario is the following as per ACM0002 (Version 13.0.0):

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 (02.2.1)”.

The power generated by the proposed project is connected to Xinjiang Grid, and then to the NWCPG. Therefore, the baseline scenario of the proposed project is as follows:

The equivalent annual electricity generated by the project would have otherwise been generated by the

operation of grid-connected power plants and by the addition of new generation sources connected to the NWCPG, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1).

The basic parameters used for calculating baseline emissions of the project are provided in Table B.2:

Table B.2 Basic parameters used for calculating baseline emissions

| Parameters | Value | Data sources |
|---|---|---|
| The operating margin emission factor ( $EF_{grid,OM,y}$ ) of the NWCPG($tCO_2e$/MWh) | 0.9913 | Chinese DNA: *2012 Baseline Emission Factors for Regional Power Grids in China*. (See details in Appendix 4) |
| The build margin emission factor( $EF_{grid,BM,y}$ ) of the NWCPG($tCO_2e$/MWh) | 0.5398 | Chinese DNA: *2012 Baseline Emission Factors for Regional Power Grids in China*. (See details in Appendix 4) |
| The combined margin emission factor( $EF_{grid,CM,y}$ ) of the NWCPG($tCO_2e$/MWh) | 0.878425 | Chinese DNA: *2012 Baseline Emission Factors for Regional Power Grids in China*. (See details in Appendix 4) |
| Total net electricity supplied to grid( $EG_{facility,y}$ ,MWh) | 429,050 | FSR |

**B.5. Demonstration of additionality**

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***Prior consideration of CDM***

The starting date of the project is 2012-05-31 when the wind turbine foundation Section I 50MW construction contract signed, which is the earliest date of project construction, implementation or real action, in compliance with the latest glossary of CDM terms. The starting date is after 2008-08-02 and before the PDD GSP date of 2012-10-24.

According to Guidelines on the demonstration and assessment of prior consideration of the CDM (EB62 Annex 13 version04), the project is a "new" project activity (with a start date after 2008-08-02). The PP informed the DNA of China on 2012-10-22. The Prior CDM Consideration Form was approved by EB on 2012-10-30. The deadline sending the notification within 6 months of the project activity start date to the respective authorities has been met.

The additionality of the project activity is demonstrated by using the steps described in the "Tool for the Demonstration and Assessment of Additionality" (Version 06.1.0) as proposed on the 69th EB meeting.

**Step 1: Identification of Alternatives to the Project Activity Consistent with Current Laws and Regulations**

**Sub-Step 1a. Define alternatives to the project activity**

According to Clause (4) quoted from "*Tool for the demonstration and assessment of additionality*" (Version 06.1.0), project activities that apply this tool in context of approved consolidated methodology ACM0002 (Version 13.0.0), only need to identify that there is at least one credible and feasible alternative that would be more attractive than the proposed project activity;

Therefore, these alternatives are to include:

a) The proposed project activity undertaken without being registered as a CDM project activity.

b) Supply of equivalent annual electricity output supplied by NWCPG.

**Outcome of Step 1a: Identified realistic and credible alternative scenario(s) to the project activity**

In conclusion, realistic and credible alternatives available to the project that provide outputs or services comparable to the project activity include:

a) The proposed project activity undertaken without being registered as a CDM project activity.

b) Supply of equivalent annual electricity output supplied by NWCPG.

**Sub-Step1b. Consistency with Mandatory Laws and Regulations**

Alternative a) and b) both comply with China current law and regulations, but doesn't belong to mandatory scope.

**Outcomes of sub-step 1b:**

Therefore, alternative a) and alternative b) comply with China's regulations and will be analyzed in Step 2 as potential alternative scenarios.

**Outcome of step 1**

The alternatives are identified reasonable and in line with Current Laws and Regulations.

**Step 2 Investment Analysis**

Determine whether the proposed project activity alternative a) is not:

a) The most economically or financially attractive; or

b) Economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs)

To conduct the investment analysis, use the following sub-steps:

**Sub-step 2a. Determine appropriate analysis method**

The additionality tool provides three investment analysis options which are: simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III). Since this proposed project has the revenues from the sales of electricity and the second alternative does not involve an investment, we choose option III, i.e. benchmark analysis to this proposed project.

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

According to the State Power Corporation of China Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects [3], published by China Electric Power Press, the post-tax Project IRR of electric power project should not be below the threshold of 8%.

**Sub-step 2c. Calculation and comparison of financial indicators (only applicable to options II and III):**

All input values used for IRR calculation are from the approved FSR, and the FSR was completed by an independent and certified institute and approved by government, the FSR therefore can be considered as an independent and realistic assessment of the proposed project activity, including the parameters listed and used as input values in the IRR calculation.

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

The basic parameters for calculating of the key financial parameters are provided in Table B.3:

Table B.3 Basic Financial Parameters of the Project

| Basic Parameters | Unit | Value | Source |
|---|---|---|---|
| Installed Capacity | MW | 200 | FSR |
| Annual net electricity supplied to the grid | MWh | 429,050 | |
| Static Total Investment | CNY | 1,834,892,000 | |
| Capital portion | % | 20 | |
| Electricity tariff (with VAT) | CNY/kWh | 0.58[4] | |
| VAT | % | 17 | |
| Urban Construction Tax | % | 7 | |
| Surcharge for Education | % | 5 | |
| Corporate Income Tax | % | 25 | |
| Depreciation Rate | % | 6.47 | |
| Period of Depreciation | Years | 15 | |
| Residual Rate | % | 3 | |
| Annual Operation & Maintenance Cost | CNY | 63,597,000 | |
| Operating Period | Years | 20 | |
| CER price | CNY /$tCO_2e$ | 100 | Expected |

The post-tax Project IRR of the project activity is shown in Table B.4.

Table B.4 post-tax Project IRR of the project activity

| | Post-tax Project IRR |
|---|---|
| Without CDM revenue | 6.04% |
| With CDM revenue | 8.33% |

Based on the benchmark IRR for financial evaluation according to the *Economical Assessment Temporary Regulation on Electrical Technology Improvement Project*, the post-tax Project IRR of a wind power project based should not be lower than the benchmark of 8%. The post-tax Project IRR is 6.04% without CDM revenue which is lower than the benchmark rate of 8%. So the project faces obvious financial difficulties without CDM revenue. But the post-tax Project IRR will achieve 8.33% with CER income. Therefore, the CDM revenue can improve the economical attraction of the project.

**Sub-step 2d. Sensitivity analysis (only applicable to options II and III):**

The sensitivity analysis is conducted to check whether, under reasonable variations in the critical assumptions, the results of the analysis remain unaltered.

According to GUIDELINES ON THE ASSESSMENT OF INVESTMENT ANALYSIS (Version 05, EB 62 Annex 5), the static total investment constitutes more than 20% of total project costs. The product of electricity tariff and annual net electricity supplied to the grid constitute more than 20% of the total revenue of the project. The total O&M throughout the project lifetime also accounts for more than 20% of the project cost, hence, following parameters are assumed to be critical assumptions:

- Static Total Investment
- Annual O&M Cost

[4] Based on the tariff document of Fa gai jia ge [2009] No.1906

- Electricity tariff
- Annual net electricity supplied to the grid

According to the FSR, sensitivity analysis was conducted to check under variation of ±10%. So we make a sensitivity analysis under variations of ±10% in the critical assumptions. Table B.5 summarizes the results of the sensitivity analysis, while Fig. B.2 provides a graphic depiction.

Table B.5 Impact of Variations in Critical Assumptions on post-tax Project IRR

| | -10% | -5% | 0% | 5% | 10% |
|---|---|---|---|---|---|
| Static Total Investment | 7.59% | 6.78% | 6.04% | 5.34% | 4.69% |
| Annual O&M Cost | 6.52% | 6.28% | 6.04% | 5.79% | 5.55% |
| Electricity tariff | 4.41% | 5.24% | 6.04% | 6.80% | 7.53% |
| Annual net electricity supplied to the grid | 4.41% | 5.24% | 6.04% | 6.80% | 7.53% |

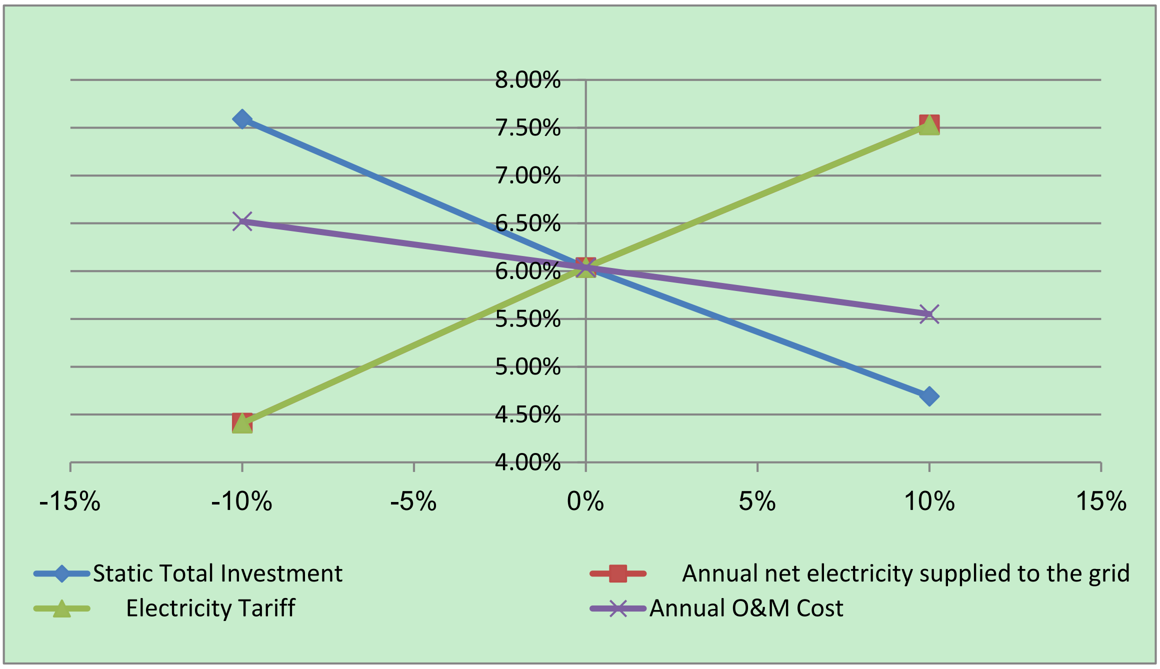


Fig. B.2 post-tax Project IRR Sensitivity Analysis

It can be seen that with the parameters under variations of ±10%, the benchmark of 8% can't be achieved. It can be further analyzed that when the variables reach the following range, the project IRR (after tax) can reach benchmark IRR (8%).

- Static Total Investment reduce by 12.38%
- Annual O&M Cost reduce by 42.2%
- Electricity tariff increase by 13.30%
- Annual net electricity supplied to the grid increase by 13.30%

However, none of these variation range can be achieved due to the following reasons:

- Static total investment

  If static total investment decreases by 12.38%, the post-tax Project IRR of the project can reach benchmark of 8%. However, Most of the static total investment will be spent on purchase and installation of equipment such as wind turbines, wind towers and supporting equipments. The

purchasing prices for wind turbines, raw materials, fuel and power, construction materials has kept increasing[5]. This trend seems unchangeable for a short period of time. Therefore, it is unlikely to improve the economic attraction due to the decrease in static total investment.

- Annual O&M Cost

  As shown in Figure B.2, the impact of annual O&M costs on sensitivity analysis is comparatively not so significant as other three variables. If the Annual O&M Cost decreases by 42.2%, the Post-tax project IRR of the project can reach benchmark of 8%. The annual O&M Cost mainly includes overhaul cost, employee wage and materials cost. Due to sustained increases in employee wage and material price, it is unlikely that the annual operation & maintenance cost will reduce during the project lifetime[6]. Therefore, the annual operational cost won't decrease, and it is unlikely to improve the financial attraction through the decrease in annual O&M cost.

- Electricity tariff

  If the Electricity tariff increases by 13.30%, the post-tax Project IRR of the project can reach benchmark of 8%. The Electricity tariff applied by the proposed project sourced from the FSR which is in accordance with the notification of China NDRC on wind power grid price policy (Fa gai jia ge [2009] No.1906), the grid price for the projects that were approved after August 1, 2009 should implement this new regulation. The project was approved in year 2012, and in the area of type III, thus, the Electricity tariff for the project is 0.58CNY RMB/kWh (with VAT)[7], the same with the one estimated in the FSR. Therefore, the Electricity tariff used by the IRR calculation is credible. Moreover, the electricity tariff of wind farm project is regulated and controlled by the central government, only adjusted when there is clear direction from NDRC as a result of a large change in power demand. By now, the only official applicable electricity tariff guidance document of wind farm projects is still the one mentioned above which was published on July 20, 2009 and effected from August 1, 2009. Therefore, an increase of 13.30% in the electricity tariff is highly unlikely, and as such, the IRR is not likely to reach the 8% benchmark.

- Annual net electricity supplied to the grid

  If the Annual net electricity supplied to the grid increases by 13.30%, the post-tax Project IRR of the project can reach benchmark of 8%. According to the FSR of the proposed project, the annual power generation is estimated basing on the on-site wind data measurements from Jan. 2010 to Dec. 2010 and the long term (1981-2010)[8] weather statistic data provided by local meteorological station. And the annual power generation is calculated by the professional WASP software, which is used by wind developers and turbines manufacturers worldwide. These data are not supposed to vary significantly during the Project lifetime (20 years). On the other hand, the installed capacity of the Project is fixed during the project lifetime. Therefore, it is unlikely to increase Annual net electricity supplied to the grid by 13.30%.

**Outcome of step 2**

The results of the above analysis indicate that the project faces significant economic and financial difficulties without CDM revenue.

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[5] Indices of Purchasing Prices of Raw Materials, Fuel and Power in 2009 from National Bureau of Statistics of China

[6] China Statistical Yearbook 2008 (http://www.stats.gov.cn/tjsj/ndsj/2008/indexch.htm) issued by National Bureau of Statistics of China. Related indices of employee wage are 113% in 2003, 114.1% in 2004, 114.6% in 2005, 114.4% in 2006, and 118.7% in 2007 respectively with preceding year of 100% (Source: Table 4-23, Chapter 4, China Statistical Yearbook 2008). Related indices of material price are 104.8% in 2003, 111.4% in 2004, 108.3% in 2005, 106.0% in 2006, and 104.4% in 2007 respectively (Source: Table4-23, Chapter 8, China Statistical Yearbook 2008).

[7] http://www.ndrc.gov.cn/zcfb/zcfbtz/2009tz/t20090727_292827.htm

[8] Sourced from FSR

**Step 3 Barrier Analysis**

N/A

**Outcome of step 3**

N/A

**Step 4 Common Practice Analysis**

According to the *"Tool for the demonstration and assessment of additionality"* (Version 06.1.0), for the common practice analysis, four types of measures are currently covered in the framework:

(a) Fuel and feedstock switch;

(b) Switch of technology with or without change of energy source (including energy efficiency improvement as well as use of renewable energies);

(c) Methane destruction;

(d) Methane formation avoidance.

The proposed project activity, as a wind farm project, is not a first-of-its kind project and belongs to the type (b) of measures above.

Therefore, the the common practice is analyzed through the following 4 steps:

***Step 1: calculate applicable capacity or output range as +/-50% of the design capacity or output of the proposed project activity.***

The applicable output range of the proposed project activity is 100MW to 300MW.

***Step 2: In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity and have started commercial operation before the start date of the project. Note their number $N_{all}$. Registered CDM project activities and projects activities undergoing validation shall not be included in this step;***

a) *Applicable geographical area*

Xinjiang Uygur Autonomous Region is selected as the applicable geographical area for the common practice, and the reasons are detailed as below:

- The investment environment of each province in China is different[9]. This is due to a number of factors including the economic development level, the industrial structure, and the fundamental infrastructure of the province, the development strategy and the policy framework. These can all affect the final investment decision;
- The unique geological conditions in Xinjiang Uygur Autonomous Region results in the different wind power resource[10], compared to the other provinces connected to NWCPG;

[9] http://www.shihang.org/zh/news/2006/11/11/chinese-cities-vary-widely-local-government-effectiveness-investment-climate-quality-life

[10] http://www.ndrc.gov.cn/jggl/jggs/t20090727_292846.htm

- Finally, a number of other key economic factors influencing power generation projects vary from province to province, including the tariff rates, the cost of labor and services, and the types of loan that can be obtained. These all vary between provinces[11].

Thus, the power plants within the same province are therefore selected for the common practice analysis..

*b)* $N_{all}$

Table B-6 gives the definitions of the projects under $N_{all}$, $N_{similar}$, and $N_{diff}$.

[11]Statistical Communiques of the All Provinces in China on the 2011 Provincial Economic and Social Development, published in the website of the National Bureau of Statistics of China, http://www.stats.gov.cn/tjgb/

**Table B-6 The definitions of the projects under $N_{all}$, $N_{similar}$, and $N_{diff}$**

<table>
<tr><th colspan="3">Description</th><th>CDM Exclusion</th><th>Applicable Geographical Area</th><th>Applicable Output Range</th><th>Applicable Date of Commercial Operation</th></tr>
<tr><td rowspan="5">Electricity generation projects under $N_{all}$ = $N_{non\text{-}renewable}$ + $N_{other\text{-}renewable}$ + $N_{wind\ before\ 2002}$ + $N_{diff\ wind\ after\ 2002}$ + $N_{similar\ wind\ after\ 2002}$</td><td rowspan="4">Different projects that apply "different technologies"* under $N_{diff}$ = $N_{non\text{-}renewable}$ + $N_{other\text{-}renewable}$ + $N_{wind\ before\ 2002}$ + $N_{diff\ wind\ after\ 2002}$</td><td>$N_{non\text{-}renewable}$: Electricity generation projects which apply the non-renewable source or fuel but not wind power</td><td rowspan="5">$N_{all}$ excluding the registered CDM project activities and project activities undergoing validation</td><td rowspan="5">In Xinjiang Uygur Autonomous Region</td><td rowspan="5">100 MW ~ 300 MW</td><td rowspan="5">Commercial operation Started before the project starting date of 2012-05-31 (the starting date before the PDD GSP date).</td></tr>
<tr><td>$N_{other\text{-}renewable}$: Electricity generation projects which apply the renewable source or renewable fuel excluding wind source</td></tr>
<tr><td>$N_{wind\ before\ 2002}$: Wind power projects with the starting date before 10 Feb 2002</td></tr>
<tr><td>$N_{diff\ wind\ after\ 2002}$: Wind power projects with the starting date on or after 10 Feb 2002 which apply different technology from the proposed project</td></tr>
<tr><td>Similar projects under $N_{similar}$ = $N_{similar\ wind\ after\ 2002}$</td><td>$N_{similar\ wind\ after\ 2002}$: Wind power projects with the starting date on or after 10 Feb 2002 which apply similar technology as the proposed project</td></tr>
</table>

* Paragraph 9 of the "*Tool for the Demonstration and Assessment of Additionality"* defines "different technologies". Accordingly, non-renewable power projects ($N_{non\text{-}renewable}$) and other renewable power projects than wind power ($N_{other\text{-}renewable}$), are classified to the ones with "different technologies", due to their different energy source/fuel (Clause (a) in Paragraph 9) from wind power.

In addition, on 10 Feb 2002, China implemented power sector reform to establish a more commercialized power market in China[12]. Since investment climate and market condition for power project development has changed significantly since 10 Feb 2002, wind power projects with the starting date before 10 Feb 2002 ($N_{wind\ before\ 2002}$) are classified to the ones with "different technologies", due to the promotional policies and legal regulations (Clause (d) in Paragraph 9) they were facing which is distinguished from successive wind power projects.

[12] Chinese National Development and Reform Commission, Separate Power Plants from Network and Compete in Price to Enter Network, http://www.ndrc.gov.cn/xwfb/t20050708_28096.htm.

According to the publicly-available statistics of installed wind power in China[13], there is no potential project found under ($N_{diff\ wind\ after\ 2002} + N_{similar\ wind\ after\ 2002}$) falling into conditions of Table B-6.

Therefore, $N_{diff\ wind\ after\ 2002} = 0$ and $N_{similar\ wind\ after\ 2002} = 0$. In other words, there are no similar projects under $N_{similar}$, then $N_{similar} = N_{similar\ wind\ after\ 2002} = 0$.

Assume $N_{diff}$ = n, then $N_{all} = N_{similar} + N_{diff} = 0 + n = n$

***Step 3: Within plants identified in Step 2, identify those that apply technologies different than the technology applied in the proposed project activity. Note their number $N_{diff}$.***

As analyzed in Step 2, assume $N_{diff}$ = n.

***Step 4: Calculate factor F=1- $N_{diff}/N_{all}$ representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity.***

As it can be seen from the analysis above, $N_{all} = N_{diff} = n$
Therefore,

$F = 1 - N_{diff}/N_{all} = 1 - n/n = 0$

$N_{all} - N_{diff} = n - n = 0$

As per the *Tool for the Demonstration and Assessment of Additionality*, when the factor *F* is greater than 0.2 and $N_{all}$-$N_{diff}$ is greater than 3, the project activity is considered to be a "common practice". Thus, the proposed project is unlikely to be a common practice in Xinjiang Uygur Autonomous Region.

**<u>Outcome of step 4</u>**

Based on the common practice analysis above, it is confirmed that the project is not a common practice.

**Summary**

The project faces investment difficulties which would prevent the implementation of the proposed project activity without CDM. CDM helps to overcome these difficulties. If the project could not be implemented, the equivalent electric power would be supplied by the NWCPG, which is highly dependent on fossil fired power plants, leading higher GHG emissions. Hence, this specific project activity isn't baseline scenario, and it is additional.

**B.6. Emission reductions**

**B.6.1. Explanation of methodological choices**

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[13] "Statistics of domestic wind farm installation capacity in 2007", Shi Pengfei, downloadable from http://www.cwea.org.cn/download/display_info.asp?id=25;
"Statistics of domestic wind farm installation capacity in 2008", Shi Pengfei, downloadable from http://www.cwea.org.cn/download/display_info.asp?cid=2&sid=&id=31;
"Statistics of domestic wind farm installation capacity in 2009", Chinese Wind Energy Assosiation (CWEA), downloadable from http://www.cwea.org.cn/download/display_info.asp?cid=2&sid=&id=36;
"Statistics of domestic wind farm installation capacity in 2010", Chinese Wind Energy Assosiation (CWEA), downloadable from http://www.cwea.org.cn/download/display_info.asp?id=39;
"Statistics of domestic wind farm installation capacity in 2011", Chinese Wind Energy Assosiation (CWEA), downloadable from http://www.cwea.org.cn/download/display_info.asp?id=44 ;
http://cdm.unfccc.int/Projects/registered.html.

As per ACM0002 and *Notice on 2012 Baseline Emission Factors for Regional Power Grids in China*[14] are applied as the following steps:

**I.** Calculating the Baseline Emissions（$BE_y$）
**II.** Calculating the Project Emissions（$PE_y$）
**III.** Calculating the Emission Reductions（$ER_y$）

***I. Calculating the Baseline Emissions（BEy）***

The baseline scenario of the project is: electricity delivered to the grid by the project would have otherwise been generated by the operation of grid-connected power plants and addition of new generation sources. The baseline emissions calculated as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y} \quad \text{(Equation B.1)}$$

Where:

$BE_y$ = Baseline emissions in year y ($tCO_2e$)

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh)

$EF_{grid,CM,y}$ = Combined margin $CO_2$ emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1) ($tCO_2e/MWh$)

The project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, according to the methodology ACM0002 (Version 13.0.0),

$$EG_{PJ,y} = EG_{facility,,y} \quad \text{(Equation B.2)}$$

Where:

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh)

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in *y* (MWh)

According to the methodology ACM0002 (Version 13.0.0), $EG_{facility,y}$ is the quantity of net electricity generation supplied by the project plant/unit to the grid. It shall be determined as a difference between (i) quantity of electricity supplied by the project plant/unit to the grid and quantity of electricity delivered to the project plant/unit from the grid.

Hence, $EG_{facility,y} = EG_{export,y} - EG_{import,y}$ (Equation B.3)

Where,

[14] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2975.pdf

$EG_{export,y}$ = quantity of electricity supplied by the project plant/unit to the grid.
$EG_{import,y}$ = quantity of electricity delivered to the project plant/unit from the grid.

According to ACM0002 (Version 13.0.0), the calculation of emission factor should use the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1). The $CO_2$ emission factor for the displacement of electricity generated by power plants in an electricity system is determined by calculating the "operating margin" (OM) and "build margin" (BM) as well as the "combined margin" (CM).

The tool provides procedures to determine the following parameters:

| Parameter | SI Unit | Description |
|---|---|---|
| $EF_{grid,CM,y}$ | $tCO_2e/MWh$ | Combined margin $CO_2$ emission factor for grid connected power generation in year *y* |
| $EF_{grid,BM,y}$ | $tCO_2e/MWh$ | Build margin $CO_2$ emission factor for grid connected power generation in year *y* |
| $EF_{grid,OM,y}$ | $tCO_2e/MWh$ | Operating margin $CO_2$ emission factor for grid connected power generation in year *y* |

Project participants shall apply the following six steps:

STEP 1. Identify the relevant electricity system.
STEP 2. Choose whether to include off-grid power plants in the project electricity system
STEP 3. Select a method to determine the operating margin (OM).
STEP 4. Calculate the operating margin emission factor according to the selected method.
STEP 5. Calculate the build margin (BM) emission factor.
STEP 6. Calculate the combined margin (CM) emissions factor.

**Step 1. Identify the relevant electricity system.**

As described in B.3 above, the electricity displaced by the proposed project should be the electricity generated by NWCPG. Therefore, NWCPG is identified as the relevant electric power system. And the Chinese DNA has also published a delineation of the project electricity system and the connected electricity system.

According to the Chinese DNA guidance[15], NWCPG is composed of Shaanxi Power Grid, Gansu Power Grid, Qinghai Power Grid, Ningxia Power Grid and Xinjiang Power Grid. NWCPG is then defined in the proposed project boundary.

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

The methodological tool for calculating operating margin and build margin emission factors provides two options:

Option I: Only grid power plants are included in the calculation
Option II: Both grid power plants and off-grid power plants are included in the calculation.

As this project is grid power plants, option I is chose to calculate emission factor.

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[15] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2975.pdf

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

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

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

According to the *Tool to calculate the emission factor for an electricity system* (version 02.2.1), the simple OM method (option a) can only be used if low-cost/ must- run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

The low-cost must run resources constitute less than 50% of total grid generation in NWCPG, the percentage of the low-cost must run resources in the recent 5 years are: 24.69% in 2006, 22.43% in 2007 and 21.82% in 2008, 24.41% in 2009, 29.71% in 2010[16], which accords with the defined condition of method (a), but not method (d). Consequently, Simple OM method is selected to calculate the Operating Margin emission factor of the proposed project.

On the other hand, among these methods, dispatch analysis, cannot be used, because dispatch data, let alone detailed dispatch data, are not available to the public or to the project participants. For the same reason, the simple adjusted OM methodology cannot be used. The average OM does not take into account the non-dispatchable nature of low-cost/must-run resources and as low-cost/must-run resources constitute less than 50% of total grid generation, we have selected the Simple OM method as the most appropriate method.

In accordance with the 'Tool to calculate the emission factor for an electricity system', the OM is calculated according to the 'ex ante option': If the ex ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation.

**Step 4. 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 ($tCO_2$/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units.

The simple OM may be calculated:

- Option A: Based on the net electricity generation and a $CO_2$ emission factor, of each power unit; or
- Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

We calculate the OM emission factor according to Option B of the Simple OM method, as data required for Option A is not available to the public or to the project participants. Where Option B is used, the simple

[16] Data source: China Electric Power Yearbook 2007-2011.

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:

$$EF_{grid,OMsimple,y} = \frac{\sum_i \left( FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y} \right)}{EG_y}$$ Equation (B.4)

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/unit, in year *y* (MWh)
*i*: All fossil fuel types combusted in power sources in the project electricity system in year y,
*y*: The relevant years as per the data vintage chosen in Step 3.

***Choice of aggregated data sources***

The published OM emission factor calculates the emission factor directly from published aggregated data on fuel consumption, net calorific values, and power supply to the grid and IPCC default values for the $CO_2$ emission factor.

***Calculation of the OM emission factor as a three-year full generation weighted average***

On the basis of these data, the Operating Margin emission factors for 2008, 2009 and 2010 are calculated. The three-year average is calculated as a full-generation-weighted average of the emission factors. For details we refer to the publications cited above and the detailed explanations and demonstration of the calculation of the OM emission factor provided in Appendix 4. The Operation Margin Emission Factor is calculated as $EF_{grid,OMsimple,y}$ = 0.9913$tCO_2$e/MWh.

The calculation of the OM emission factor is done once (*ex ante*) and will *not* be updated during the first crediting period. This has the added advantage of simplifying monitoring and verification of emission reductions.

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

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

The sample group of power units m used to calculate the build margin should be determined as per the following procedure, consistent with the data vintage selected above:

(a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-units}}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-units}}$, in MWh);

(b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities ($AEG_{total}$, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and

that comprise 20% of $AEG_{total}$ (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\%}$) and determine their annual electricity generation ($AEG_{SET-\geq 20\%}$, in MWh);

(c) From $SET_{5-units}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation ($SET_{sample}$);

It is very difficult to obtain the data of the five power units started to supply electricity to the grid most recently because these data are considered as confidential business matter in China. So, $SET_{\geq 20\%}$ is selected as $SET_{sample}$. Based on relevant data released by Chinese DNA, none of the power units in the selected $SET_{sample}$ started to supply electricity to the grid more than 10 years ago. Hence the selected $SET_{sample}$ is used to calculate the build margin.

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

$$EF_{\text{grid},BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \qquad \text{Equation (B.5)}$$

Where:

$EF_{grid,BM,y}$: Build margin $CO_2$ emission factor in year *y* ($CO_2$/MWh)
$EG_{m,y}$: Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)
$EF_{EL,m,y}$: $CO_2$ emission factor of power unit m in year *y* ($tCO_2$/MWh)
*m* : Power unit include in the build margin
*y* :Most recent historical year for which power generation data is available

The sample *m*, according to the methodology, should be over the latest 5 power plants added to the grid, or over the last added power plants accounting for at least 20% of power generation. We apply an indirect approach based on the EB decision[17] as mentioned in step 4.

First we calculate the newly–added installed capacity and the share of each power generation technology in the total capacity. Second, we calculate the weights of each power generation technology in the newly-added installed capacity. Third, emission factors for each fuel group are calculated on the basis of an advanced efficiency level for each power generation technology and a weighted average carbon emission factor on the basis of IPCC default carbon emission factors of individual fuels.

Since the exact data are aggregated, the calculation will apply the following method: We calculate the share of the $CO_2$ emissions of solid fuel, liquid fuel and gas fuel in total emissions respectively by using the latest energy balance data available; the calculated shares are the weights.

Using the emission factor for advanced efficient technology we calculate the emission factor for thermal power; the BM emission factor of the power grid will be calculated by multiplying the emission factor of the thermal power with the share of the thermal power in the most recently added 20% of total installed capacity.

Detailed steps and formulas are as below:

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[17] This is in accordance with the "Request for guidance: Application of AM0005 and AMS-I.D in China", a letter from DNV to the Executive Board, dated 07/10/2005, available online at: http://cdm.unfccc.int/UserManagement/FileStorage/6POIAMGYOEDOTKW25TA20EHEKPR4DM.

***Calculate the share of $CO_2$ emissions of the solid, liquid and gaseous fuels in total emissions respectively.***

$$\lambda_{Coal} = \frac{\sum_{i \in COAL,m} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{\sum_{i,m} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}$$ Equation (B.6)

$$\lambda_{Oil} = \frac{\sum_{ieOIL,m} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{\sum_{i,m} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}$$ Equation (B.7)

$$\lambda_{Gas} = \frac{\sum_{ieGAS,m} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{\sum_{i,m} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}$$ Equation (B.8)

Where:
$\lambda_{Coal}$, $\lambda_{Oil}$ and $\lambda_{Gas}$ respectively refers to weights of $CO_2$ emissions of solid, liquid and gas fuel in total emissions; *Coal, Oil and Gas* respectively refers to the group of solid, liquid, and gas fuels;
$FC_{i,m,y}$ is the amount of fuel *i* consumed in province *m* in year *y*;
$NCV_{i,y}$ is the net calorific value (energy content) of fossil fuel *i* in year *y*;
$EF_{CO2,i,y}$ is the $CO_2$ emission factor of fossil fuel *i* in year *y*.

For the detailed information, please see the Appendix 4.

***Calculation of Emission Factor of Relevant Thermal Power***

The emission factor of thermal is then calculated by using a formula as follows:

$$EF_{Thermal,adv} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv}$$ Equation (B.9)

Where:
$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ respectively refers to the emission factor representing best technology commercially available for fuel of coal, oil or gas fired power plants.
$\lambda_{Coal}$, $\lambda_{Oil}$ and $\lambda_{Gas}$ respectively refers to the weighing of capacity additions for fuel of coal, oil or gas fired power plants.

***Calculate BM of the power grid:***

The calculation of the BM is based on the results above and the weighing of thermal power of recent 20% capacity additions.

$$EF_{grid,BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal}$$ Equation (B.10)

Where:
$CAP_{Total}$ is the total of new capacity additions;

$CAP_{Thermal}$ is the new capacity addition of thermal power.

The calculation of the BM emission factor is done once (*ex ante*) and will *not* be updated during the first crediting period. This has the added advantage of simplifying monitoring and verification of emission reductions. For details we refer to the publications cited above and the detailed explanations and demonstration of the calculation of the BM emission factor provided in Appendix 4. The Build Margin Emission Factor is calculated as $EF_{grid,BMsimple,y}$ = 0.5398t$CO_2$e/MWh.

**Step 6. Calculate the combined margin emission factor**

The Baseline Emission Factor is calculated as a Combined Margin, using a weighted average of the Operating Margin and Build Margin

To calculate $EF_{grid,CM,y}$ with the combined margin (CM), the following equation is used:

$$EF_{grid,CM,y} = w_{OM} \times EF_{grid,OM,y} + w_{BM} \times EF_{grid,BM,y} \quad \text{Equation (B.11)}$$

Where:

$EF_{grid,BM,y}$: Build margin $CO_2$ emission factor in year *y* (t$CO_2$/MWh)
$EF_{grid,OM,y}$: Operating margin $CO_2$ emission factor in year y (t$CO_2$/MWh)
$w_{OM}$: Weighting of operating margin emissions factor (%)
$w_{BM}$: Weighting of build margin emission factor (%)

According to the *2012 Baseline Emission Factors for Regional Power Grids in China* renewed by Director Office of National Climate Change Coordination of Chinese DNA on October. 15, 2012, the Operating Margin Emission Factor ( $EF_{grid,OM,y}$ ) of the NWCPG is **0.9913t$CO_2$e/MWh** and the Build Margin Emission Factor ( $EF_{grid,BM,y}$ ) is **0.5398t$CO_2$e/MWh.** The defaults weights value for waste energy recovery projects during the first crediting period are used as specified in the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1).

$$w_{OM} = 0.75\,;\, w_{BM} = 0.25$$

Using above mentioned values the Combined Baseline Emission Factor of the NWCPG corresponds to **0.878425t$CO_2$e/MWh.**

The calculation of the CM emission factor is done once (*ex ante*) and will *not* be updated during the first crediting period.

### *II. Calculating the Project Emissions($PE_y$)*

According to the methodology, there are no expected project emissions for a wind power project.
Therefore, $PE_y = 0$.

### *III. Calculating the Leakage（$LE_y$）*

According to the methodology, no leakage emissions are considered.

***IV. Calculating the Emission Reductions（$ER_y$）***

Emission reductions will be estimated based on the baseline emission, the project emission and the leakage emission. The emission reduction $ER_y$ due to the project activity during a given year *y* is calculated as follows:

$$ER_y = BE_y - PE_y - LEy \qquad \text{Equation (B.12)}$$

Based on formula (B.1), (B.2), (B.3) and (B.12),

$$ER_y=BE_y=EG_{facility,y} \times EF_{grid,CM,y}=( EG_{export,y} - EG_{import,y}) \times EF_{grid,CM,y} \qquad \text{Equation (B.13)}$$

**B.6.2. Data and parameters fixed ex ante**

| **Data / Parameter** | $FC_{i,y}$ |
|---|---|
| **Unit** | $10^4$t, $10^7$m$^3$ |
| **Description** | Amount of fossil fuel type *i* ( in a mass or volume unit) consumed in NWCPG in year *y* |
| **Source of data** | *China Energy Statistical Yearbook 2009-2011* |
| **Value(s) applied** | Refer to Appendix 4 for details |
| **Choice of data or Measurement methods and procedures** | Data that is collected from the Chinese official statistics. |
| **Purpose of data** | Used for baseline emission calculation |
| **Additional comment** | Official data |

| **Data / Parameter** | $EF_{CO2,i,y}$ |
|---|---|
| **Unit** | kg$CO_2$/TJ |
| **Description** | $CO_2$ emission factor of fossil fuel type *i* in year y |
| **Source of data** | 2006 IPCC Guidelines for National Greenhouse Gas Inventories ,Volume 2 Energy |
| **Value(s) applied** | Refer to Appendix 4 for details |
| **Choice of data or Measurement methods and procedures** | Data that is collected from the IPCC because the local data is not available. |
| **Purpose of data** | Used for baseline emission calculation |
| **Additional comment** | Official data |

| | |
|---|---|
| **Data / Parameter** | $NCV_{i,y}$ |
| **Unit** | GJ/mass or volume unit |
| **Description** | Net calorific value (energy content) of fossil fuel type *i* in year *y* |
| **Source of data** | China Energy Statistical Yearbook 2009-2011 |
| **Value(s) applied** | Refer to Appendix 4 for details |
| **Choice of data or Measurement methods and procedures** | Data that is collected from the Chinese official statistics. |
| **Purpose of data** | Used for baseline emission calculation |
| **Additional comment** | Official data |

| | |
|---|---|
| **Data / Parameter** | *CAP* |
| **Unit** | MW |
| **Description** | Installed capacities of NWCPG |
| **Source of data** | China Electric Power Yearbook 2009-2011 |
| **Value(s) applied** | Refer to Appendix 4 for details |
| **Choice of data or Measurement methods and procedures** | Data that is collected from the official statistics. |
| **Purpose of data** | Used for baseline emission calculation |
| **Additional comment** | Official data |

| | |
|---|---|
| **Data / Parameter** | $EG_y$ |
| **Unit** | MWh |
| **Description** | Net electricity generated and delivered to NWCPG in year *y* |
| **Source of data** | China Electric Power Yearbook, 2009-2011 |
| **Value(s) applied** | Refer to Appendix 4 for details |
| **Choice of data or Measurement methods and procedures** | Data that is collected from the Chinese official statistics. |
| **Purpose of data** | Used for baseline emission calculation |
| **Additional comment** | Official data |

| | |
|---|---|
| **Data / Parameter** | *Auxiliary Power Ratio* |
| **Unit** | % |
| **Description** | The auxiliary power ratio of source *j* in NWCPG |
| **Source of data** | China Electric Power Yearbook 2009-2011 |
| **Value(s) applied** | Refer to Appendix 4 for details |
| **Choice of data or Measurement methods and procedures** | Data that is collected from the official statistics. |
| **Purpose of data** | Used for baseline emission calculation |
| **Additional comment** | Official data |

| | |
|---|---|
| **Data / Parameter** | $EF_{Coal, Adv}$ |
| **Unit** | % |
| **Description** | The fuel consumption rate of coal-fired power plants which are applied by the most advanced commercialized technologies. |
| **Source of data** | China DNA |
| **Value(s) applied** | 39.65% |
| **Choice of data or Measurement methods and procedures** | Data that is collected from the official statistics. |
| **Purpose of data** | Used for baseline emission calculation |
| **Additional comment** | Official data |

| | |
|---|---|
| **Data / Parameter** | $EF_{Oil, Adv}$ |
| **Unit** | % |
| **Description** | The fuel consumption rate of Oil-fired power plants which are applied by the most advanced commercialized technologies. |
| **Source of data** | China DNA |
| **Value(s) applied** | 51.93% |
| **Choice of data or Measurement methods and procedures** | Data that is collected from the official statistics. |
| **Purpose of data** | Used for baseline emission calculation |
| **Additional comment** | Official data |

| Data / Parameter | $EF_{Gas, Adv}$ |
|---|---|
| Unit | % |
| Description | The fuel consumption rate of Gas-fired power plants which are applied by the most advanced commercialized technologies. |
| Source of data | China DNA |
| Value(s) applied | 51.93% |
| Choice of data or Measurement methods and procedures | Data that is collected from the official statistics. |
| Purpose of data | Used for baseline emission calculation |
| Additional comment | Official data |

**B.6.3. Ex-ante calculation of emission reductions**
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***I. Baseline emission***

According to the descriptions and calculation in section B. 6.1, the combined baseline emission factor of the NWCPG is:
$EF_{grid,CM,y}$ =0.878425 $tCO_2e$/MWh.

According to the Feasibility Study Report of the proposed project, the estimated annual electricity generation delivered to the power grid is as follows, so the baseline emission $BE_y$ is identified.

| Year | Estimation of electricity supplied to the grid (MWh) | $EF_{grid,CM,y}$ (t $CO_2e$/MWh) | Estimation of Baseline emissions (t $CO_2e$) |
|---|---|---|---|
| 01/06/2016-31/05/2017 | 429,050 | 0.878425 | 376,888 |
| 01/06/2017-31/05/2018 | 429,050 | 0.878425 | 376,888 |
| 01/06/2018-31/05/2019 | 429,050 | 0.878425 | 376,888 |
| 01/06/2019-31/05/2020 | 429,050 | 0.878425 | 376,888 |
| 01/06/2020-31/05/2021 | 429,050 | 0.878425 | 376,888 |
| 01/06/2021-31/05/2022 | 429,050 | 0.878425 | 376,888 |
| 01/06/2022-31/05/2023 | 429,050 | 0.878425 | 376,888 |

***II. Project Emission***

According to the methodology, there are no expected project emissions for a wind power project. Therefore, $PE_y$ = 0.

***III. Leakage***

According to the methodology. no leakage emissions are considered.

## IV. *Estimate emission reductions*

The Emission Reductions ($ER_y$) for the project activity could be calculated as the formula (B.14):

$$ER_y = BE_y - PE_y$$ Equation (B.14)

**B.6.4. Summary of ex-ante estimates of emission reductions**

| Year | Baseline emissions ($t\ CO_2e$) | Project emissions ($t\ CO_2e$) | Leakage ($t\ CO_2e$) | Emission reductions ($t\ CO_2e$) |
|---|---|---|---|---|
| 01/06/2016-31/05/2017 | 376,888 | 0 | 0 | 376,888 |
| 01/06/2017-31/05/2018 | 376,888 | 0 | 0 | 376,888 |
| 01/06/2018-31/05/2019 | 376,888 | 0 | 0 | 376,888 |
| 01/06/2019-31/05/2020 | 376,888 | 0 | 0 | 376,888 |
| 01/06/2020-31/05/2021 | 376,888 | 0 | 0 | 376,888 |
| 01/06/2021-31/05/2022 | 376,888 | 0 | 0 | 376,888 |
| 01/06/2022-31/05/2023 | 376,888 | 0 | 0 | 376,888 |
| **Total** | 2,638,216 | 0 | 0 | 2,638,216 |
| **Total number of crediting years** | 7 | | | |
| **Annual average over the crediting period** | 376,888 | 0 | 0 | 376,888 |

**B.7. Monitoring plan**

**B.7.1. Data and parameters to be monitored**

| | |
|---|---|
| **Data / Parameter** | $EG_{export,y}$ |
| **Unit** | MWh/yr |
| **Description** | Quantity of electricity supplied by the project plant/unit to the grid in year y |
| **Source of data** | Measured by main meter, and there will be a backup meter installed at the same place with the main meter. |
| **Value(s) applied** | The power supplied to the grid by the project is estimated to be 429,050MWh/yr |
| **Measurement methods and procedures** | Measured continuously and recorded on a monthly basis. The meters' accuracy is no less than 0.5. Monitoring Section is responsible for monitor, collect and archive the data according to the Monitoring and Management Manual. |
| **Monitoring frequency** | Continuous measurement and at least monthly recording |
| **QA/QC procedures** | The meters will be annually calibrated by a third party according to the relevant national electric industry standards and regulations; power supplied to the grid will be cross checked according to sales invoices. |
| **Purpose of data** | Baseline Emission calculation |
| **Additional comment** | Refer to B.7.3. Description of the monitoring plan The data is to be kept for two years after the end of the last crediting period. |

| Data / Parameter | $EG_{import,y}$ |
|---|---|
| Unit | MWh/yr |
| Description | Quantity of electricity delivered to the project plant/unit from the grid in year y |
| Source of data | Measured by main meter, and there will be a backup meter installed at the same place with the main meter. |
| Value(s) applied | 0MWh/yr |
| Measurement methods and procedures | Measured continuously and recorded on a monthly basis. The meters' accuracy is no less than 0.5. Monitoring Section is responsible for monitor, collect and archive the data according to the Monitoring and Management Manual. |
| Monitoring frequency | Continuous measurement and at least monthly recording |
| QA/QC procedures | The meters will be annually calibrated by a third party according to the relevant national electric industry standards and regulations; electricity use of power plant supplied by the grid will be cross checked according to purchasing invoices. |
| Purpose of data | Baseline Emission calculation |
| Additional comment | Refer to B.7.3. Description of the monitoring plan. The data is to be kept for two years after the end of the last crediting period. |

| Data / Parameter | $EG_{facility,y}$ |
|---|---|
| Unit | MWh/yr |
| Description | Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* |
| Source of data | Calculated as $EG_{facility,y} = EG_{export,y} – EG_{import,y}$ |
| Value(s) applied | 429,050MWh/yr |
| Measurement methods and procedures | / |
| Monitoring frequency | Continuous measurement and at least monthly recording |
| QA/QC procedures | / |
| Purpose of data | Baseline Emission calculation |
| Additional comment | The data is to be kept for two years after the end of the crediting period or the last crediting period. |

**B.7.2. Sampling plan**

>>

No data and parameters monitored in the section B.7.1 above is determined by a sampling approach.

**B.7.3. Other elements of monitoring plan**

>>

The monitoring plan is compiled in accordance with the requirements of ACM0002 (version13.0.0), the purpose of which is to ensure the completeness, consistency, accuracy of the monitoring and calculation for the emission reductions.

**1. Monitoring management structure**

In order to obtain effective monitored data, the project owner will establish a CDM Monitoring Office and designate qualified staffs responsible for all relevant matters, including monitoring, data collection and archiving, QC/QA, and verification. The structure of the CDM Monitoring Office is outlined in Figure B–3.

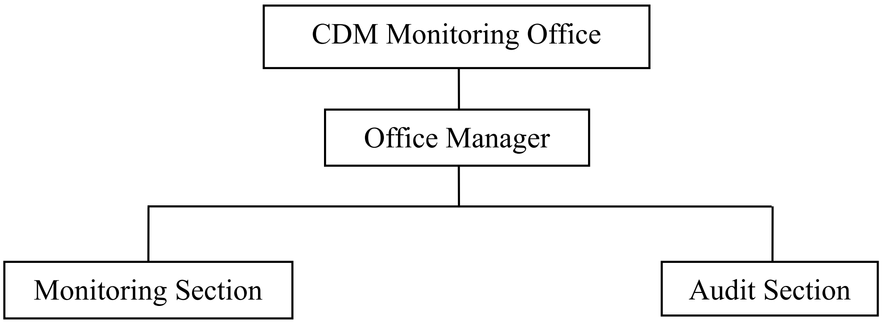


**Figure B-3 Organization Chart of the CDM Project Management Office**

The responsibilities of the sections are briefly described as following:

- Office Manager: Manage the work of CDM Monitoring Office; Charge of all relevant matters with the monitoring activity.
- Monitoring Section: Monitor, collect and archive the data according to the Monitoring and Management Manual.
- Audit Section: Audit the work of Monitoring Section and execute the QC/QA procedures according to the Monitoring and Management Manual.

**2. Calibration of Meters & Metering**

The meters will be properly installed and maintained according to the requirement from relevant national regulations. The meters' accuracy is no less than 0.5, and will be calibrated once a year. All the records should be documented and maintained by the project owner for DOE's verification.

**3. Monitor**

The readings of meters will be used for calculating the emission reductions. It is illustrated in figure B.1 in section B.3 that the monitoring meters will be installed at the project site or the grid company according to the future actual situation.
If inaccuracy of the reading data from the monitoring meter exceeds the allowable tolerance or otherwise the meter malfunctioned will operate in one month, EB's relevant guidelines will be followed and if no relevant EB's guidelines no emission reductions will be claimed.

The meter reading shall be readily accessible for the DOE. Calibration test records shall be maintained for verification.

**4. Data collection and management system**

The project owner and the Grid Company are responsible for monitoring equipment, and guarantee the measuring equipments are in good operation.

The electricity recorded by the monitoring meter alone will suffice for the purpose of record and emission reduction verification as long as the accuracy of the monitoring meter is within the permissible tolerance. The measured values by the monitoring meters are the basis of the ER. The sales records with the grid are used as cross-check for the measured value.

Data will be archived at the end of each month using electronic spreadsheets. The electronic files will be stored on hard disk and CD-ROM. In addition, a hard copy printout will be archived. Physical documentation such as, paper-based maps, diagrams and environmental assessment, will be collected in a central place, together with the monitoring plan. In order to facilitate the auditor's reference, monitoring results will be indexed. The electronical data is to be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

**5. Quality Assurance and Quality Control**

The project activity will use high-precision monitoring equipment to monitor the electricity to the grid. All meters will be calibrated and sealed as per the industry practices at regular intervals. Hence, high quality is ensured. Electricity sales invoices will be used to test the consistency of the recorded data.

Calibration of Meters & Metering should be implemented according to national standards and rules. For the project, the meter calibration frequency will be once a year. All the records should be documented and maintained by the project owner for DOE's verification.

**6. Verification**

The main objective of the verification is to independently verify that the proposed project has achieved the emission reductions as reported.

The proposed project owner has the responsibility to provide any necessary data, information and document required by DOE during the certification process.

**SECTION C. Duration and crediting period**
**C.1. Duration of project activity**
**C.1.1. Start date of project activity**
>>
31/05/2012(when the wind turbine foundation Section I 50 MW construction contract signed)

**C.1.2. Expected operational lifetime of project activity**
>>
20 years and 0 month

**C.2. Crediting period of project activity**
**C.2.1. Type of crediting period**
>>
The renewable crediting period will be applied and this is the first crediting period.

**C.2.2. Start date of crediting period**
>>
01/06/2016 or registration date whichever is later

**C.2.3. Length of crediting period**
>>
7 years and 0 month for first crediting period

**SECTION D. Environmental impacts**
**D.1. Analysis of environmental impacts**
>>
According to the relevant environmental law and regulations, an environmental impact assessment has been carried out, and the assessment report has been approved by the Xinjiang Environmental Protection Bureau. The main assessment conclusions are as follows:

- **Noise Impact on the Environment**

Noise will be generated by machine equipment and vehicle during the construction period. Measures will be taken to reduce the environmental impacts of noise: choosing low-noise machines and technologies, strengthening the management and maintenance on equipment, allocate reasonable selection and layout on the plant construction site, and enhancing construction management etc. Low-noise turbine units will be employed and installed far away from the surrounding villages. Noise level will be controlled within the Class 1 requirement of Standard of Environmental Noise of Urban Area (GB 3096-93). In addition, during the operation period the nearest residential area is far away from the construction site, and there is no enterprises, schools or hospitals nearby. So, the neighbourhood residents will not be influenced by the noise.

- **Impact of solid waste on environment**

During the construction period, the discharged waste slag will be reduced by refilling the excavated earth as much as possible, and the wastes will be piled up in designated waste disposal sites.
During the operation period, the domestic waste produced by operational workers will be collected and discharged by existing garbage disposal facilities.

- **Impact on the water environment**

The main water pollution includes industrial wastewater and domestic wastewater.
During the construction period, the domestic wastewater will be discharged through local sewage treatment facilities. For the applied mechanical equipment is relative less, so the industrial wastewater will be also less, in addition, the industrial wastewater can be used to irrigate plant.
During the operation period, domestic wastewater will be treated by a septic tank, so the wastewater after treatment could well satisfy the requirement of Chinese Environmental Standard, which will be collected into a water collection basin for greening and so on. After those appropriate treatment measures has been taken, such wastewater will not cause negative impacts on the environment.

- **Impact on the Air quality**

The main air pollution sources during the construction period include excavation, blasting and transportation, and the main air pollutant is dust. Some measures will be taken to reduce impact of dust, such as watering, covering and the construction material will be pile up centralized. Therefore, the construction has little negative impact on the local air environment.

- **Impact on ecological environment**

In order to protect the environment, the following measures will be taken: pouring concrete and backfilling after foundation ditch excavated; rolling and compacting the surface layer in order to protect the vegetation and reduce dust; carrying away all waste slag and cleaning up the construction site to recover the original vegetation when the construction is over.
There is no rare plant and wild animal living around the project site, nor the inhabitant of birds. Therefore, the proposed project activity has little negative influence on birds and ecological environment.

**D.2. Environmental impact assessment**
The Environmental Impacts Assessment of the Project indicates that the operation of the Project will discharge almost no wastewater or air pollutants to the local environment. Noise from the wind turbines

will have no impact on human being because the project site is deserted.

From above statement, it is safe to conclude that the environmental impacts of the Project are minor, and the Project is definitely an environment friendly way of providing power.

## SECTION E. Local stakeholder consultation

### E.1. Solicitation of comments from local stakeholders

>>

The project developer invited the comments of local stakeholders by issuing questionnaires in May. 2012. Beijing Tianrun New Energy Investment Co., Ltd. carried out the survey on the local residents and the representative of government officials. The survey was conducted through distributing and collecting responses to a questionnaire which was designed by project developer and put up posters.

There are almost one hundred residents located nearby the project site (within 20km) who might be influenced by the project activity. In order to make all the persons know the project, the project owner put up posters in the village government. On the posters, all the information of the project activity have been listed, and it also indicated that anyone have the comments to the project can show their issues to the project owner and local government. The project owner and the local government do not obtained any comments. Questionnaires have been distributed according to the principle of both representation and randomness in order to reflect the public opinions and comments in a fair and real manner. The participants who fulfilled the questionnaire are mainly local governments, social communities and publics who will be possibly directly affected by the proposed project. And the investigation has taken full account into the public advice of different ages, education levels and occupations.

The survey was conducted through distributing and collecting responses to a questionnaire which was designed by project developer.

1) Project introduction

2) Respondent's basic information

3) Questions on:

- What level do you know about the proposed project?
- Do you know about the Clean Development Mechanism?
- Do you think which impact on the environment may be caused by the project?
- What kind of impact on local environment may be caused by the project?
- What impacts on your life may be caused by the project?
- What kind of impact on local economic development may be caused by the project？
- Whether to support the construction of the project?
- Other suggestions

4) Space for the respondents' signature and date.

Questionnaires have been distributed according to the principle of both representation and randomness in order to reflect the public opinions and comments in a fair and real manner.

The investigation has taken full account into the public advice of different ages, education levels and occupations.

### E.2. Summary of comments received

>>

Total 50 questionnaires were distributed, all of the distributed questionnaires had been returned. All of the opinions from the local stakeholders had been collected and considered. Detailed information of respondents lists as follows：

| No. | Items | Range | Numbers(Person) | Ratio (%) |
|---|---|---|---|---|
| 1 | Age | ~30 | 15 | 30% |
| | | 31~40 | 15 | 30% |
| | | 40~ | 20 | 40% |
| 2 | Education level | elementary school | 8 | 16% |
| | | junior high school | 18 | 36% |
| | | senior high schoolor secondary technical school | 18 | 16% |
| | | college | 6 | 12% |
| 3 | Career | Worker | 20 | 40% |
| | | Government official | 15 | 30% |
| | | Peasant、Resident and individual operation | 15 | 30% |

**Summary of the survey：**

Comments from the returned questionnaires show that 100% of the investigated stakeholders agree with the project construction, and none of them objects.

100% of the investigated stakeholders know something about the project;

90% of them know something about CDM while 10% of them don’t know about it;

95% of them think that the project will not bring negative impact to local environment, 5% of them have no idea;

100% of them think that the construction of the project will bring positive impact to local environment;

As for the issue of What impacts on your life may be caused by the project, 90% of them think the construction of proposed project could guarantee the supplement of electricity and other 10% do not choose this option, 80% of them think it could increase job opportunity and other 20% do not choose this option, 60% of them think it could increase family income and other 40% do not choose this option, 45% of them think it could improve local air quality and other 55% do not choose this option;

100% of them think it will promote the development of local economy and society;

100% of them support the construction of the project;

All the stakeholders are supportive of this project.

**E.3. Report on consideration of comments received**

>>

As stated above, the public survey showed that the project activity is supported by local stakeholders and has positive impact on various aspects. No negative impacts will be caused by the project. Therefore, measures to address adverse impacts are not necessary.

**SECTION F. Approval and authorization**

>>

The LOA from China for the proposed project was provided to DOE.

- - - - -

## Appendix 1: Contact information of project participants

| | |
|---|---|
| **Organization** | Beijing Tianrun New Energy Investment Co., Ltd. |
| **Street/P.O. Box** | No.91 Jianguo Road |
| **Building** | 20F, Block A , Gemdale Plaza |
| **City** | Beijing |
| **State/Region** | |
| **Postcode** | 100022 |
| **Country** | P.R.China |
| **Telephone** | +86-10-57672999 |
| **Fax** | +86-10-57672888 |
| **E-mail** | chengpeijie@tianrun.cn |
| **Website** | |
| **Contact person** | Cheng Peijie |
| **Title** | Project Manager |
| **Salutation** | Mr. |
| **Last name** | Cheng |
| **Middle name** | |
| **First name** | Peijie |
| **Department** | Investment Dept. |
| **Mobile** | |
| **Direct fax** | +86-10-57672888 |
| **Direct tel.** | +86-10-57672739 |
| **Personal e-mail** | chengpeijie@tianrun.cn |

| | |
|---|---|
| **Organization name** | National Development and Reform Commission of the People's Republic of China |
| **Street/P.O. Box** | No.38, South Yuetan Street |
| **Building** | |
| **City** | Beijing |
| **State/Region** | / |
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| **Country** | China |
| **Telephone** | +86-(0)10-68502963 |
| **Fax** | +86-(0)10-68502963 |
| **E-mail** | sunch@ccchina.gov.cn |
| **Website** | / |
| **Contact person** | Sun Cuihua |
| **Title** | Vice director |
| **Salutation** | Ms. |
| **Last name** | Sun |
| **Middle name** | / |
| **First name** | Cuihua |
| **Department** | / |
| **Mobile** | |
| **Direct fax** | +86-(0)10-68502963 |
| **Direct tel.** | +86-(0)10-68502963 |

| | |
|---|---|
| **Personal e-mail** | sunch@ccchina.gov.cn |

## Appendix 2: Affirmation regarding public funding

No public funding from Annex I parties are involved in this project activity.

## Appendix 3: Applicability of selected methodology

No further information on the applicability of the selected methodology is available.

## Appendix 4: Further background information on ex ante calculation of emission reductions

The project refers to the *2012 Baseline Emission Factors for Regional Power Grids in China* that is published by the National Development and Reform Committee of China (Chinese DNA) on 15/10/2012 for the OM and BM emission factors of the Northwest Power Grid (NWCPG). In the reference, emission factors of NWCPG are calculated based on the approved *"Tool to calculate the emission factor for an electricity system"*. The $EF_{grid,CM,y}$, $EF_{grid,OM,y}$, and $EF_{grid,BM,y}$ of Northwest Power Grid (NWCPG) could be calculated as following:

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

Option (C) was chosen to calculate the Operating Margin Emission Factor ($EF_{grid,OM,y}$) as bellows:

**Table 1 Electricity Generation of NWCPG in 2008**

| Province name | Electricity generation of fuel-fired power plants（MWh） | Auxiliary power ratio（%） | Total Electricity Supplied to the Grid（MWh） |
|---|---|---|---|
| Shaanxi | 71,500,000 | 6.95 | 66,530,750 |
| Gansu | 46,800,000 | 6.4 | 43,804,800 |
| Qinghai | 10,700,000 | 7.14 | 9,936,020 |
| Ningxia | 44,000,000 | 7.57 | 40,669,200 |
| Xinjiang | 39,700,000 | | 39,700,000 |
| **Total** | | | **200,640,770** |

*Sources: China Electric Power Yearbook 2009*

**Table 2 Electricity Generation of NWCPG in 2009**

| Province name | Electricity generation of fuel-fired power plants（MWh） | Auxiliary power ratio（%） | Total Electricity Supplied to the Grid（MWh） |
|---|---|---|---|
| Shaanxi | 77,400,000 | 7.24 | 71,796,240 |
| Gansu | 44,100,000 | 6.88 | 41,065,920 |
| Qinghai | 10,700,000 | 7.01 | 9,949,930 |
| Ningxia | 44,700,000 | 7.76 | 41,231,280 |
| Xinjiang | 45,200,000 | 5.16 | 42,867,680 |
| **Total** | | | **206,911,050** |

*Sources: China Electric Power Yearbook 2010*

**Table 3 Electricity Generation of NWCPG in 2010**

| Province name | Electricity generation of fuel-fired power plants（MWh） | Auxiliary power ratio（%） | Total Electricity Supplied to the Grid（MWh） |
|---|---|---|---|
| Shaanxi | 95,800,000 | 7.23 | 88,873,660 |
| Gansu | 59,100,000 | 6.73 | 55,122,570 |
| Qinghai | 10,900,000 | 6.58 | 10,182,780 |
| Ningxia | 57,200,000 | | 57,200,000 |
| Xinjiang | 53,900,000 | 8.7 | 49,210,700 |
| **Total** | | | **260,589,710** |

*Sources: China Electric Power Yearbook 2011*

**Table 4 Calculating $CO_2$ Emission of NWCPG in 2008**

| Fuel | Unit | Shaanxi | Gansu | Qinghai | Ningxia | Xinjiang | Total | Emission factor (tC/TJ) | OXID (%) | Fuel emission factor ($kgCO_2/TJ$) | NCV ($MJ/t,m^3$) | $CO_2$ Emission（$tCO_2e$） |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **A** | **B** | **C** | **D** | **E** | **F=A+B+…+E** | **G** | **H** | **I** | **J** | **K=F×I×J/100000 (quality unit); K=F×I×J/10000 (volume unit)** |
| Raw Coal | $10^4t$ | 3620 | 2216.9 | 507.44 | 2330.72 | 1924.9 | **10599.96** | 25.8 | 100 | 87,300 | 20,908 | 193,477,720 |
| Cleaned coal | $10^4t$ | | | | | | **0** | 25.8 | 100 | 87,300 | 26,344 | 0 |
| Other Washed Coal | $10^4t$ | 9.22 | | | 53.85 | 8.2 | **71.27** | 25.8 | 100 | 87,300 | 8,363 | 520,335 |
| Briquettes | $10^4t$ | | | | | | **0** | 26.6 | 100 | 87,300 | 20,908 | 0 |
| Coke | $10^8m^3$ | | | | | | **0** | 29.2 | 100 | 95,700 | 28,435 | 0 |
| Coke Oven Gas | $10^8m^3$ | 0.35 | 0.74 | | | 0.13 | **1.22** | 12.1 | 100 | 37,300 | 16,726 | 76,113 |
| Other Gas | $10^4t$ | 18.38 | 0.2 | | | | **18.58** | 12.1 | 100 | 37,300 | 5,227 | 362,249 |
| Crude Oil | $10^4t$ | | | | | | **0** | 20 | 100 | 71,100 | 41,816 | 0 |
| Gasoline | $10^4t$ | 0.05 | | | | 0.01 | **0.06** | 18.9 | 100 | 67,500 | 43,070 | 1,744 |
| Diesel Oil | $10^4t$ | 1.03 | 0.44 | 0.26 | 0.05 | 1.64 | **3.42** | 20.2 | 100 | 72,600 | 42,652 | 105,902 |
| Fuel Oil | $10^4t$ | | 0.86 | 0.04 | | 0.02 | **0.92** | 21.1 | 100 | 75,500 | 41,816 | 29,045 |
| LPG | $10^4t$ | | | | | | **0** | 17.2 | 100 | 61,600 | 50,179 | 0 |
| Refinery Gas | $10^8m^3$ | | | | | 7.25 | **7.25** | 15.7 | 100 | 48,200 | 46,055 | 160,939 |
| Natural Gas | $10^4t$ | 0.94 | 0.24 | 2.99 | | 7.2 | **11.37** | 15.3 | 100 | 54,300 | 38,931 | 2,403,565 |
| Other Petroleum Products | $10^4t$ | | | | | 0.01 | **0.01** | 20 | 100 | 72,200 | 41,816 | 302 |
| Other Coking Products | $10^4t$ | | | | | | **0** | 25.8 | 100 | 95,700 | 28,435 | 0 |
| Other Energy | $10^4tce$ | 93.67 | 10.58 | | 21.24 | | **125.49** | 0 | 0 | 0 | 0 | 0 |
| Total | | | | | | | | | | | | **197,137,915** |

*Sources: China Energy Statistical Yearbook 2009*

**Table 5 Calculating $CO_2$ Emission of NWCPG in 2009**

| Fuel | Unit | Shaanxi | Gansu | Qinghai | Ningxia | Xinjiang | Total | Emission factor (tC/TJ) | OXID (%) | Fuel emission factor ($kgCO_2/TJ$) | NCV ($MJ/t,m^3$) | $CO_2$ Emission （$tCO_2e$） |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **A** | **B** | **C** | **D** | **E** | **F=A+B+…+E** | **G** | **H** | **I** | **J** | **K=F×I×J/100000 (quality unit); K=F×I×J/10000 (volume unit)** |
| Raw Coal | $10^4t$ | 3949.22 | 2060 | 467.05 | 2350.13 | 2380 | **11206.4** | 25.8 | 100 | 87,300 | 20,908 | 204,546,878 |
| Cleaned coal | $10^4t$ | | | | | | **0** | 25.8 | 100 | 87,300 | 26,344 | 0 |
| Other Washed Coal | $10^4t$ | 8.34 | | | 56.01 | 6.66 | **71.01** | 25.8 | 100 | 87,300 | 8,363 | 518,437 |
| Briquettes | $10^4t$ | | | | | | **0** | 26.6 | 100 | 87,300 | 20,908 | 0 |
| Coke | $10^4t$ | | | | | | **0** | 29.2 | 100 | 95,700 | 28,435 | 0 |
| Coke Oven Gas | $10^8m^3$ | 0.49 | 0.8 | | | 0.12 | **1.41** | 12.1 | 100 | 37,300 | 16,726 | 87,967 |
| Other Gas | $10^8m^3$ | 18.37 | 0.44 | | | | **18.81** | 12.1 | 100 | 37,300 | 5,227 | 366,733 |
| Crude Oil | $10^4t$ | | | | | | **0** | 20 | 100 | 71,100 | 41,816 | 0 |
| Gasoline | $10^4t$ | 0.02 | | | | | **0.02** | 18.9 | 100 | 67,500 | 43,070 | 581 |
| Diesel Oil | $10^4t$ | 0.6 | 0.52 | 0.2 | 0.07 | 0.7 | **2.09** | 20.2 | 100 | 72,600 | 42,652 | 64,718 |
| Fuel Oil | $10^4t$ | | 0.25 | 0.08 | | 0.06 | **0.39** | 21.1 | 100 | 75,500 | 41,816 | 12,313 |
| LPG | $10^4t$ | 0.02 | | | | | **0.02** | 17.2 | 100 | 61,600 | 50,179 | 618 |
| Refinery Gas | $10^4t$ | | | | | 8.56 | **8.56** | 15.7 | 100 | 48,200 | 46,055 | 190,019 |
| Natural Gas | $10^8m^3$ | 0.91 | 0.07 | 3.93 | | 7.83 | **12.74** | 15.3 | 100 | 54,300 | 38,931 | 2,693,177 |
| Other Petroleum Products | $10^4t$ | | | | | | **0** | 20 | 100 | 72,200 | 41,816 | 0 |
| Other Coking Products | $10^4t$ | | | | | | **0** | 25.8 | 100 | 95,700 | 28,435 | 0 |
| Other Energy | $10^4tce$ | 73.76 | 18.52 | | 18.08 | | **110.36** | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total | | | | | | | | | | | | **208,481,441** |

*Sources: China Energy Statistical Yearbook 2010*

**Table 6 Calculating $CO_2$ Emission of NWCPG in 2010**

| Fuel | Unit | Shaanxi | Gansu | Qinghai | Ningxia | Xinjiang | Total | Emission factor (tC/TJ) | OXID (%) | Fuel emission factor ($kgCO_2/TJ$) | NCV ($MJ/t,m^3$) | $CO_2$ Emission （$tCO_2e$） |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **A** | **B** | **C** | **D** | **E** | **F=A+B+…+E** | **G** | **H** | **I** | **J** | **K=F×I×J/100000 (quality unit); K=F×I×J/10000 (volume unit)** |
| Raw Coal | $10^4$t | 4850.49 | 2771.89 | 483.72 | 2916.46 | 2494.9 | **13517.46** | 25.8 | 100 | 87,300 | 20,908 | 246,729,926 |
| Cleaned coal | $10^4$t | | | | 1.05 | | **1.05** | 25.8 | 100 | 87,300 | 26,344 | 24,148 |
| Other Washed Coal | $10^4$t | 11.01 | | | 42.96 | 6.82 | **60.79** | 25.8 | 100 | 87,300 | 8,363 | 443,822 |
| Briquettes | | | | | | | **0** | 26.6 | 100 | 87,300 | 20,908 | 0 |
| Coke | $10^4$t | | | | | | **0** | 29.2 | 100 | 95,700 | 28,435 | 0 |
| Coal gangue | $10^4$t | 355.13 | 37.86 | | 163.58 | 2.85 | **559.42** | 25.8 | 100 | 87,300 | 8,363 | 4,084,269 |
| Coke Oven Gas | $10^8m^3$ | 1.97 | 0.89 | | | 0.7 | **3.56** | 12.1 | 100 | 37,300 | 16,726 | 222,101 |
| Blast Furnace Gas | $10^8m^3$ | 18.24 | 4.06 | | | 5.28 | **27.58** | 70.8 | 100 | 219,000 | 3,763 | 2,272,860 |
| Converter gas | $10^8m^3$ | | 0.31 | | | | **0.31** | 46.9 | 100 | 145,000 | 7,945 | 35,713 |
| Other Gas | $10^8m^3$ | | | | | | **0** | 12.1 | 100 | 37,300 | 5,227 | 0 |
| Crude Oil | $10^4$t | | | | | | **0** | 20 | 100 | 71,100 | 41,816 | 0 |
| Gasoline | $10^4$t | 0.01 | | 0.03 | | 0.01 | **0.05** | 18.9 | 100 | 67,500 | 43,070 | 1,454 |
| Diesel Oil | $10^4$t | 0.67 | 0.42 | 0.21 | 0.23 | 0.39 | **1.92** | 20.2 | 100 | 72,600 | 42,652 | 59,453 |
| Fuel Oil | $10^4$t | | 0.17 | 0.09 | 0.1 | 0.7 | **1.06** | 21.1 | 100 | 75,500 | 41,816 | 33,465 |
| Naphtha | $10^4$t | | | | | | **0** | | 100 | 72,600 | 43,906 | 0 |
| Lubricating oil | $10^4$t | | | | | | **0** | | 100 | 71,900 | 41,398 | 0 |
| Paraffin | $10^4$t | | | | | | **0** | | 100 | 72,200 | 39,934 | 0 |
| Solvent naphtha | $10^4$t | | | | | | **0** | | 100 | 72,200 | 42,945 | 0 |
| Petroleum asphalt | $10^4$t | | | | | | **0** | | 100 | 69,300 | 38,931 | 0 |
| Petroleum coke | $10^4$t | | | | | | **0** | | 100 | 82,900 | 31,947 | 0 |
| LPG | $10^4$t | | | | | | **0** | 17.2 | 100 | 61,600 | 50,179 | 0 |
| Refinery Gas | $10^4$t | | | | | 12.2 | **12.2** | 15.7 | 100 | 48,200 | 46,055 | 270,822 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Natural Gas | $10^8m^3$ | 0.87 | | 2.48 | 0.3 | 8.54 | **12.19** | 15.3 | 100 | 54,300 | 38,931 | 2,576,909 |
| Other Petroleum Products | $10^4t$ | | | | | 0.01 | **0.01** | 20 | 100 | 72,200 | 41,816 | 302 |
| Other Coking Products | $10^4t$ | | | | | | **0** | 25.8 | 100 | 95,700 | 28,435 | 0 |
| Other Energy | $10^4$tce | 1.76 | 2.68 | | | | **4.44** | 0 | 0 | 0 | 0 | 0 |
| Total | | | | | | | | | | | | **256,755,243** |

*Sources: China Energy Statistical Yearbook 2011*

**Table7 The three years weighted average emission factor of NWCPG**

| Years | **2008** | **2009** | **2010** | Three years average emission factor ($tCO_2e/MWh$) |
|---|---|---|---|---|
| Total $CO_2$ emission($tCO_2e$) | 197,137,915 | 208,481,441 | 256,755,243 | **0.9913** |
| The total fuel fired electricity connected to the grid(MWh) | 200,640,770 | 206,911,050 | 260,589,710 | |
| $EF_{OM,y}$ | **0.98254** | **1.00759** | **0.98529** | |

**Step 5. Calculate the build margin emission factor**

***Sub-step 1. Calculating the percentages of $CO_2$ emissions from the coal-fired, oil-fired and gas-fired power plants in total fuel-fired $CO_2$ emissions***

**Table 8 The percentages of $CO_2$ emissions from the coal-fired, oil-fired and gas-fired power plants in total fuel-fired $CO_2$ emissions**

| Fuel | Unit | Shaanxi | Gansu | Qinghai | Ningxia | Xinjiang | Subtotal | NCV (MJ/t, $m^3$) | Emission factor $tCO_2e/TJ$ | Oxid (%) | $CO_2$ Emission （$tCO_2e$） |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **A** | **B** | **C** | **D** | **E** | **F=A+…+E** | G | H | I | **J=F×G×H×I/100,000** |
| Raw Coal | $10^4$ t | 4850.49 | 2771.89 | 483.72 | 2916.46 | 2,494.9 | 13,517.46 | 20,908 | 87,300 | 100 | 246,729,926 |
| Cleaned Coal | $10^4$ t | 0 | 0 | 0 | 1.05 | 0 | 1.05 | 26,344 | 87,300 | 100 | 24,148 |
| Other Washed Coal | $10^4$ t | 11.01 | 0 | 0 | 42.96 | 6.82 | 60.79 | 8,363 | 87,300 | 100 | 443,822 |
| Briquettes | $10^4$ t | 0 | 0 | 0 | 0 | 0 | 0 | 20,908 | 87,300 | 100 | 0 |
| Coal gangue | $10^4$ t | 355.13 | 37.86 | | 163.58 | 2.85 | 559.42 | 8,363 | 87,300 | 100 | 4,084,269 |
| Coke | $10^4$ t | 0 | 0 | 0 | 0 | 0 | 0 | 28,435 | 95,700 | 100 | 0 |
| Other Coking Products | $10^4$ t | 0 | 0 | 7.99 | 0 | 0 | 7.99 | 28,435 | 95,700 | 100 | 217,426 |
| **Subtotal** | | | | | | | | | | | 251,499,591 |
| Crude Oil | $10^4$ t | 0 | 0 | 0 | 0 | 0 | 0 | 41,816 | 71,100 | 100 | 0 |
| Gasoline | $10^4$ t | 0.01 | 0 | 0.03 | 0 | 0.01 | 0.05 | 43,070 | 67,500 | 100 | 1,454 |
| Diesel Oil | $10^4$ t | 0.67 | 0.42 | 0.21 | 0.23 | 0.39 | 1.92 | 42,652 | 72,600 | 100 | 59,453 |
| Fuel Oil | $10^4$ t | 0 | 0.17 | 0.09 | 0.1 | 0.7 | 1.06 | 41,816 | 75,500 | 100 | 33,465 |
| Petroleum coke | $10^4$ t | 0 | 0 | 0 | 0 | 0 | 0 | 31,947 | 82,900 | 100 | 0 |
| Other Petroleum Products | $10^4$ t | 0 | 0 | 0 | 0 | 0.01 | 0.01 | 41,816 | 75,500 | 100 | 316 |
| **Subtotal** | | | | | | | | | | | 94,688 |
| Natural Gas | $10^7m^3$ | 8.7 | 0 | 24.8 | 3 | 85.4 | 121.9 | 38,931 | 54,300 | 100 | 2,576,909 |
| Liquefied natural gas | $10^4$ t | 0 | 0 | 0 | 0 | 0 | 0 | 51,434 | 54,300 | 100 | 0 |
| Coke Oven Gas | $10^7m^3$ | 19.7 | 8.9 | 0 | 0 | 7 | 35.6 | 16,726 | 37,300 | 100 | 222,101 |
| Blast Furnace Gas | $10^7m^3$ | 182.4 | 40.6 | 0 | 0 | 52.8 | 275.8 | 3,763 | 219,000 | 100 | 2,272,860 |
| Converter gas | $10^7m^3$ | 0 | 3.1 | 0 | 0 | 0 | 3.1 | 7,945 | 145,000 | 100 | 35,713 |
| Other Gas | $10^7m^3$ | 0 | 0 | 0 | 0 | 0 | 0 | 5,227 | 37,300 | 100 | 0 |
| LPG | $10^4$ t | 0 | 0 | 0 | 0 | 0 | 0 | 50,179 | 61,600 | 100 | 0 |
| Refinery Gas | $10^4$ t | 0 | 0 | 0 | 0 | 12.2 | 12.2 | 46,055 | 48,200 | 100 | 270,822 |
| **Subtotal** | | | | | | | | | | | 5,378,404 |

| | | |
|---|---|---|
| **Total** | | **256,972,683** |

*Sources: China Energy Statistical Yearbook 2011*

The result from the above table: $\lambda_{Coal,y}$ **= 97.87%,** $\lambda_{Oil,y}$ **= 0.04%,** $\lambda_{Gas,y}$ **= 2.09%**

***Sub-step 2. Calculating the fuel-fired emission factor***

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

Where:

$EF_{Thermal}$ is the fuel-fired emission factor;

$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ are corresponding to the emission factors of coal, oil and gas fired power plants which are applied by the most advanced commercialized technologies.

The maximum electricity supplied efficiency of oil and gas fired generation plants are regarded as approximate estimation of commercially optimal efficiency technology. Similarly, the fuel consumption per kWh supplied of best advanced oil and gas fired generation technology is determined to be 236.6 gce/kWh, which means a generation efficiency of 51.93% .these data were show as below:

**Table 9 Emission factors of Coal, Oil and Gas with the most advanced commercialized technologies applied by the fuel-fired power plants**

| | Parameters | Fuel consumption rate(%) | Fuel Emission Factor(kg$CO_2$/TJ) | Oxidation | Emission Factor（t$CO_2$/MWh） |
|---|---|---|---|---|---|
| | | A | B | C | D=3.6/A/10000*B*C |
| Coal-fired plant | $EF_{Coal,Adv}$ | 39.65 | 87,300 | 1 | 0.7927 |
| Oil-fired plant | $EF_{Oil,Adv}$ | 51.93 | 75,500 | 1 | 0.5234 |
| Gas-fired plant | $EF_{Gas,Adv}$ | 51.93 | 54,300 | 1 | 0.3765 |

*Sources: The Baseline Emission Factors of Chinese Power Grids, NDRC.*

Then, calculating

$$EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y} = 0.7839 \text{ tCO}_2\text{/MWh}$$

***Sub-step 3. Calculating the Build Margin Emission Factor.***

$$EF_{grid,BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal}$$

Where:

$EF_{BM,y}$ = the Build Margin emission factor with advanced commercialized technologies for year *y*;

$CAP_{Total}$ = the new capacity additions;

$CAP_{Thermal}$ = the new fuel-fired capacity additions.

**Table 12 Installed Capacities of the NWCPG 2010**

| Installed Capacity | Unit | Shaanxi | Gansu | Qinghai | Ningxia | Xinjiang | Total |
|---|---|---|---|---|---|---|---|
| Fuel-fired | MW | 21,370 | 13,240 | 1,930 | 12,710 | 11,720 | 60,970 |
| Hydro | MW | 2,210 | 6,110 | 10,680 | 430 | 2,990 | 22,420 |
| Nuclear | MW | 0 | 0 | 0 | 0 | 0 | 0 |
| Wind & Others | MW | 0 | 1,390 | 0 | 660 | 1,360 | 3,352 |
| Total | MW | 23,580 | 20,740 | 12,610 | 13,740 | 16,070 | 86,742 |

*Sources：China Electric Power Yearbook 2011*

**Table 10 Installed Capacities of the NWCPG 2009**

| Installed Capacity | Unit | Shaanxi | Gansu | Qinghai | Ningxia | Xinjiang | Total |
|---|---|---|---|---|---|---|---|
| Fuel-fired | MW | 19,900 | 10,990 | 1,930 | 8,820 | 9,520 | 51,160 |
| Hydro | MW | 1,920 | 5,940 | 8,740 | 430 | 2,430 | 19,460 |
| Nuclear | MW | 0 | 0 | 0 | 0 | 0 | 0 |
| Wind&Others | MW | 0 | 750 | 0 | 270.3 | 860 | 1,880 |
| Total | MW | 21,820 | 17,680 | 10,670 | 9,520 | 12,810 | 72,500 |

*Sources：China Electric Power Yearbook 2010*

**Table 11 Installed Capacities of the NWCPG 2008**

| Installed Capacity | Unit | Shaanxi | Gansu | Qinghai | Ningxia | Xinjiang | Total |
|---|---|---|---|---|---|---|---|
| Fuel-fired | MW | 17,850 | 8,980 | 2,000 | 7,540 | 8,200 | 44,570 |
| Hydro | MW | 1,810 | 5,440 | 5,910 | 430 | 2,190 | 15,780 |
| Nuclear | MW | 0 | 0 | 0 | 0 | 0 | 0 |
| Wind & Others | MW | 0 | 600 | 0 | 170 | 510 | 1,280 |
| Total | MW | 19,660 | 15,020 | 7,910 | 8,140 | 10,900 | 61,630 |

*Sources：China Electric Power Yearbook 2009*

**Table 13 Change Installed Capacity from 2008-2010**

| | Year 2008 | Year 2009 | Year 2010 | 2008-2010 New Capacity | Percentage of New Capacity Additions |
|---|---|---|---|---|---|
| | B | C | A | D=C-A | |
| Fuel-fired (MW) | 44,570 | 51,160 | 60,970 | 19,270 | 68.87% |
| Hydro (MW) | 15,780 | 19,460 | 22,420 | 6,640 | 23.73% |
| Nuclear (MW) | 0 | 0 | 0 | 0 | 0.00% |
| Wind(MW) | 1,280 | 1,880 | 3,352 | 2,072 | 7.40% |
| Total | **61,630** | **72,500** | **86,742** | **27,982** | **100.00%** |
| Percentage of Year 2009 | | | | 32.26% | |

**Then, the result is** $EF_{BM,y} = EF_{grid,BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal}$

$= 0.78386 \times 68.87\% = \mathbf{0.5398}$ $tCO_2/MWh$

**Step 6. calculate the combined margin Emission Factor (*$EF_y$*)**

$\boldsymbol{EF_{grid,CM,y}} = 0.75 \times EF_{grid,OM,y} + 0.25 \times EF_{grid,BM,y}$

$= 0.75 \times 0.9913$ $tCO_2/MWh$ $+ 0.25 \times 0.5398$ $tCO_2/MWh$ = **0.878425** $tCO_2/MWh$

## Appendix 5: Further background information on monitoring plan

No further background information used in the development of the monitoring plan.

## Appendix 6: Summary of post registration changes

No further information.

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**History of the document**

| Version | Date | Nature of revision |
|---|---|---|
| 04.1 | 11 April 2012 | Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b. |
| 04.0 | EB 66<br>13 March 2012 | Revision required to ensure consistency with the "Guidelines for completing the project design document form for CDM project activities" (EB 66, Annex 8). |
| 03 | EB 25, Annex 15<br>26 July 2006 | |
| 02 | EB 14, Annex 06b<br>14 June 2004 | |
| 01 | EB 05, Paragraph 12<br>03 August 2002 | Initial adoption. |
| **Decision Class:** Regulatory<br>**Document Type:** Form<br>**Business Function:** Registration | | |