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

**CONTENTS**



**Annexes**

## SECTION A. General description of project activity

### A.1. Title of the project activity:

>>

CECIC Gansu Yumen Changma No.3 Wind Farm Project
Version 11.0 02/07/2012

### A.2. Description of the project activity:

>>

CECIC Gansu Yumen Changma No.3 Wind Farm Project (hereinafter referred as “the Project”) is located in Yumen Town, Yumen City, Gansu Province, the People’s Republic of China. The Project is to generate renewable electricity from wind and supply to the Northwest China Power Grid (Hereinafter referred as “NWPG”). The NWPG currently uses conventional fossil fuel based thermal power plants to meet the majority of regional electricity demand, resulting in high levels of $CO_2$ emissions.

The Project is developed by CECIC Wind-power (Gansu) Co., Ltd. (hereinafter referred as “the Project owner” or “PP”), a solely owned subsidiary company of China Energy Conservation Investment Corporation Wind Power Investment Co., Ltd.

The Project involves the construction and operation of a 201 MW wind farm, located in the southwest of Yumen Town, Yumen City, Gansu Province. The Project will install 134 new wind turbines of 1,500 kW and is expected to deliver 463,714 MWh of clean electricity to NWPG, annually throughout its lifetime, which will partially displace electricity currently generated from grid connected conventional fossil fuel based thermal power plants, while reducing emissions of 425,689 $tCO_2$ annually.

The Project is expected to produce various benefits to society as well as the environment. Therefore, the Project will significantly contribute to national as well as local sustainable development, including;

**Job creation:** Implementation of the Project will generate employment opportunities for local contractors and suppliers, while operation and maintenance of the plant will create additional long term employment opportunities for skilled professionals. For the Project operation PP is planning to employ a number of skilled workers, while more additional jobs were created by sub-contractors for construction of the Project.

**Reduction in GHG emissions:** Currently, most of the electricity in the region is generated through conventional fossil fuel based thermal power plants, according to the China Electricity Power Yearbook 2009. Through combustion of fossil fuels, they emit a large volume of Greenhouse gasses (GHG) into the atmosphere, which has a negative effect on global society. Generation of GHG emission free electricity, such as wind, will displace electricity generated by these fossil fuel based thermal plants, therefore reducing GHG emissions.

**Reduction of fossil fuel use:** The Project Activity will reduce reliance on imported fossil fuels, which will contribute to increasing China’s energy security, and will also improve local air quality as it reduces the emissions of $SO_2$ and $NO_x$ associated with fossil fuel use.

**Increase of power supply:** Due to rapid economic growth in recent years, China is experiencing a serious shortage of electricity, causing blackouts and brownouts throughout the country[1]. Such power outage reduces economical activity, and has a negative effect on daily life. With the new wind farm, the grid is expected to improve its supply while contributing to steady and reliable economical growth in the region.

[1] http://www.chinaeconomicreview.com/cer/2008_06/Balance_of_power.html

**A.3. Project participants:**

>>

| Name of Party involved(*) ((host) indicates a host Party) | Private and/ or Public entity(ies) Project participants(*) (as applicable) | Kindly indicate if the Party involved wishes to be considered a project participant (Yes/ No) |
|---|---|---|
| The People's Republic of China (host) | CECIC Wind-power (Gansu) Co., Ltd. | No |
| United Kingdom of Great Britain and Northern Ireland | EnBW Trading GmbH | No |
| Japan | Mitsubishi UFJ Morgan Stanley Securities Co., Ltd. | No |
| (*) In accordance with the CDM modalities and procedures, at the time of making the PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required. | | |

**A.4. Technical description of the project activity:**

**A.4.1. Location of the project activity:**

>>

**A.4.1.1. Host Party(ies):**

>>The People's Republic of China

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

>>Gansu Province

**A.4.1.3. City/Town/Community etc.:**

>>Yumen Town, Yumen City

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

>>

The Project site is located 18-31 km southwest of Yumen Town, Yumen City, Gansu Province in the People's Republic of China. It is located at Latitude from +40.0942 (N 40 °05′39″) to +40.1644 (N 40°09′52″) and longitude from +96.7728 (E 96° 46′22″) to +96.8658 (E 96° 51′57″). The altitude of the Project site ranges from between 1690 m to 1825 m above the sea level. Figure A.4-1 shows the location of the Project.

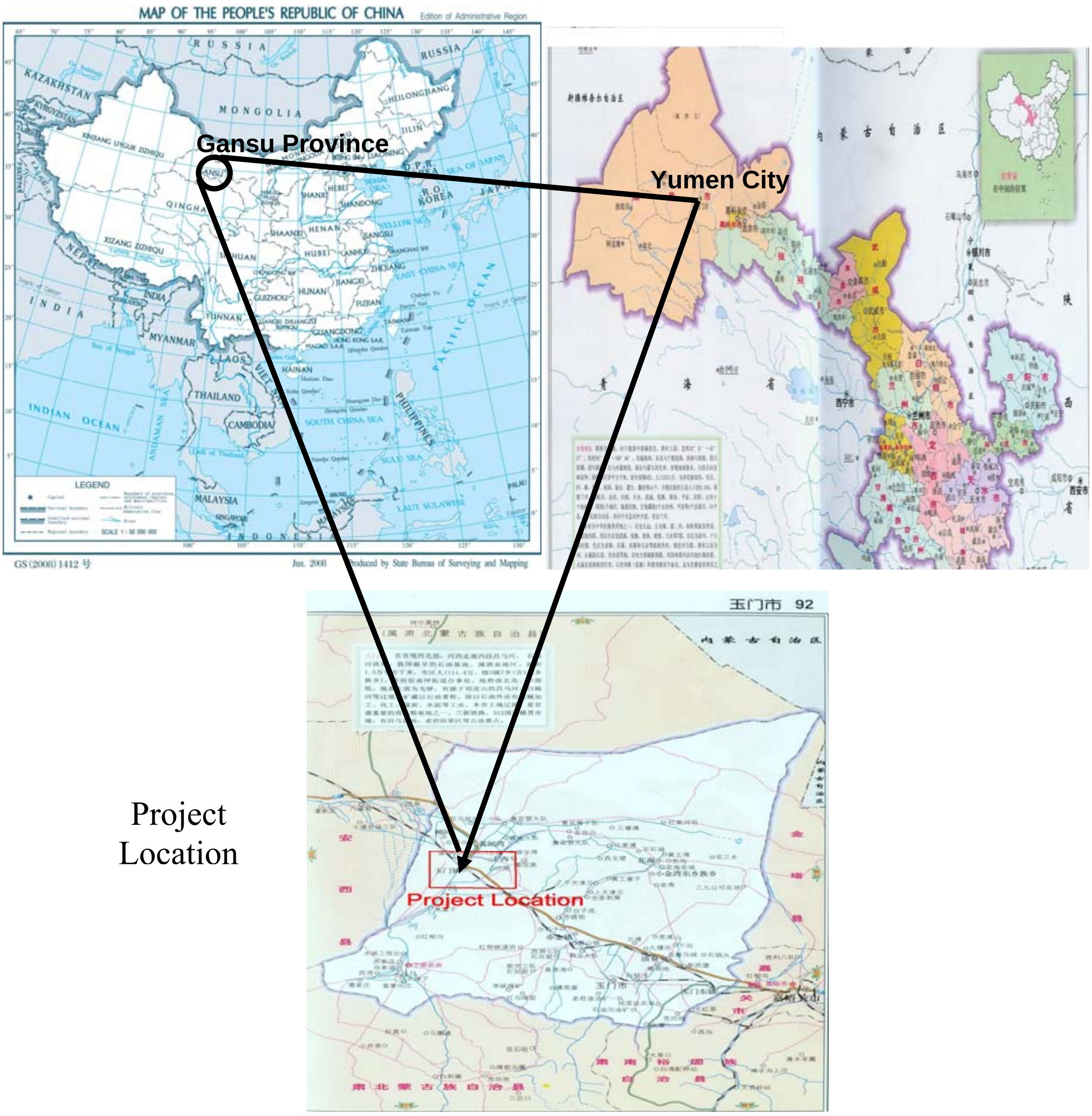


**Figure A.4 - 1 Map of Project Location**

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

>>The Project comes under sectoral scope 1, Energy Industries renewable sources.

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

>>

Prior to the Project implementation, the region's electricity demand was met by existing power plants in the NWPG, mostly conventional fossil fuel based thermal power plants, resulting in high levels of $CO_2$ emissions[2].

[2] China Electric Power Yearbooks 2009

The Project will install 134 sets of FD82A-1500/11 wind turbines, each of which has a power generation capacity of 1,500 kW. With these turbines, the Project will have a total capacity of 201 MW. Technical lifetime of the FD82A-1500/11 is 20 years[3] and the technical lifetime has also been specified in the technical agreement of the equipment purchase contract.

The FD82A-1500/11 turbines will be manufactured and assembled by China's Dongfang Steam Turbine Manufacture, using imported European advanced technology such as the central control system and the monitoring control system. Sufficient training necessary for construction, operation and maintenance will be provided for local workers.

**Table A.4-1 Technology Parameters**

| Item | FD82A/1500 |
|---|---|
| 1. Data for Unit | |
| Rated capacity (kW) | 1500 |
| Number of unit | 134 |
| Capacity control method | Adjusting the pitch of blade and wind wheel speed control |
| Turbine diameter (m) | 82 |
| Hub height (m) | 70 |
| Cut in wind speed (m/s) | 3.0 |
| Rated wind speed (m/s) | 11 |
| Cut out wind speed (m/s) | 20.0 |
| Wind speed limit (m/s) | 52.5 |
| Operating temperature (℃) | -20～+40 |
| The wind direction | Upwind |
| Technical lifetime (y) | 20 |
| 2. Blade | |
| Number of blades | 3 |
| Material of balde | GRP |
| End profiles of blades speed (m/s) | 74.3 |
| 3. Generator | |
| Type of generator | Double-fed slip ring asynchronous generator |
| Rated capacity (kW) | 1500 |
| Output Voltage (V) | 690 |
| Rated speed (rpm) | 1000～1800 ±10% |
| 4. Machinery space & Tower | |
| Machinery space (t) (exclude blade) | 61 |
| blade | 3×6.2 |
| Type of tower | Conical steel tube |
| High of tower (m) | 70 |
| Weight of tower (t) | 127.66 |

Source: Turbine purchase agreement between Dongfang Steam Turbine Manufacture and CECIC, April 2009

With Mount Qilian to its south and the Beishan Mountains to its north, the Project location has good conditions for power generation. The table below B 5-2 in the section B.5 shows 10 years average wind speed at the location.

[3] FSR, Ch5. page 5-6

Under such wind conditions, the theoretical full load power generation output of 682,146 MWh/year. In addition, the wind turbines' synthesized reduction coefficient was also calculated based on the below factors.

**Table A.4-2 Wind Turbines Synthesized Reduction Coefficient**

| No. | Items | FD82A-1500/11 |
|---|---|---|
| 1 | Wake turbulence reduction coefficient | 7.51% |
| 2. | Synthesized reduction coefficient | 26.50% |
| 2.1 | Reduction coefficient of wind-blown sand and pollution on blades | 1.00% |
| 2.2 | Wind turbines utilization rate | 5.00% |
| 2.3 | Power curve assurance coefficient | 8.00% |
| 2.4 | Reduction coefficient on climate factor | 2.50% |
| 2.5 | Impact of control and intensity of turbulence | 4.00% |
| 2.6 | Factory electricity usage, line loss, etc. | 5.00% |
| 2.7 | Other | 1.00% |

Source: Feasibility Study Report, produced by Northwest Hydro Consulting Engineers, CHECC April, 2009

The total power generation output is calculated as 463,714 MWh/year by discounting the above theoretical power generation output of 682,146 MWh/year, with the turbine wake turbulence reduction coefficient of 7.51% and wind turbines' synthesized reduction coefficient of 26.50% as indicated above. Accordingly, by dividing the estimated power generation of 463,714 MWh/year by the full possible annual load of 1,760,760 MWh (201MW x 24h/day x 365 days/year), the load factor of the project was calculated as 26.34%, or 2,307 of operating hours per year.

These values used in the load factor were taken from the Project's feasibility study report, which was prepared by a third party, Northwest Hydro Consulting Engineers, and was also approved by NDRC in April 2009. Therefore, these are in line with the requirements mentioned in the "Guidelines for the Reporting and Validation of Plant Load Factors" (EB48) for ex-ante load factor.

The electricity generated by the Project will be exported to the local Yumen town grid via a newly built 35kV/330kV transformer station, which is then exported to the NWPG.

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

>> A renewable crediting period 7 years x 3 is adopted for the Project. The total estimation of emission reductions in the first crediting period is 2,979,823 $tCO_2$, as shown in the following table.

**Table A.4-3 Estimation of the Emission Reduction (1st Crediting Period)**

| **Years** | **Annual estimation of emission reductions in tonnes $CO_2e$** |
|---|---|
| Jul. 2011-Dec. 2011 | 212,845 |
| 2012 | 425,689 |
| 2013 | 425,689 |
| 2014 | 425,689 |
| 2015 | 425,689 |
| 2016 | 425,689 |
| 2017 | 425,689 |
| Jan. 2018- Jun 2018 | 212,845 |
| **Total estimated reductions (tonnes of $CO_2e$)** | 2,979,823 |
| **Total number of crediting years** | 7 |
| **Annual average over the crediting period of estimated reductions (tonnes of $CO_2e$)** | 425,689 |

**A.4.5. Public funding of the project activity:**

>> There is no public funding from any Annex 1 country.

## SECTION B. Application of a baseline and monitoring methodology

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

>>

Approved Consolidated Methodology ACM0002, "Consolidated Methodology for Grid-Connected Electricity Generation from Renewable Sources", Version 12.1 was applied to the Project, referring to the most up-to-date version of methodology tools, "Tool for the Demonstration and Assessment of Additionality" version 5.2 and "Tool to Calculate the Emission Factor for an Electricity System" version 02.1.0. Although "Tool to Calculate Project or Leakage $CO_2$ Emissions from Fossil Fuel Combustion" and "Combined tool to identify the baseline scenario and demonstrate additionality" are listed as a tool used for the ACM0002 Ver. 12.1, the tool was not applied to the Project, as the Project is not a geothermal or solar thermal project.

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

>>

Since it is a wind power generation project which exports electricity to the NWPG, ACM0002 has been selected as the methodology for this project.

The Project conforms to the applicability condition of ACM0002 Version 12.1 – "Consolidated methodology for Grid-Connected Electricity Generation from Renewable Sources" as demonstrated in the table below:

**Table B.2-1 Applicability Criteria**

| Applicability Criteria for ACM0002 Ver. 12.1 | Project Activity |
|---|---|
| 1. The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit. | The Project involves installation of a new wind power plant |
| 2. In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use Option 2: on page 10 to calculate the parameter $EG_{PJ,y}$): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity; | The Project involves installation of a new wind power plant, and does not involve capacity addition, retrofits or replacements. |
| 3. In case of hydro power plants:<br>- The project activity is implemented in an existing reservoir, with no change in the volume of reservoir.<br>- The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 $W/m^2$.<br>- The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 $W/m^2$. | The Project does not involve installation, modification or retrofit of hydro power plants. Therefore, this applicability condition is not relevant to the Project. |

In addition, the ACM0002 –"Consolidated methodology for grid-connected electricity generation from renewable sources" is not applicable in the following scenarios.

**Table B.2-2 Other Criteria**

| Criteria not applicable for ACM0002 Ver., 12.1 | Project Activity |
|---|---|
| 1. Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; | The Project is a new wind project to export electricity to the Grid system. Therefore, the Project will not involve switching from fossil fuels to renewable energy source at the site of the Project activity. |
| 2. Biomass fired power plants; | The Project is not a biomass fired power plant. |
| 3. Hydro power plants that result in new reservoirs or in the increase in existing reservoirs where the power density of the power plant is less than 4 W/ $m^2$ | The Project is not a hydro power plant. |

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

>>

In accordance with the methodology ACM0002 (Version 12.1), the spatial extent of the project boundary includes the project power plant and all power plants connected physically to the NWPG. According to China DNA's guidance, NWPG is composed of Shanxi Grid, Gansu Grid, Qinghai Grid, Ningxia Grid, and Xinjiang Grid. The schematic diagram of the Project is as shown on the below figure.

The following table describes which emissions are included and which are omitted from the Project emissions calculations.

**Table B.3-1 GHG Included in the Project**

| | Source | Gas | Included? | Justification/explanation |
|---|---|---|---|---|
| Baseline | Power plants connected to the Northwest China Grid | $CO_2$ | Yes | Included as per ACM0002. |
| | | $CH_4$ | No | Excluded as per ACM0002. This is conservative. |
| | | $N_2O$ | No | Excluded as per ACM0002. This is conservative. |
| Project Activity | Not applicable | $CO_2$ | No | Excluded. The project activity is a zero-emission wind power generation. |
| | | $CH_4$ | No | Excluded. The project activity is a zero-emission wind power generation. |
| | | $N_2O$ | No | Excluded. The project activity is a zero-emission wind power generation. |

The schematic diagram of the Project is as shown on the below figure.

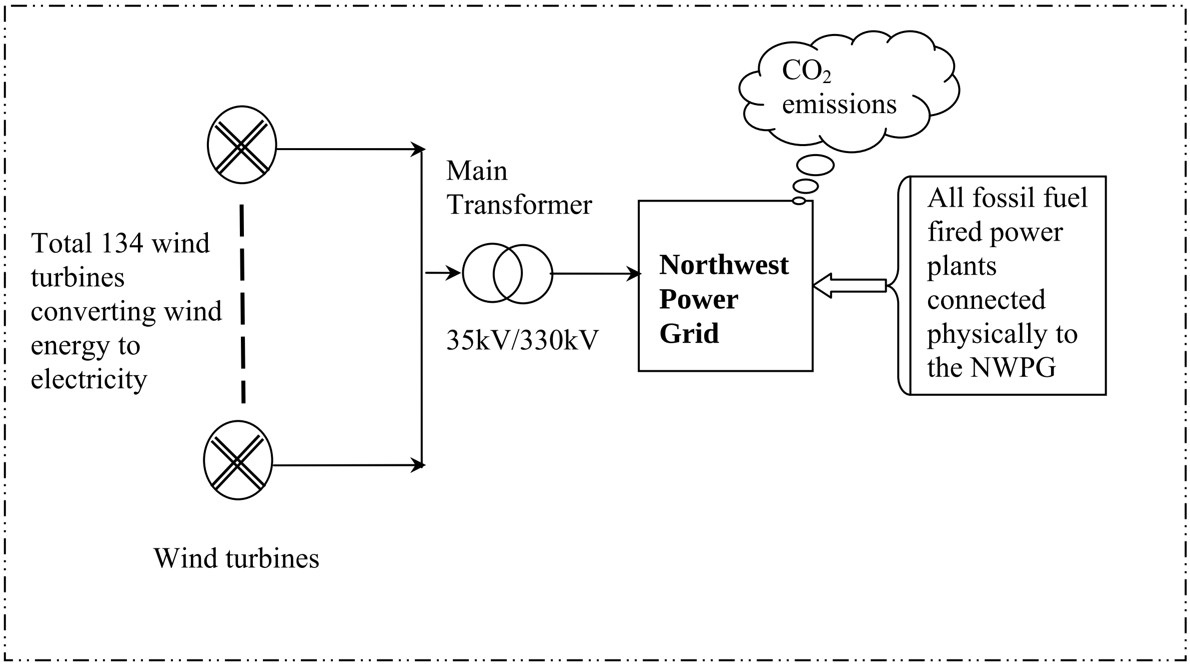


**Figure B.3-1 Project Boundary**

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

>>

The Project involves installation of a new grid connected wind power plant. Therefore it is not a modification or retrofit of an existing grid-connected plant. According to the methodology, the following baseline scenario should be applied:

"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".

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

>>

**Demonstration and assessment of additionality**

According to the methodology, "Tool for the Demonstration and Assessment of Additionality" was used to demonstrate the additionality. The following steps from the tool are applied:

Step 1: Identification of alternative scenarios
Step 2: Investment analysis
Step 4: Common practice analysis

**Step 1. Identification of alternative scenarios**

As mentioned in the section B.4, baseline scenario of the Project is set as the following.

"Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an

electricity system".

**Step 2- Investment analysis**

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

The "Tool for the Demonstration and Assessment of Additionality" suggests three possible analysis methods: simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III).

As the Project generates financial and economic benefits (income from electricity sales) other than CDM-related income, Option I (simple cost analysis) is not applicable. From Option II and Option III, Option III (benchmark analysis) will be carried out.

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

The relevant financial indicator chosen was IRR. As stipulated by ACM0002, the type of IRR used in this analysis is project IRR.

The benchmark will be derived from Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects[4], published by Operation Department of Power Generation and Power Transmission of the State Power Corporation of China. According to this publication, the project IRR benchmark return rate for wind power projects should be 8% after tax.

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

The project IRR of the Project, based on the financing conditions available to the project owner, was calculated using the following variables and data sources.

[4] http://cdm.unfccc.int/UserManagement/FileStorage/JL694VF0I1STX3G7M3RL8W0TMHVOAR

**Table B.5-1 Variables and data used for IRR calculation**

| Item | Value |
|---|---|
| **Project Information** | |
| Fixed Asset Investment | RMB1,980.023 million |
| Project life | 23 years (including 3 years of phase wise construction) |
| Electricity tariff for 3rd year through 15th year | RMB 0.5206 (incl. VAT) |
| Electricity tariff for 16th year* | RMB 0.487 (incl. VAT) |
| Electricity tariff for 17h through 23rd year | RMB 0.4200 (incl. VAT) |
| Annual Electricity Output | 463,714 MWh |
| **Revenues and Expenses** | |
| Electricity sales/yr (average) | RMB 188.229 million |
| O&M costs/yr (average) | RMB 43.019 million |
| Income tax | 25% |
| VAT | 17% |
| VAT drawback rate | 50% |
| City VAT Surcharge tax for Education | 3% of VAT |
| City VAT Surcharge tax for Urban Construction & Maintenance | 7% of VAT |
| CERs crediting time | 7×3 |
| Expected CERs Price to Calculate project IRR | 12 EUR/CER |
| **IRR Results** | |
| Project IRR (after tax) without CDM | 5.53% |
| Project IRR (after tax) with CDM | 9.21% |

Source: Feasibility Study Report, produced by Northwest Hydro Consulting Engineers, CHECC, April, 2009

* In year 16, the first 1,547 hours will be considered as part of the initial 30,000h (tariff of 0.5206 RMB / kWh), whereas the remaining 760 hours will be considered post 30,000h (tariff of 0.4200 RMB / kWh). Therefore, an average tariff of 0.487 RMB / kWh was applied for the year 16.

**Tariff:**

NDRC Approval FaGaiNengYuan [2008] No.1135, issued 16/05/2008, confirms that projects which are listed in the approval and constructed after the approval date should be constructed and managed using the guidelines set in the Yumen Changma Wind Power Concession Project Approval, which was issued on 17/06/2008. The Project is listed in the NDRC approval document. According to the Yumen Changma Wind Power Concession Project Approval, two different electricity tariffs were applied, based on the aggregated operating hour, 0.5206 RMB/kWh for the first 30,000 hours and the local average electricity tariff for post 30,000 hours. The Project started construction in 2009, therefore, this two-stage tariff was applied in the FSR. In addition, the FSR was prepared in April 2009, after issuance of the FaGaiNengYuan [2008] No.1135, therefore the FSR was also prepared using this guideline. Furthermore, this is in line with the tariff guideline specified in the NDRC's FSR Approval of the Project (Fagai Nengyuan [2009] No.1005).

Accordingly, a tariff of 0.5206 RMB/kWh was applied for the first 30,000 hours, while an estimated average tariff of 0.4200 RMB/kw was applied for the post 30,000 hour. In year 16, the first 1,547 hours will be considered as part of the initial 30,000h (tariff of 0.5206 RMB / kWh), whereas the remaining 760 hours will be considered post 30,000h (tariff of 0.4200RMB / kWh). Therefore, an average tariff of 0.487 RMB / kWh was applied for the year 16. However, this is only an estimation and actual tariff level will be determined based on the actual performance.

In fact, the assumption in the FSR of a tariff of 0.4200 RMB/kWh after year 16 is very conservative as an province average tariff. According to Power Engineering, Economic Evaluation and Tariff (second Edition), an average tariff of coal thermal power plant in Gansu province was 0.2765 RMB/kWh in 2008, which is 34% lower than the estimated tariff of after 30,000 h in the FSR. On the other hand, an average tariff of Hydro was 0.217 RMB/kWh, according to a study of data available in registered CDM projects, which is 48% lower than the estimated tariff after 30,000 h in the FSR. Since coal thermal power plants and hydro power plants covers over 98% of overall power supply of the NWPG, it is reasonable to conclude that the FSR assumption of 0.4200 RMB/kWh is significantly higher than the average tariff in Gansu province. Therefore, this assumption is considered conservative, particularly given that other elements in the IRR calculation are taken as fixed (for example, O&M costs), throughout the project life.

**Investment Cost:**

For the investment cost, the Project has investment cost ratio of RMB 9,851/kw. According to data given in the table Annex 5-1 in Annex 5 of the PDD, an average ratio of all the wind projects constructed in Gansu province since 2002 had ratio of RMB 9,156/kw. Although the Project's ratio is slightly higher than the average (about 8%), it is still considered a reasonable estimation.

**O&M Cost:**

Similarly, O&M cost ratio was also considered. As shown in the table Annex 5-1, an average O&M cost ratio of Gansu province is RMB 230/kw, whereas the Project has a ratio of RMB 214/kw. Since the Project has a lower O&M ratio than the average, it is considered conservative in the financial analysis and a reasonable estimation.

**Load Factor:**

Finally load-factor was also considered. In average, wind projects in Gansu province applied 25.2% load-factor, whereas the Project applied 26.34%, which results in higher output and is also considered conservative in the financial analysis and a reasonable estimation.

Based on the above information, the project IRR for the Project was calculated to be 5.53% (post tax). Against the benchmark mentioned in Sub-step 2b of 8%, it is clear that the project IRR of the Project is below the benchmark, and that it is not feasible for the Project to be implemented on a business-as-usual basis. Furthermore, if the PP sales CER generated from the Project at a market value of Euro 12/CER, the IRR becomes 9.21%, which is above the benchmark. This clearly demonstrates that the Project requires extra revenue from the CDM to be implemented.

***Sub-step 2d. Sensitivity analysis***

The following conditions were assumed for sensitivity analysis:

- Decrease of fixed asset investment by 10%: The equipment purchase agreement and construction agreement have been already finalized for the Project. Out of the total initial investment cost in the FSR, 64% attribute to the cost of turbines. According to the FSR and actual turbine contract, the difference between the estimation and the actual cost was found to be 1% of the cost. Furthermore, at the time of the PDD preparation, the PP has already signed contracts to pay total of RMB 1,854 million as part of initial investment costs, which is over 93.6% of the estimated fixed asset investment in the FSR, RMB 1,980.023 million. As the Project progresses on the construction, PP will sign more contracts, adding additional costs to the already confirmed costs. Therefore, the PP is not expecting significant decrease in the equipment and plant costs, and 10% variance is sufficient enough to deal with unexpected changes. Finally, to exceed the benchmark of 8%, equipment cost must decrease by 16.90%, and as stated above, this is not realistic.

- Decrease in O&M cost by 10%: Considering the fact that both Northwest Hydro Consulting Engineers (CHECC) a company which prepared the FSR, and the PP are experts in wind power generation in China, their estimates are reliable. In addition, the FSR was prepared last year, meaning that recent economical and industry conditions have been taken into account. Finally, as mentioned in the sub-step2c, the estimated O&M cost is comparable with other wind projects located in the Gansu province. Therefore, 10% variance is sufficient enough to deal with unexpected change in operation cost. Finally, under an extreme scenario where O&M cost is zero, the IRR becomes 7.83%, which is still below the benchmark.

- Increase in electricity tariff by 10%: Tariff rates for the first 30,000 hours have been finalized with Northwest Grid and have been approved by the government. Therefore, significant change in the tariff rate is unrealistic and 10% variance is sufficient to deal with unexpected events. As noted above, the tariff from Year 16, when the fixed tariff is expected to expire, has already been estimated on an extremely conservative basis. Finally, to exceed the benchmark of 8%, overall tariff (year 3 to year 25) must increase by 22.3%, and as stated above, this is not realistic.

- Increase of power generation by 10%: Considering the fact that both CHECC and the PP are experts in wind power generation in China, their estimates are reliable. In addition, minimum average annual wind speed between 1997 and 2007 (data is only available up to 2007) is 2.9m/s whereas the maximum is 3.1m/s, the difference between maximum and minimum is less than 7%.[5] Although wind speed varies between months, the annual average is considered stable. Finally, as mentioned in the sub-step2c, the estimated load factor is comparable with other projects located in the Gansu province. Therefore, 10% variance is sufficient to deal with unexpected events. Finally, to exceed the benchmark of 8%, tariff must increase by 25.0%, and as stated above, this is not realistic.

**Table B.5-2 Annual average wind speed**

| Year | Average wind speed (m/s) |
|---|---|
| 1997 | 2.9 |
| 1998 | 3.1 |
| 1999 | 3.0 |
| 2000 | 2.9 |
| 2001 | 2.9 |
| 2002 | 2.9 |
| 2003 | 2.9 |
| 2004 | 3.1 |
| 2005 | 2.9 |
| 2006 | 3.0 |
| 2007 | 3.0 |
| Minimum | 2.9 |
| Maximum | 3.1 |
| Average | 2.98 |

Source: Feasibility Study Report, produced by Northwest Hydro Consulting Engineers, CHECC April, 2009

[5] Feasibility Study Report, produced by Northwest Hydro Consulting Engineers, CHECC, April, 2009

The results of the sensitivity analysis are as follows:

**Table B.5-3 Results of the sensitivity analysis**

| Factor \ Variation | -10% | -5% | 0% | +5% | +10% |
|---|---|---|---|---|---|
| Electricity tariffs | 4.28% | 4.93% | 5.53% | 6.10% | 6.66% |
| Fixed Asset Investment | 6.90% | 6.19% | 5.53% | 4.92% | 4.36% |
| O&M costs | 5.77% | 5.65% | 5.53% | 5.41% | 5.28% |
| Power Generation | 4.41% | 4.99% | 5.53% | 6.04% | 6.54% |

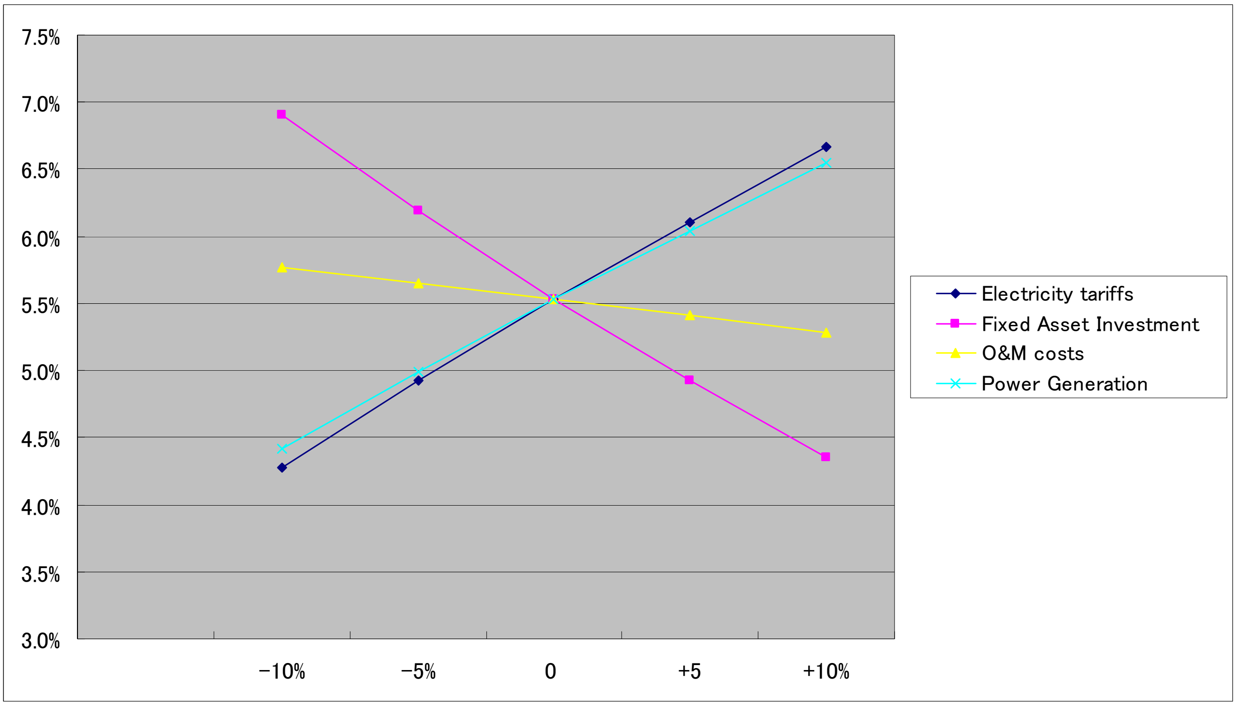


**Figure B.5-1 Results of the sensitivity analysis**

The tariff rates used in the above IRR calculation was set in the NDRC of China's approval (Fagai Nengyuan [2009]1005). In addition, the decreases of tariff level after 30,000 hours is considered reasonable assumptions based on the local electricity tariff level.

Furthermore, it is clear that the government approved feasibility study to undertake the Project were made under the same assumptions, therefore it is reasonable to use these tariff rates in the IRR calculation above.

Aside from the sensitivity analyses, further study on the tariff was conducted. "Information Note on the Highest Tariff Applied by the Executive Board in its Decisions on Registration of Project in the People's Republic of China" [6] which was prepared by Secretariat of UNFCCC in accordance with EB54 paragraph 53, confirms that the highest known tariff for wind power plant in Gansu Province is RMB 0.585/kWh (incl. VAT). The IRR was recalculated by applying the highest known tariff in the Gansu Province RMB 0.585 /kWh (incl. VAT) for the first 30,000 hours, while keeping everything else constant. The result indicates that Project IRR (post tax) would become 6.71%, which is still below the benchmark of 8%. Furthermore, when the same highest tariff of 0.585/kWh (incl. VAT) was applied to the entire

[6] http://cdm.unfccc.int/Reference/Notes/index.html

project lifetime (year 3 through year 25), the IRR (post tax) was recalculated as 7.48%, which is still below the benchmark of 8%.

Under the same condition, further analyses were conducted for various tariff levels. It was concluded that to make the IRR above the benchmark of 8%, the Project would need a tariff of RMB 0.653/kWh (incl. VAT) or higher, for the first 30,000 hours. Therefore, it can be concluded that even with the highest known tariff in Gansu Province, the Project is still considered below the benchmark and additional.

**Step 3. Barrier analysis**

Barrier analysis has not been conducted for the Project.

**Step 4. Common practice analysis**

Using the database of UNFCCC and Statistics of Windpark Installed Capacities in China of 2007, Chinese Wind Energy Association[7], all the CDM projects and non-CDM projects since 2001 located in Gansu Province are listed in the Table Annex 5-1 in Annex 5 of the PDD.

According to the "Tool for the demonstration and assessment of additionality", an analysis of any other activities that are operational and that are similar to the proposed project activity is required. Projects are considered "similar", if they are

- Same country/region and environment
- Relying on similar technologies
- Similar scale
- Take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing

<u>Same country/region and environment</u>
In China, there are significant differences between policies, regulations and economic conditions between different provinces, therefore, wind power projects in different provinces face very different operational environments. Further, with a population of 26 million people and area of 454,000 km$^2$, Gansu Province is larger than many countries. The common practice analysis in this PDD therefore limits the region to the province, which is standard practice for Chinese CDM projects.

<u>Relying on similar technologies</u>
There is significant difference in technology used, depending on efficiency and capacity of each projects. However, for simplicity and conservative reasons, all the wind projects are considered to use similar technologies.

<u>Similar scale</u>
Clearly, 201 MW should be considered different scale from projects that are less than 100 MW. However, for reasons of simplicity and conservativeness, projects are considered not to be of similar scale, if they are less than 15 MW, which is the threshold for small-scale CDM project.

<u>Take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing</u>
Each project faces different environment. This is true especially for projects developed before 2002 were considered not similar. In April 2002, China implemented power sector reform to establish a more commercialized power market in China.[8] As a result, new generation, including wind power, was

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[7] http://www.cwea.org.cn/upload/20080324.pdf
[8] http://www.ndrc.gov.cn/xwfb/t20050708_28096.htm

expected to run in a fully competitive commercial market. Moreover, the Chinese Government launched the Wind Concession Program in 2003, which was designed to bring wind power development in China onto a new commercial footing. Since market conditions for wind power project development changed significantly as a result of this sector reform, the common practice analysis excludes projects which commenced prior to 2002.

Finally, the Tool states that CDM projects should be excluded from the analysis. As result, the following project has been identified as a similar project.

**Table B.5-4 List of Wind Projects in Gansu Province**

| Name of CDM Project | Date | Capacity (KW) | CDM (Y/N) | Tariff | | Reference |
|---|---|---|---|---|---|---|
| | | | | inc. VAT | excl. VAT | |
| Gansu Anxi Wind Farm Project (Developer is currently developing it as a Gold Standard VER project) | Dec. 2006 | 750 | No | 0.4616[9] | 0.425 | Fa Gai Ban Neng Yuan [2005]2037 |
| | Oct. 2007 | 99750 | | | | |

***Sub-step 4a. Analyze other activities similar to the Project activity***

As shown above, all the wind projects within the Gansu Province have been developed as part of a CDM activity or are in the process of developing as CDM activities, except for the "Gansu Anxi Wind Farm Project".

The "Gansu Anxi Wind Farm Project" was set up by China Power International New Energy Holdng Ltd (CPI) in 2006. The project company is a Joint Venture with two objectives of (a) generate power, (b) generate and sale carbon credit from the project. Since CPI is a registered company in Hong Kong, it was not possible to apply for CDM in China (finally in December 2009, Hong Kong registered companies became eligible to apply for CDM)[10]. Therefore, CPI applied for VER (Gold Standard) to cover extra revenue needed to make the project financially viable. It is clear that the CPI project owner is aiming to gain a revenue stream from the sale of carbon credits (Gold Standard VERs), therefore, the "Gansu Anxi Wind Farm Project" can be excluded from the similar project activities analysis.

From this analysis, it is clear that under normal market conditions, due to the high equipment and plant costs and relatively low electricity tariff, wind power projects are generally unattractive for the investors in Gansu Province under business-as-usual circumstances.

The above analysis was performed in line with the additionality tool and clearly shows that the Project activity would not be built were it not for the additional revenue available through the CDM. In its absence, electricity would be supplied by existing and new power generation units connected to the NWPG.

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9 http://www.86ne.com/Wind/200805/Wind_139705_6.html

10 http://www.epd.gov.hk/epd/english/climate_change/cdm_suppleme mtary_notes.html

**CDM Consideration**

The following tables show the timeline of the actions taken for the project implementation as well as the CDM registration.

**Table B.5-5 Timeline for the project implementation**

| Date | Action taken | Remark |
|---|---|---|
| April 2008 | The Environmental Impact Assessment Report | EIA Report was completed by Lanzhou University |
| 6th August 2008 | The EIA approval | The EIA was approved by Gansu Province Environmental Protection Bureau |
| April, 2009 | The Feasibility Study Report | The Feasibility Study Report for the Project was completed by Northwest Hydro Consulting Engineers. |
| 21st April, 2009 | NDRC Approval (Fagai Nengyuan [2009]1005) | The Project received Approval from NDRC |
| 28th April 2009 | Turbines purchase contract | An agreement for the equipment purchase is finalized between Dongfang Steam Turbine Manufacture and CECIC. |
| 14th July 2009 | Main transformer contract | An agreement for the main transformer between Baoting Tianwei Baobian Electrical Co.,Ltd and CECIC |
| 3rd Aug. 2009 | Wind turbine tower purchase contract | Wind tower equipment contract for Phase I |
| Sep. 2009 | Wind turbine construction contract for Phase 1 | Construction contract between Hebei Construction Group Co.,Ltd and CECIC |
| Sep. 2009 | Wind turbine construction contract for Phase 1 | Construction contract between Gansu Huamao Construction Installation Engineering Co.,Ltd and CECIC |
| 19th Sep, 2009 | Start of construction | Construction was started |
| Oct. 2009 | Wind turbine construction contract for Phase 2 | Construction contract between Gansu Huamao Construction Installation Engineering Co.,Ltd and CECIC |
| Oct. 2009 | Wind turbine construction contract for Phase 2 | Construction contract between Gansu Construction Investment (Holdings) Group Co.,Ltd and CECIC |
| Oct. 2009 | Wind turbine tower purchase contract | Wind tower equipment contract for Phase II |
| Dec. 2009 | Wind turbine installation contract | Wind turbine installation contract between China Nuclear Industry Zhongyuan Construction Co.,Ltd and CECIC |
| 24th May 2010 | 35kV transmission line installation contract | Transmission line installation contract between Gansu Huamao Construction Installation Engineering Co.,Ltd and CECIC |
| May 2010 | 35kV package transformer purchase contract | An agreement for the equipment purchase is finalized between Jiangsu Huapeng Transformer Co.,Ltd and CECIC |

**Table B.5-6 Timeline for CDM registration**

| Date | Action taken | Remark |
|---|---|---|
| 18th June, 2008 | Stakeholders Consultation | 45 stakeholders attended the meeting |
| 15th April, 2009 | Board's decision | Board made a decision to implement the Project with consideration of CDM |
| 3rd Aug 2009 | Prior Consideration Notification to the NDRC | Notification of the commencement of the project activity and the intention to seek CDM status was sent to NDRC |
| 3rd Sep 2009 | Prior Consideration Notification to the EB | Notification of the commencement of the project activity and the intention to seek CDM status was sent to EB |
| 20th Nov. 2009 | PIN production | PIN |
| 12th April, 2010 | Sale of CERs and contract for CDM Consulting | Signed the Term Sheet with Mitsubishi UFJ Morgan Stanley Securities |

As shown in the above table, the project owner considered the incentive from the CDM at a very early stage of the Project activity and has continued to take real actions to secure CDM status in parallel with the implementation of the Project activity.

## B.6. Emission reductions:

### B.6.1. Explanation of methodological choices:

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The Project Activity reduces $CO_2$ through the substitution of fossil fuel fired grid-connected electricity generation with renewable electricity generation.

As described in ACM0002 and the "Tool to calculate the emission factor for an electricity system", the emission reductions associated with wind projects are calculated as follows:

**Baseline emissions ($BE_y$)**

As defined in the above section, the baseline scenario of the Project is $CO_2$ emissions from electricity generation in fossil fuel based thermal power plants. Based on the methodology, the baseline emissions were calculated as shown below

$$BE_y = EG_{PJ,y} \times EF_{gird,CM,y}$$

Where:

| | |
|---|---|
| $BE_y$ | Baseline emissions in year $y$ ($tCO_2$/yr). |
| $EG_{PJ,y}$ | Electricity supplied by the project activity to the grid (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". |

For the calculation of $EG_{PJy}$, following is applied, as the Project is considered a Greenfield plant, i.e., the project activity is the installation of a new grid-connected renewable power plant at a site where no renewable power plant was operated prior to the implementation of the project activity.

$$EG_{PJ,y} = EG_{facility,y}$$

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

As directed in the methodology, the emission factor for the electricity grid is calculated according to the "Tool to calculate the emission factor for an electricity system". The calculations have been completed by the Chinese DNA - the Office of Climate Change under the National Development and Reform Commission - in line with the Tool. The results can be found on the Chinese DNA's website.[11] The calculation procedures are as follows

***STEP 1. Identify the relevant electricity systems***

According to the Tool, project electricity system is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity. The Chinese DNA has published a delineation of the project electricity system and connected electricity system. According to the delineation, the project electricity system of the local grid to which the Project activity is connected is NWPG.

Similarly, a connected electricity system is defined as an electricity system that is connected by transmission lines to the project electricity system. According to the delineation, the NWPG is connected to the Central China Power Grid (CCPG) and CCPG is considered as a connected electricity system. However, as NWPC exports power to CCPG and there is no power import from CCPG to NWPG, CCPG was not considered in the emission factor calculation[12].

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

For the operating margin, "Option I: only grid power plants are included in the calculation" was selected.

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

There are 4 options for calculating the OM, according to the "Tool to calculate the emission factor for an electricity system".

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

The Project selected option (a) the simple OM method; however, option (a) can only be used if low-cost/must-run resources constitute less than 50% of total grid generation in: 1) the average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

Dispatch data is unavailable for the Northwest China Power Grid; therefore, this PDD selects option (a), the Simple OM method, to calculate this parameter. As shown in the table below, low-cost/must-run resources constitute less than 50% of total grid generation, averaged over the five most recent years.

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11 http://qhs.ndrc.gov.cn/qjfzjz/t20090703_289357.htm

12 China Electric Power Yearbooks 2005, 2006, 2007, and 2008

**Table B.6-1 List of Low-Cost/Must-Run Plants**

| Year | Low-cost/must-run generation ($10^8$ kWh) | Total Generation ($10^8$ kWh) | % |
|---|---|---|---|
| 2004 | 373.14 | 1692.53 | 22 |
| 2005 | 506.53 | 1845.62 | 27 |
| 2006 | 490.54 | 1984.92 | 25 |
| 2007 | 532.34 | 2299.38 | 23 |
| 2008 | 584.4 | 2673.27 | 22 |
| | | **Average:** | **23.8** |

Source: China Electric Power Yearbooks 2005, 2006, 2007, 2008 and 2009

In calculating the simple OM, the ex-ante option of a 3-year generation-weighted average is chosen, and is based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation. Under the ex ante option, 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 the calculation, data from 2006, 2007 and 2008 is chosen as the data for these years is the most recent available.

***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 of $CO_2$ emissions per unit of net electricity generation ($tCO_2/MWh$) of all generation power plants serving the system, not including low-cost/must-run power plants/units. It is calculated based the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system (option B). This option was selected, because the necessary data for option A is not available, only nuclear and renewable power generation are considered as low-cost/ must-run power sources and the quantity of electricity supplied to the grid by these sources is known, and finally, Option I was chosen in Step 2 above. Electricity imports are treated as one power plant.

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_y}$$

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 grid system, not including low-cost/must-run power plants/units in year y (MWh) |
| i | All fossil fuel types combusted in power sources in the project electricity system in year y |
| y | The relevant year as per the data vintage chosen in Step 3 |

***STEP 5. Identify the group of power units to be included in the build margin (BM)***

Since the plant specific data for the Northwest China Power Grid is not available, the capacity addition from one year to the next and the efficiency of the best available technology are used as a basis for determining the build margin of the grid, as clarified by the CDM Executive Board[13]. The build margin emission factor will be calculated ex-ante based on the most recent information available at the time of CDM-PDD submission to the DOE for validation and applied during the first crediting period. For the second crediting period, the build margin emission factor will be updated based on the most recent information available at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period will be used (Option 1).

***STEP 6. Calculate the build margin emission factor***

The procedure to calculate the Build Margin emission factor conservatively is as follows:

1) Using the latest available statistical data determine the two years with added capacity closest to 20% (above 20%) of the system generation (in MWh) and that have been built most recently.

- The capacity of each previous year *x* is compared with the capacity of the most recent year.

$$\text{Capacity increase}(\%) = \left( \frac{\text{Capacity of the most recent year}}{\text{Capacity of the year x}} - 1 \right) \times 100$$

- Select the year of which the capacity increase is closest to and above 20% for the build margin emission factor calculation

2) Calculation of weights of $CO_2$ emissions of solid, liquid and gas fuel in total emissions for power generation:

$$\lambda_{COAL,y} = \frac{\sum_{i \in COAL, j} FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}{\sum_{i,j} FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}$$

$$\lambda_{OIL,y} = \frac{\sum_{i \in OIL, j} FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}{\sum_{i,j} FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}$$

$$\lambda_{GAS,y} = \frac{\sum_{i \in GAS, j} FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}{\sum_{i,j} FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,j,y}}$$

Where:

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

$NCV_{i\,y}$ the net calorific value (energy content) per mass or volume unit of a fuel *i* in year *y* (country-specific values are used)

$EF_{CO2,i,j,y}$ the $CO_2$ emission factor per unit of energy of the fuel *i*

*Coal, Oil, Gas* respectively refers to the group of solid, liquid, and gas fuels

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

3) Calculation of Emission Factor of Relevant Thermal Power

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

Where:

$EF_{Coal,\ Adv,\ y}$ the emission factor representing best technology commercially available for fuel of coal fired power plants in year *y*;

$EF_{Oil,\ Adv,\ y}$ the emission factor representing best technology commercially available for fuel of oil fired power plants in year *y*;

$EF_{Gas,\ Adv,\ y}$ the emission factor representing best technology commercially available for fuel of gas fired power plants in year *y*.

The values used for best technology commercially available were as follows: (Taken from data published by the Chinese DNA on December 20th, 2010).

**Table B.6-2 List of Highest efficiency**

| **Power generation type** | **Highest commercially available thermal efficiency** |
|---|---|
| Coal | 39.08% |
| Oil and Gas | 51.46% |

Source: China DNA's grid baseline notification issued on 20/12/2010[14]

4) Calculation of BM of the Grid

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

Where:

$CAP_{Total}$ the total of new capacity additions

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

***STEP 7. Calculate the combined margin emission factor***

The combined margin emission factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$$

Where:

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

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

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

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

The following default values will be applied for $w_{OM}$ and $w_{BM}$:

For wind and solar projects, $w_{OM}$ = 0.75 and $w_{BM}$ = 0.25 for the first crediting period and for subsequent crediting periods.

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[14] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2552.pdf

**Project Emissions ($PE_y$)**

Project emission shall be calculated as below.

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y}$$ [15]

Where

| | |
|---|---|
| $PE_y$ | Project emission in year y ($tCO_2e/yr$) |
| $PE_{FF,y}$ | Project emission from fossil fuel consumption in year y ($tCO_2e/yr$) |
| $PE_{GP,y}$ | Project emission from the operation of geothermal power plants due to the release of non-condensable gases in year y ($tCO_2e/yr$) |
| $PE_{HP,y}$ | Project emission from water reservoirs of hydro power plants in year y ($tCO_2e/yr$) |

Since the Project is not a geothermal thermal, solar thermal or hydro project $PE_{FF,y}$, $PE_{GP,y}$ and $PE_{HP,y}$ are considered zero. Therefore, $PE_y$ is also considered zero.

**Leakage ($LE_y$)**

No leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, transport). These emissions sources are neglected.

**Emission Reductions ($ER_Y$)**

In line with the methodology, emission reductions are calculated as follows:

$$ERy = BEy - PEy$$

Where

| | |
|---|---|
| ERy | Emission reduction in year y (tCO2/yr) |
| BEy | Baseline emissions in year y (tCO2/yr) |
| PEy | Project emissions in year y (tCO2/yr) |

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

| **Data / Parameter:** | **FC** $_{i,y}$ |
|---|---|
| Data unit: | A mass or volume of unit of the fuel i |
| Description: | The amount of fuel i consumed in the project electricity system in year y (mass or volume unit) |
| Source of data used: | China Energy Statistics Yearbook 2007, 2008 and 2009 |
| Value applied: | Please see China DNA grid data publication referenced in Annex 3 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Since the detailed fuel consumption data by power plants are not available, the aggregated data by fuel types recommended by the Chinese DNA are used. |
| Any comment: | |

[15] Equation (1) of ACM0002

| **Data / Parameter:** | **$EG_{grid,y}$** |
|---|---|
| Data unit: | MWh |
| Description: | Net electricity generated and delivered to the grid by all power sources serving the grid system, not including low-cost/must-run power plants/units in year y |
| Source of data used: | China Electric Power Yearbooks 2007, 2008, and 2009 |
| Value applied: | see table below |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | This is an official published data from the government. |
| Any comment: | |

| Year | $EG_{grid,y}$ (MWh) |
|---|---|
| 2006 | 156,142,241 |
| 2007 | 178,920,940 |
| 2008 | 200,640,770 |

| **Data / Parameter:** | **$NCV_i$** |
|---|---|
| Data unit: | kJ/kg |
| Description: | Net calorific value (energy content) per mass or volume unit of fuel type $_i$ |
| Source of data used: | China Energy Statistics Yearbook 2009 |
| Value applied: | Please see China DNA grid data publication referenced in Annex 3 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | This is an official published data from the government. |
| Any comment: | |

| **Data / Parameter:** | **$EF_{CO2,i}$** |
|---|---|
| Data unit: | $tCO_2/TJ$ |
| Description: | $CO_2$ emission factor per unit of energy of the fuel *i* |
| Source of data used: | Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy |
| Value applied: | (see table below) |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | IPCC default values are used in line with the calculations published by the Chinese DNA. |
| Any comment: | |

| **Fuel type** | **EF (kgCO2/TJ)** |
|---|---|
| Raw coal | 87,300 |
| Clean coal | 87,300 |
| Other washed coal | 87,300 |
| Briquette | 87,300 |
| Coke | 95,700 |
| Coke oven gas | 37,300 |
| Other coal gas | 37,300 |
| Crude oil | 71,100 |
| Gasoline | 67,500 |
| Diesel | 72,600 |
| Fuel oil | 75,500 |
| LPG | 61,600 |
| Refinery gas | 48,200 |
| Natural gas | 54,300 |
| Other petroleum products | 72,200 |
| Other coking products | 95700 |
| Other energy | 0 |

| **Data / Parameter:** | **$EF_{Coal,adv,i}$** |
|---|---|
| Data unit: | $tCO_2/MWh$ |
| Description: | The emission factor representing best technology commercially available for coal fired power plants in year *y*; |
| Source of data used: | China DNA's grid baseline notification issued on 20/12/2010[16] |
| Value applied: | 0.8042 $tCO_2/MWh$ |
| Justification of the choice of data or description of measurement methods | This is an official published data from the government. |

[16] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2552.pdf

| | |
|---|---|
| and procedures actually applied : | |
| Any comment: | This was based on a highest thermal efficiency value for coal power plants of 39.08%. |

| **Data / Parameter:** | $\mathbf{EF_{Oil, adv,i}}$ |
|---|---|
| Data unit: | $tCO_2/MWh$ |
| Description: | The emission factor representing best technology commercially available for oil fired power plants in year *y*; |
| Source of data used: | China DNA's grid baseline notification issued on 20/12/2010[17] |
| Value applied: | 0.5282 $tCO_2/MWh$ |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | This is an official published data from the government. |
| Any comment: | This was based on a highest thermal efficiency value for oil and gas power plants of 51.46%. |

| **Data / Parameter:** | $\mathbf{EF_{Gas, adv,i}}$ |
|---|---|
| Data unit: | $tCO_2/MWh$ |
| Description: | The emission factor representing best technology commercially available for gas fired power plants in year *y*; |
| Source of data used: | China DNA's grid baseline notification issued on 20/12/2010[18] |
| Value applied: | 0.3799 $tCO_2/MWh$ |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | This is an official published data from the government. |
| Any comment: | This was based on a highest thermal efficiency value for oil and gas power plants of 51.46%. |

| **Data / Parameter:** | $\mathbf{CAP_{i, y}}$ |
|---|---|
| Data unit: | MW |
| Description: | Installed capacity of relevant power source *i* connected to North West China Grid in year *y* |
| Source of data used: | China Electric Power Yearbooks 2009 |
| Value applied: | Please see China DNA grid data publication |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | For Chinese grids, due to the unavailability of data on individual plants to calculate build margin in accordance with the tool to calculate the emission factor of an electricity system. |

[17] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2552.pdf

[18] http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File2552.pdf

| | |
|---|---|
| Any comment: | |

| Data / Parameter: | $EF_{grid,BM,y}$ |
|---|---|
| Data unit: | $tCO_2/MWh$ |
| Description: | Build margin $CO_2$ emission factor in year y |
| Source of data used: | Calculations |
| Value applied: | 0.6878 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Calculated as directed in B.6.1. |
| Any comment: | |

| Data / Parameter: | $EF_{grid,OM,y}$ |
|---|---|
| Data unit: | $tCO_2/MWh$ |
| Description: | Build margin $CO_2$ emission factor in year y |
| Source of data used: | Calculations |
| Value applied: | 0.9947 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Calculated as directed in B.6.1. |
| Any comment: | |

| Data / Parameter: | $w_{OM}$ |
|---|---|
| Data unit: | Fraction |
| Description: | Weighting of operating margin emissions factor % |
| Source of data used: | Tool to calculate the emission factor for an electricity system |
| Value applied: | 0.75 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | As directed in the tool, a value of 0.75 is to be used for the entire crediting period |
| Any comment: | |

| Data / Parameter: | $w_{BM}$ |
|---|---|
| Data unit: | Fraction |
| Description: | Weighting of build margin emissions factor |
| Source of data used: | Tool to calculate the emission factor for an electricity system |
| Value applied: | 0.25 |
| Justification of the choice of data or description of measurement methods and procedures actually | As directed in the tool, a value of 0.25 is to be used for the entire crediting period |

| | |
|---|---|
| applied : | |
| Any comment: | |

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

>>

**Electricity generated by the project**

At full capacity, the project will deliver

| | | | | | | |
|---|---|---|---|---|---|---|
| Gross Power generation (MWh/year) | = | Capacity per Unit (MW) | × | Number of Units (Unit) | × | Hours per year (Hour) |
| | = | 1.5 | × | 134 | × | 2,307.0348 |
| | = | 463,714 (MWh/year) | | | | |

**Baseline Emissions**

The emissions from the grid-electricity displaced in year *y* are calculated as follows:

| | | | | |
|---|---|---|---|---|
| $BE_y$ | = | $EG_{facility,y}$ | × | $EF_{grid,CM,y}$ |
| ($tCO_2$) | | (MWh) | | ($tCO_2$/MWh) |
| | = | 463,714 | × | 0.9180 |
| | = | 425,689 ($tCO_2$) | | |

**Project Emissions**

As described in section B.6.1., Project emissions, $PE_y$, are equal to zero.

**Leakage**

No leakage is applicable under this methodology.

**Emission Reductions**

| | | | | |
|---|---|---|---|---|
| $ER_y$ | = | $BE_y$ | — | $PE_y$ |
| ($tCO_2$) | | ($tCO_2$) | | ($tCO_2$) |
| | = | 425,689 | — | 0 |
| | = | 425,689 ($tCO_2$) | | |

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

>>

**Table B.6-3 CER Estimation (for 1st crediting period)**

| Year | Estimation of baseline emissions ($tCO_2e$) | Estimation of project emissions ($tCO_2e$) | Estimation of leakage ($tCO_2e$) | Estimation of emission reductions ($tCO_2e$) |
|---|---|---|---|---|
| Jul. 2011-Dec. 2011 | 212,845 | 0 | 0 | 212,845 |
| 2012 | 425,689 | 0 | 0 | 425,689 |
| 2013 | 425,689 | 0 | 0 | 425,689 |
| 2014 | 425,689 | 0 | 0 | 425,689 |
| 2015 | 425,689 | 0 | 0 | 425,689 |
| 2016 | 425,689 | 0 | 0 | 425,689 |
| 2017 | 425,689 | 0 | 0 | 425,689 |
| Jan. 2018- Jun 2018 | 212,845 | 0 | 0 | 212,845 |
| TOTAL | 2,979,823 | 0 | 0 | 2,979,823 |

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

### B.7.1 Data and parameters monitored:

| **Data / Parameter:** | **$EG_{facility,y}$** |
|---|---|
| Data unit: | MWh |
| Description: | Quantity of net electricity generation supplied by the project plant/unit to the grid in year y |
| Source of data to be used: | Project activity site |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 463,714 MWh per year at full capacity.<br>Electricity supplied to the grid by the Project in the year y ($EG_y$) is the net electricity of exported to the grid by the Project and imported from the grid by the Project, and is estimated as 463,714 MWh, using the installed capacity (201 MW) and the expected annual operation factor (2,307 hours) |
| Description of measurement methods and procedures to be applied: | Measurement will be performed continuously with electricity meters, and it will be recorded monthly. Data will be archived for 2 years following the end of the crediting period by means of electronic and paper backup. |
| QA/QC procedures to be applied: | Meters will be examined, tested and calibrated at least once a year, according to the manufacturer's standards. Measured data are counter-checked by receipt of electricity sales. |
| Any comment: | |

**B.7.2. Description of the monitoring plan:**

>>

**Monitoring:**

Purpose

The monitoring methodology clearly describes how to identify and collect the necessary data. The following is a summary list of the main items to be monitored:

The operational and management structure to be adopted by the project owner in implementing the monitoring plan for the project activity is outlined in the figureB.7-1 below.

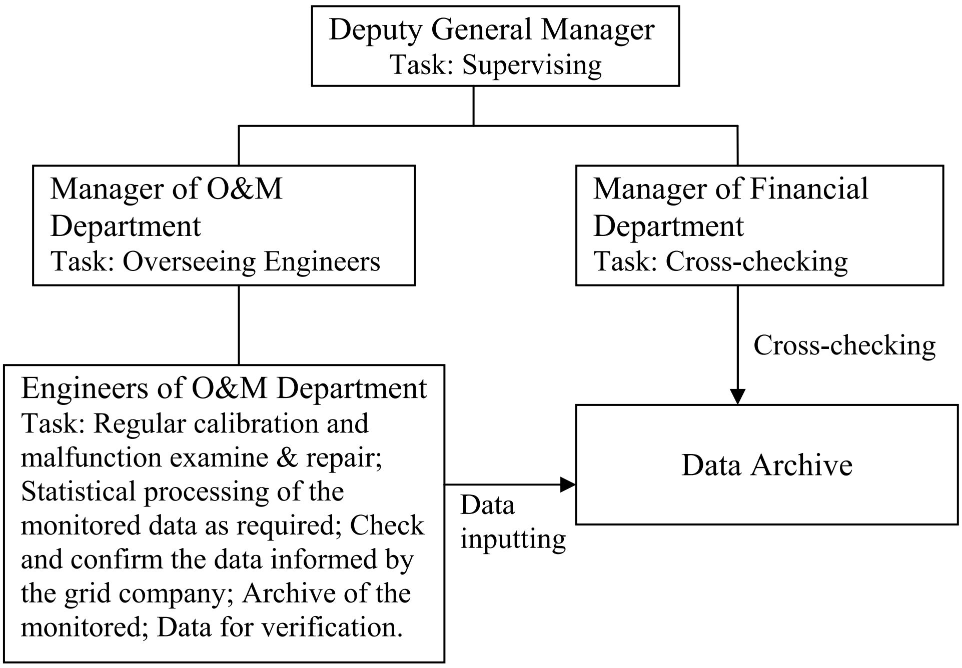


**Figure B.7-1 Operational and management structure for monitoring the project activity.**

The performance of the Project will be reviewed and analyzed by the consultant on a regular basis.

Organization

PP will form a CDM Project Management Team headed by the vice general manager. Monitoring and reporting will be implemented by the Operation & Maintenance Department and Financial Department.

Engineers of the Operation & Maintenance Department will conduct following tasks

- Regular calibration and malfunction examine & repair;
- Statistical processing of the measured data as required;
- Check and confirm the data informed by the grid company;
- Archive of the measured data for verification.

The manager of O&M Department will check the reported measured data monthly. The manager of Financial Department will responsible for the cross-check via the sales receipts monthly.

Measurement meters

The electricity exported to the grid by the Project and the electricity imported from the grid by the Project are continuously measured by ten bi-directional electricity energy meters installed at the 35kV side of the 35kV/330kV substation. The Project will share one same gateway meter installed at the 330kV level of the 35kV/330kV substation with other projects.

Configuration of the monitoring meters

The illustrative metering diagram for the Project is shown at the figure below. The Project will share the Gateway Meter with other projects.

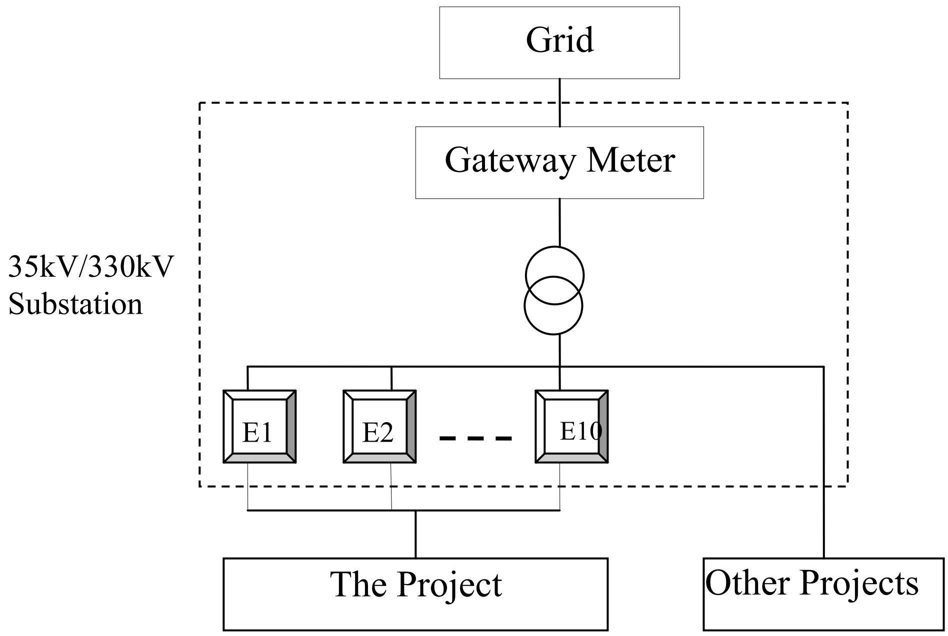


Figure B.7-2 Illustrative metering diagram

All of the meters in the 35kV/330kV substation are operated and maintained by the grid company. The electricity exported to the grid and electricity imported from the grid by the Project are continuously measured by the bi-directional electricity meters of E1 to E10. The electricity output and input of other current and any future projects which share the same Gateway Meter with the Project, can be measured directly by their own meters. The Gateway Meter can obtain the total electricity output and input by these projects. Considering the transmission and line loss, the electricity exported to the grid and electricity imported from the grid by the Project shown at the sale receipts can be calculated according to the approach defined in the PPA agreed by the project company and grid company. The Project owner will ensure that the meters and the PPA be readily available for DOE's verification.

The grid company will read and record the readings of the meters monthly, and the project company also will read and record the readings of the meters monthly through telecommunication system. At the end of each month, both of the electricity exported to the grid and the electricity imported from the grid by the Project are calculated separately based on the description in the PPA and informed to the project company by the grid company. After confirmed by the project company, the grid company issue the sales receipts

respectively for the electricity exported to the grid and the electricity imported from the grid by the Project to project company for settlement.

The data from the electricity meters can be cross-checked with the sales receipts. The conservative value will be adopted once the value from meter reading and the value from the sales receipts are different.

Data
All data collected as part of monitoring should be archived electronically and be kept for at least 2 years after the end of the last crediting period.

**Quality Assurance and Quality Control**

Various measures will be taken to insure the quality assurance and quality control of the monitoring.

Calibration
The metering equipments will be calibrated and checked by a qualified third party according to an appropriate industry standard or the manufacturer's specifications. The calibration records will be maintained and made available for review by the DOE.

Accuracy
As mentioned above, measurement meters have accuracy range of no less than 0.5S and will be calibrated and checked for accuracy according to local industry standards to make sure that any error resulting from such equipment will not exceed 0.5% of full-scale rating. All the meters shall be jointly inspected and sealed on behalf of the parties concerned and shall be only checked in the presence of the other party or its accredited representatives. It will also comply with the national standards Technical Administrative Code of Electric Energy Metering (DL/T 448-2000) or Alternating Current Static Watt-hour Meters for Active Energy (Classes 0.2S and 0.5S) (GB/T 17883-1999).

Crosschecking of data
Monitored data will be counter-checked by receipt of electricity sales.

Corrective actions

When reading error of any meter exceeds the allowable range or any inconsistency occurs, the meter should be repaired and followed by calibration by a third part in accordance with the standard, within 10 days. The grid company shall inform the project company before the calibration and all the record should be kept by the project company.

When the any meter detects the error beyond the allowable range or inconsistency, the grid company shall repair the meter, recalibrate, or replace, while giving the project company sufficient notice to allow their representative to attend during any corrective activities. When it happens, the electricity will be calculated and estimated by the project company and the grid company using a reasonable and conservative method, based on the reading of gateway meter and other projects meters, and historical generation data. Also, the project owner should provide the evidence to testify whether the method is reasonable and conservative.

Training

To make sure that the monitoring can be carried out properly, the PP will provide an extensive training to the whole monitoring team. The training content mainly includes of the monitoring data collecting procedure, data cross-check procedure and archiving procedure, etc. The consultant will help the project owner to issue a CDM monitoring management guideline manual.

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

>>

The baseline study was completed in 20/04/2011 by:

Clean Energy Finance Committee
Mitsubishi UFJ Morgan Stanley Securities Co., Ltd.

2nd Floor, KR Toyosu Building
5-4-9 Toyosu, Koto-ku, Tokyo 135-001, Japan.

watanabe-hajime@sc.mufg.jp

Please note that Mitsubishi UFJ Morgan Stanley Securities is also a Participant to the Project.

## SECTION C. Duration of the project activity / crediting period

### C.1. Duration of the project activity:

#### C.1.1. Starting date of the project activity:

>> 28/04/2009

The starting date of the Project was set as 28/04/2009, which is contract signing date for the turbines purchase contract with Dongfang Steam Turbine Manufacture. This is considered the first real action for the Project activity, as it was the first significant investment and commitment the PP made for the project.

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

>> 20 years

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

#### C.2.1. Renewable crediting period:

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

>> 28/04/2011 (which is the registration date of the Project)

##### C.2.1.2. Length of the first crediting period:

>> Renewable Seven (7) years

#### C.2.2. Fixed crediting period:

##### C.2.2.1. Starting date:

>> N/A

##### C.2.2.2. Length:

>> N/A

## SECTION D. Environmental impacts

>>

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

>>

In line with the requirements of local government, an Environmental Impact Assessment (EIA) for the proposed wind farm project was carried out. The EIA was completed by Lanzhou University and has been approved by the Environmental Protection Bureau of Gansu Province, indicating that the Project meets all national environmental protection regulations. The analysis and measures to be taken to mitigate the impacts are demonstrated in the following:

- Impact on Air Quality
  The air pollution during construction mainly comes from flying dust produced by excavating land as well as some exhaust discharge from transportation vehicles and construction machinery. To minimize effects from such activities, PP will take appropriate measures, such as watering the site regularly. In addition, since the project site is far away from the nearest local residential area (over 5Km), there is no impact on local residents from dust and air pollution. The main impact is on the construction staff and appropriate measures such as watering and converting will be taken to reduce any negative impact and ensure staff safety.

- Noise Pollution
  The noise mainly comes from the drilling machines and cement mixers during the construction period, and aerodynamic interaction between the wind and turbine blades during operation. Although the operating level of these turbines is around 100dB, at a range of 150 meters from the turbines the noise weakens to 33dB, which is below the national standard of 45dB. However, as the Project is far away from any residential area (5km), effects on the surrounding environment of noise pollution are not significant.

- Impact of Solid Waste:
  Solid waste mainly comes from construction and living waste. During the construction period, construction waste will be properly disposed to avoid water and soil erosion problems. The Project will generate living wastes of 150 kg per day during construction. This waste will be properly collected and delivered to the local county for disposal.

- Impact on Waste Water:
  The waste water generated during the construction includes washing water from machines and wastewater from the project office. Since the project site is located in the Gobi desert area, the waste water will be reused on the construction site or as fertilizer. During operation, the waste water and sewage will be treated by using a septic tank and all-in-one biochemical process equipment to recycle and reuse water on the project site. The treated waste water will be used for on-site greening and road spreading. The treated waste water quality will meet the requirement of the Fields Irrigation Water Standard (GB 5084-1992), therefore, it has no negative impact on the surrounding environment.

- Impact on Ecosystem:
  The Project is located in the Gobi desert area with sparse vegetation. Through minimizing the construction area, backfilling the gravel, properly disposing of solid waste during construction, and growing drought-resistant, sand-fixing, and fast growing plants after construction, the impact on the ecological environment will be reduced.

- Impact on Radiation of Electromagnetism
  Radiation of electromagnetism arising from generators, transformer substations and transmission lines is considered insignificant in terms of intensity, and is unlikely to have a negative impact on residents' health because of the long distance between project site and the nearest residential area. The project has 134 units of 35kv medium-pressure transformer substation which are covered in metal cabinet and radiation is kept low.

In conclusion, the Project will not have a significant negative impact on the surrounding environment.

**D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:**

>>

According to the results of the EIA of the proposed Project and the approval from the Gansu Environment Protection Bureau, the impacts on the environment are not significant.

## SECTION E. Stakeholders' comments

>>

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

>>

The local stakeholder's meeting was held in Yumen City on 18th June, 2008. 45 participants attended the meeting including local residents, builders and members of the local authorities. The project owner introduced the Project, and then a survey was arranged through a one-page questionnaire, which was designed to be easily filled in. The opinions expressed by the stakeholders were recorded and are available on request. The survey includes the following sections:

(i) Project introduction;

(ii) Respondents' basic information and education level;

(iii) Questions;

- Do you consider your current living, studying and working environment to be quiet?
- Do you think that the project will have an impact on the environment, such as air quality, noise, water, etc.?
- Will the project construction have a negative impact on the living, studying and working environment of you and your family?
- Do you think the project implementation will have some positive impact on your life?
- During the project construction which of the following problems concerns you most: noise, air pollution, equipment safety, wastewater discharge, electromagnetic interference, landscape destruction?
- Do you agree with the development and construction of the project?
- Do you have any suggestion regarding the kind of measures which should be applied during the project construction and operation in order to protect the environment?
- Do you have any suggestions/advice for the developer of the Project?

(iv) Space for the date of stakeholder meeting.

### E.2. Summary of the comments received:

>>

- Stakeholder Meeting
  Every stakeholder expressed their comments in favour of the Project. To date, no negative comments have been received. The summary of stakeholder meeting's comments is as following:
- Promote the local economic development
  The local government strongly supports the development and construction of the proposed Project. It will increase local financial income and promote technological progress of local building materials, tower tube manufacturing, and other related industries. This project will provide clean energy ("green energy") to the Northwest grid, and promote the sustainable development of the local economy.
- Local environment protection
  According to the project EIA report, the noise level of the installed turbines is within below the national standard. The proposed Project site is located in the Gobi desert, the underdeveloped region. Moreover, there are no residents or industrial firms near the project site. Furthermore, there are no issues related to noise and communications signal interference, or to bird migration. The project will play an exemplary role on energy saving, pollution reduction and the environment protection.
- Improve the living condition of local residents
  The project site is located in Gobi desert and there are no residents around the project site, so the local residents will not be impacted by the noise from the construction and operation of the project. The proposed project will create new employment opportunities through the project construction and operation. For the construction, the PP is planning to employ a number of skilled workers for the operation, while creating more jobs by sub-contractors for construction work. The project will also purchase the raw materials for construction and other supplies from the local market. Therefore, the local people will benefit from the Project.

**Questionnaire Survey**

The survey had a 100% response rate with all questionnaires returned. The key findings of the survey and the summary of the consultation are as following:

- 86.67% of respondents agree with the development and construction of the project.
- 86.67% of the respondents believe that the Project will have no negative impact on their living, studying and working environments.
- 71.11% of the respondents believe that the project implementation will have a positive impact on their lives.

The stakeholder meeting and the survey showed that the Project receives strong support from the local community. The result and comments received in the survey is shown below. They all believe the Project will promote local economic development and agree with the project development and construction.

**Table E.2-1: Survey result**

| Questions | Answer | Number | Ratio |
|---|---|---|---|
| 1. Is your current living, working and study environment quiet? | Quiet | 38 | 84.44% |
| | Not Quiet | 2 | 4.44% |
| | Not sure | 4 | 8.89% |
| | No answer | 1 | 2.22% |
| 2. Do you think the project will affect the surrounding environment (air, noise and water)? | Yes | 8 | 17.78% |
| | No | 31 | 68.89% |
| | Not sure | 5 | 11.11% |
| | No answer | 1 | 2.22% |
| 3. Will the project construction have a negative impact on the living, studying and working environment of you and your family? | Yes | 2 | 4.44% |
| | No | 39 | 86.67% |
| | Not sure | 2 | 4.44% |
| | No answer | 2 | 4.44% |
| 4. Do you think the project implementation will have some positive impact on your life? | Yes | 32 | 71.11% |
| | No | 6 | 13.33% |
| | Not sure | 6 | 13.33% |
| | No answer | 1 | 2.22% |
| 5. What do you concern the most during the project construction and operation?* | Noise | 10 | 17.86% |
| | Air pollution | 10 | 17.86% |
| | Equipment safety | 16 | 28.57% |
| | Wastewater discharge | 9 | 16.07% |
| | Electromagnetic | 9 | 16.07% |
| | Landscape destruction | 2 | 3.57% |
| 6. Do you agree with development of this project? | Agree | 39 | 86.67% |
| | Not agree | 0 | 0.00% |
| | No sure | 1 | 2.22% |
| | No answer | 5 | 11.11% |

(*For the question 5, multiple answers per survey was allowed)

Furthermore, several comments and suggestions were received on issues related to equipment safety, electromagnetic, air pollution, noise, waste water, solid waste, landscape destruction and effect of heavy vehicles. PP is taken various measures to deal with such concerns as shown in the section E.3 below.

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

>>

Although there was no negative comment directly opposing the Project implementation, there were several concerns and suggestions raised by stakeholders, especially on possible effects on the environment. However, for these concerns, PP has already taken necessary measures to minimize such effects, as shown in the below table.

**Table E.3-1: Measures taken by PP to minimize environmental effects**

| Issues | Preventative actions taken by CECIC |
|---|---|
| Equipment safety | Wind turbine and hub are the key equipment used for the Project. The Project will install efficient and highly reliable turbines manufactured by Dongfang Steam Turbine Manufacture. |
| Electromagnetic | Radiation of electromagnetism arising from generators, transformer substations and transmission lines is considered insignificant in terms of intensity, and is unlikely to have a negative impact on residents' health because of the long distance between the project site and the nearest residential area. The project has 134 units of 35kv medium-pressure transformer substation which are each covered in a metal cabinet and electromagnetic radiation is kept low. |
| Air pollution | Air pollution during construction mainly comes from flying dust produced by excavating land as well as some exhaust discharge from transportation vehicles and construction machinery. To minimize effects from such activities, the PP will take appropriate measures, such as watering the site regularly. In addition, since the project site is far away from the nearest local residential area (over 5Km), there is no impact on local residents from dust and air pollution. The main impact is on the construction staff and appropriate measures such as watering and covering will be taken to reduce any negative impact and ensure staff safety. |
| Noise | The noise mainly comes from the drilling machines and cement mixers during the construction period, and aerodynamic interaction between the wind and turbine blades during operation. Although the operating level of these turbines is around 100dB, at a range of 150 meters from the turbines the noise weakens to 33dB, which is below the national standard of 45dB. However, as the Project is far away from any residential area (5km), effects on the surrounding environment of noise pollution are not significant. |

| | |
|---|---|
| Waste water | The waste water generated during the construction includes washing water from machines and wastewater from the project office. Since the project site is located in the Gobi desert area, the waste water will be reused on the construction site or as fertilizer. During operation, the waste water and sewage will be treated by using a septic tank and all-in-one biochemical process equipment to recycle and reuse water on the project site. The treated waste water will be used for on-site greening and road spreading. The treated waste water quality will meet the requirement of the Fields Irrigation Water Standard (GB 5084-1992), therefore it has no negative impact on the surrounding environment. |
| Solid Waste | Solid waste mainly comes from construction and living waste. During the construction period, construction waste will be disposed of properly to avoid water and soil erosion problems. The Project will generate living waste of 150 kg per day during construction This waste will be properly collected and delivered to the local county for disposal. |
| Landscape destruction | The Project is located in the Gobi desert area with sparse vegetation. The Project construction could exacerbate the soil erosion and blown sand hazards. Through minimizing the construction area, backfilling the gravel, properly disposing of solid waste during construction, and growing drought-resistant, sand-fixing, and fast growing plants after construction, the impact on the ecological environment will be reduced. Furthermore, there is no farmland or residential area near the Project site, therefore, damage to such farmland or residential areas are considered minimum. |
| Protection from heavy vehicles on Gobi desert, road, city and residential area | Since the Project is located in the Gobi desert, damage caused by heavy vehicles at the Project site is considered minimum. In addition, CECIC will plant fast-growing plants upon completion of the Project, which will restore any damage caused by the Project. In addition, heavy vehicles used for construction would not cause excess wear and tears to the road, and will avoid driving in the city or close to residential areas to minimize any impact. |

# Annex 1

## CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

| | |
|---|---|
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| E-Mail: | watanabe-hajime@sc.mufg.jp |
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| Represented by: | |
| Title: | Chairman |
| Salutation: | Mr. |
| Last Name: | Watanabe |
| Middle Name: | |
| First Name: | Hajime |
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| Direct FAX: | |
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| Personal E-Mail: | |

**Annex 2**

**INFORMATION REGARDING PUBLIC FUNDING**

This Project receive no public funding from an Annex I country

## ANNEX 3

### BASELINE INFORMATION

The data for calculation of grid emission factors are found on the website of the Office of National Coordination Committee on Climate Change.

China's grid baseline OM calculation progress (Chinese version)
http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1879.pdf

China's grid baseline BM calculation progress (Chinese version)
http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1875.pdf

The relevant information for the calculation of CM is shown below.

## Operating Margin

**Emission Factor of 2006:**

**Table Annex 3-1: Basic data for the Northwest China Power Grid for 2006**

| Fuel Type | Unit | Shaanxi A | Gansu B | Qinghai C | Ningxia D | Xinjiang E | $FC_{i,y}$ Subtotal F=A+B+C+D+E | Carbon Content (tC/TJ) G | Oxidation factor (%) H | EF ($kgCO_2/TJ$) I | NCV (MJ/t,km3) J | $CO_2$ Emission ($tCO_2$) K=F×I×J/100000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Raw coal | 10,000t | 2834.44 | 1660.92 | 421.86 | 1833.72 | 1547.69 | 8298.63 | 25.8 | 100 | 87,300 | 20,908 | 151,472,271 |
| Clean coal | 10,000t | | | | | | 0 | 25.8 | 100 | 87,300 | 26,344 | 0 |
| Other washed coal | 10,000t | | | | 112.7 | 8.45 | 121.15 | 25.8 | 100 | 87,300 | 8,363 | 884,504 |
| Briquette | 10,000t | 0 | | | | | 0 | 26.6 | 100 | 87,300 | 20,908 | 0 |
| Coke | 10,000t | | | | 0.01 | | 0.01 | 29.2 | 100 | 95,700 | 28,435 | 272 |
| Coke oven gas | 1E+8 m3 | 0.2 | | | | 0.08 | 0.28 | 12.1 | 100 | 37,300 | 16,726 | 17,469 |
| Other coal gas | 1E+8 m3 | 0.1 | | | | | 0.1 | 12.1 | 100 | 37,300 | 5,227 | 1,950 |
| Crude oil | 10,000t | | | | | 0.02 | 0.02 | 20 | 100 | 71,100 | 41,816 | 595 |
| Gasoline | 10,000t | 0.01 | | | | | 0.01 | 18.9 | 100 | 67,500 | 43,070 | 291 |
| Diesel | 10,000t | 1.14 | 0.24 | 0.61 | | 1.25 | 3.24 | 20.2 | 100 | 72,600 | 42,652 | 100,328 |
| Fuel oil | 10,000t | | 0.6 | | | 0.11 | 0.71 | 21.1 | 100 | 75,500 | 41,816 | 22,415 |
| LPG | 10,000t | | | | | | 0 | 17.2 | 100 | 61,600 | 50,179 | 0 |
| Refinery gas | 10,000t | | | | | | 0 | 15.7 | 100 | 48,200 | 46,055 | 0 |
| Natural gas | 1E+8 m3 | 1.59 | 0.56 | 1.06 | | 7.49 | 10.7 | 15.3 | 100 | 54,300 | 38,931 | 2,261,930 |
| Other petroleum products | 10,000t | | | | | | 0 | 20 | 100 | 72,200 | 41,816 | 0 |
| Other coking products | 10,000t | 1.86 | | | | | 1.86 | 25.8 | 100 | 95,700 | 28,435 | 50,615 |
| Other energy | 10,000t ce | 33.57 | 8.81 | | | 2.2 | 44.58 | 0 | 0 | 0 | 0 | 0 |
| | | | | | | | | | | | **Subtotal** | **154,812,639** |

《China Energy Statistics Yearbook 2007》

**Table Annex 3-2: Electricity Generation from the Thermal Power Plants of Northwest China Power Grid (2006)**

| Province | Electricity Generation (1E+8 kWh) A | (MWh) B = A x 100,000 | On-site use (%) C | **Power output** EGy (MWh) D= B x (1-C) |
|---|---|---|---|---|
| Shaanxi | 544.82 | 54,482,000 | 6.97 | 50,684,605 |
| Gansu | 357.38 | 35,738,000 | 4.29 | 34,204,840 |
| Qinghai | 72.04 | 7,204,000 | 2.57 | 7,018,857 |
| Ningxia | 367.31 | 36,731,000 | 0 | 36,731,000 |
| Xinjiang | 299.01 | 29,901,000 | 8.02 | 27,502,940 |
| **Subtotal** | | | | **156,142,241** |

《China Electric Power Yearbook 2007》

**Table Annex 3-3: 2006 Emission Factor**

| | |
|---|---|
| Total $CO_2$ emission (tCO2): A | **154,812,639** |
| Total Power Output (MWh): B | **156,142,241** |
| $EF_{grid,OMsimple,2006}$ (tCO2/MWh) : C = A/B | **0.99148** |

**Emission Factor of 2007:**

**Table Annex 3-4:Basic data for the Northwest China Power Grid for 2007**

| **Fuel Type** | **Unit** | Shaanxi A | Gansu B | Qinghai C | Ningxia D | Xinjiang E | **$FC_{i,y}$** Subtotal F=A+B+C+D+E | Carbon Content （tC/TJ） G | Oxidation factor （%） H | **EF** ($kgCO_2$/TJ) I | **NCV** （MJ/t,km3） J | **$CO_2$ Emission** ($tCO_2$) K=F×I×J/100000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Raw coal | 10,000t | 3303.44 | 1969.03 | 470.85 | 2165.8 | 1762.11 | 9671.23 | 25.8 | 100 | 87,300 | 20,908 | 176,525,905 |
| Clean coal | 10,000t | | | | | | 0 | 25.8 | 100 | 87,300 | 26,344 | 0 |
| Other washed coal | 10,000t | 3.73 | | | 124.31 | 7.73 | 135.77 | 25.8 | 100 | 87,300 | 8,363 | 991,243 |
| Briquette | 10,000t | 3.53 | | | | | 3.53 | 26.6 | 100 | 87,300 | 20,908 | 64,432 |
| Coke | 10,000t | | | | | | 0 | 29.2 | 100 | 95,700 | 28,435 | 0 |
| Coke oven gas | 1E+8 m3 | 0.52 | 0.65 | | | 0.26 | 1.43 | 12.1 | 100 | 37,300 | 16,726 | 89,215 |
| Other coal gas | 1E+8 m3 | 14.14 | 0.71 | | | | 14.85 | 12.1 | 100 | 37,300 | 5,227 | 289,526 |
| Crude oil | 10,000t | | | | | 0.09 | 0.09 | 20 | 100 | 71,100 | 41,816 | 2,676 |
| Gasoline | 10,000t | 0.02 | | | | | 0.02 | 18.9 | 100 | 67,500 | 43,070 | 581 |
| Diesel | 10,000t | 1.12 | 0.26 | 0.42 | | 1.77 | 3.57 | 20.2 | 100 | 72,600 | 42,652 | 110,546 |
| Fuel oil | 10,000t | 0.01 | 1.05 | 0.04 | | 0.05 | 1.15 | 21.1 | 100 | 75,500 | 41,816 | 36,307 |
| LPG | 10,000t | | | | | | 0 | 17.2 | 100 | 61,600 | 50,179 | 0 |
| Refinery gas | 10,000t | | | | | 5.99 | 5.99 | 15.7 | 100 | 48,200 | 46,055 | 132,969 |
| Natural gas | 1E+8 m3 | 1.68 | 0.49 | 1.93 | | 8.66 | 12.76 | 15.3 | 100 | 54,300 | 38,931 | 2,697,404 |
| Other petroleum products | 10,000t | | | | | | 0 | 20 | 100 | 75,200 | 41,816 | 0 |
| Other coking products | 10,000t | | | | | | 0 | 25.8 | 100 | 95,700 | 28,435 | 0 |
| Other energy | 10,000t ce | 94.36 | 9.73 | | | | 104.09 | 0 | 0 | 0 | 0 | 0 |
| | | | | | | | | | | | **Subtotal** | **180,940,805** |

《China Electric Power Yearbook 2008》

**Table Annex 3-5: Electricity Generation from the Thermal Power Plants of Northwest China Power Grid (2007)**

| Province | Electricity Generation （1E+8 kWh） A | （MWh） B = A x 100,000 | On-site use （%） C | **Power output** EGy (MWh) D= B x (1-C) |
|---|---|---|---|---|
| Shaanxi | 591 | 59,100,000 | 6.77 | 55,098,930 |
| Gansu | 424 | 42,400,000 | 5.89 | 39,902,640 |
| Qinghai | 97 | 9,700,000 | 7.19 | 9,002,570 |
| Ningxia | 435 | 43,500,000 | | 43,500,000 |
| Xinjiang | 346 | 34,600,000 | 9.2 | 31,416,800 |
| **Subtotal** | | | | **178,920,940** |

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**Table Annex 3-6: 2007 Emission Factor**

| | |
|---|---|
| Total $CO_2$ emission (tCO2): A | **180,940,805** |
| Total Power Output (MWh): B | **178,920,940** |
| $EF_{grid,OMsimple,2007}$ (tCO2/MWh) : C = A/B | **1.01129** |

**Emission Factor of 2008:**

**Table Annex 3-7: Basic data for the Northwest China Power Grid for 2008**

| **Fuel Type** | **Unit** | Shaanxi A | Gansu B | Qinghai C | Ningxia D | Xinjiang E | **$FC_{i,y}$** Subtotal F=A+B+C+D+E | Carbon Content （tC/TJ） G | Oxidation factor （%） H | **EF** ($kgCO_2$/TJ) I | **NCV** （MJ/t,km3） J | **$CO_2$ Emission** ($tCO_2$) K=F×I×J/100000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Raw coal | 10,000t | 3620 | 2216.9 | 507.44 | 2330.72 | 1924.9 | 10599.96 | 25.8 | 100 | 87,300 | 20,908 | 193,477,720 |
| Clean coal | 10,000t | | | | | | 0 | 25.8 | 100 | 87,300 | 26,344 | 0 |
| Other washed coal | 10,000t | 9.22 | | | 53.85 | 8.2 | 71.27 | 25.8 | 100 | 87,300 | 8,363 | 520,335 |
| Briquette | 10,000t | | | | | | 0 | 26.6 | 100 | 87,300 | 20,908 | 0 |
| Coke | 10,000t | | | | | | 0 | 29.2 | 100 | 95,700 | 28,435 | 0 |
| Coke oven gas | 1E+8 m3 | 0.35 | 0.74 | | | 0.13 | 1.22 | 12.1 | 100 | 37,300 | 16,726 | 76,113 |
| Other coal gas | 1E+8 m3 | 18.38 | 0.2 | | | | 18.58 | 12.1 | 100 | 37,300 | 5,227 | 362,249 |
| Crude oil | 10,000t | | | | | | 0 | 20 | 100 | 71,100 | 41,816 | 0 |
| Gasoline | 10,000t | 0.05 | | | | 0.01 | 0.06 | 18.9 | 100 | 67,500 | 43,070 | 1,744 |
| Diesel | 10,000t | 1.03 | 0.44 | 0.26 | 0.05 | 1.64 | 3.42 | 20.2 | 100 | 72,600 | 42,652 | 105,902 |
| Fuel oil | 10,000t | | 0.86 | 0.04 | | 0.02 | 0.92 | 21.1 | 100 | 75,500 | 41,816 | 29,045 |
| LPG | 10,000t | | | | | | 0 | 17.2 | 100 | 61,600 | 50,179 | 0 |
| Refinery gas | 10,000t | | | | | 7.25 | 7.25 | 15.7 | 100 | 48,200 | 46,055 | 160,939 |
| Natural gas | 1E+8 m3 | 0.94 | 0.24 | 2.99 | | 7.2 | 11.37 | 15.3 | 100 | 54,300 | 38,931 | 2,403,565 |
| Other petroleum products | 10,000t | | | | | 0.01 | 0.01 | 20 | 100 | 72,200 | 41,816 | 302 |
| Other coking products | 10,000t | | | | | | 0 | 25.8 | 100 | 95,700 | 28,435 | 0 |
| Other energy | 10,000t ce | 93.67 | 10.58 | | 21.24 | | 125.49 | 0 | 0 | 0 | 0 | 0 |
| | | | | | | | | | | | **Subtotal** | **197,137,915** |

《China Energy Statistics Yearbook 2009》

**Table Annex 3-8: Electricity Generation from the Thermal Power Plants of Northwest China Power Grid (2008)**

| Province | Electricity Generation （1E+8 kWh） A | （MWh） B = A x 100,000 | On-site use （%） C | **Power output** EGy (MWh) D= B x (1-C) |
|---|---|---|---|---|
| Shaanxi | 715 | 71,500,000 | 6.95 | 66,530,750 |
| Gansu | 468 | 46,800,000 | 6.4 | 43,804,800 |
| Qinghai | 107 | 10,700,000 | 7.14 | 9,936,020 |
| Ningxia | 440 | 44,000,000 | 7.57 | 40,669,200 |
| Xinjiang | 397 | 39,700,000 | | 39,700,000 |
| **Subtotal** | | | | **200,640,770** |

《China Electric Power Yearbook 2009》

**Table Annex 3-9: 2008 Emission Factor**

| | |
|---|---|
| Total $CO_2$ emission (tCO2): A | **197,137,915** |
| Total Power Output (MWh): B | **200,640,770** |
| $EF_{grid,OMsimple,2008}$ (tCO2/MWh) : C = A/B | **0.98254** |

**Operating Margin (2006-2008):**

**Table Annex 3-10: Summary of 3 years OM**

| | 2006 | 2007 | 2008 | Total |
|---|---|---|---|---|
| **Total emission (tCO2): A** | 154,812,639 | 180,940,805 | 197,137,915 | 532,891,358 |
| **Total Power Output (MWh): B** | 156,142,241 | 178,920,940 | 200,640,770 | 535,703,951 |
| **$EF_{OM,y}$ (tCO2/MWh) : C = A / B** | 0.9915 | 1.0113 | 0.9825 | **0.9947** |

**$EF_{OM}$ (3 yers Average) OM: 0.9947**

## Build Margin

**Thermal Emission Factor:**

**Table Annex 3-11: Basic data for the Northwest China Power Grid for 2008**

| **Fuel Type** | Unit | Shaanxi<br>A | Gansu<br>B | Qinghai<br>C | Ningxia<br>D | Xinjiang<br>E | **$FC_{i,y}$**<br>Subtotal<br>G=A+B+C+D+E | **NCV**<br>（MJ/t,km3）<br>H | **EF**<br>($kgCO_2/TJ$)<br>I | Oxidation Rate<br>J | **$CO_2$ Emission**<br>($tCO_2$)<br>K=G×H×I×J/100,000 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Raw coal | 10,000t | 3620 | 2216.9 | 507.44 | 2330.72 | 1924.9 | 10599.96 | 20,908 | 87,300 | 1 | 193,477,720 |
| Clean coal | 10,000t | 0 | 0 | 0 | 0 | 0 | 0 | 26,344 | 87,300 | 1 | 0 |
| Other washed coal | 10,000t | 9.22 | 0 | | 53.85 | 8.2 | 71.27 | 8,363 | 87,300 | 1 | 520,335 |
| Briquette | 10,000t | 0 | 0 | 0 | 0 | 0 | 0 | 20,908 | 87,300 | 1 | 0 |
| Coke | 10,000t | 0 | 0 | 0 | 0 | 0 | 0 | 28,435 | 95,700 | 1 | 0 |
| Other coking products | 10,000t | 0 | 0 | 0 | 0 | 0 | 0 | 28,435 | 95,700 | 1 | 0 |
| **Subtotal** | | | | | | | | | | | **193,998,055** |
| Crude oil | 10,000t | 0 | 0 | 0 | 0 | 0 | 0 | 41,816 | 71,100 | 1 | 0 |
| Gasoline | 10,000t | 0.05 | 0 | 0 | 0 | 0.01 | 0.06 | 43,070 | 67,500 | 1 | 1,744 |
| Diesel | 10,000t | 1.03 | 0.44 | 0.26 | 0.05 | 1.64 | 3.42 | 42,652 | 72,600 | 1 | 105,902 |
| Fuel oil | 10,000t | 0 | 0.86 | 0.04 | 0 | 0.02 | 0.92 | 41,816 | 75,500 | 1 | 29,045 |
| Other petroleum products | 10,000t | 0 | 0 | 0 | 0 | 0.01 | 0.01 | 41,816 | 72,200 | 1 | 302 |
| **Subtotal** | | | | | | | | | | | **136,993** |
| Natural gas | 1E+8 m3 | 9.4 | 2.4 | 29.9 | 0 | 72 | 113.7 | 38,931 | 54,300 | 1 | 2,403,565 |
| Coke oven gas | 1E+8 m3 | 3.5 | 7.4 | 0 | 0 | 1.3 | 12.2 | 16,726 | 37,300 | 1 | 76,113 |
| Other coal gas | 1E+8 m3 | 183.8 | 2 | 0 | 0 | 0 | 185.8 | 5,227 | 37,300 | 1 | 362,249 |
| LPG | 10,000t | 0 | 0 | 0 | 0 | 0 | 0 | 50,179 | 61,600 | 1 | 0 |
| Refinery gas | 10,000t | 0 | 0 | 0 | 0 | 7.25 | 7.25 | 46,055 | 48,200 | 1 | 160,939 |
| **Subtotal** | | | | | | | | | | | **3,002,866** |
| | | | | | | | | | | Total | 197,137,915 |

《China Energy Statistics Yearbook 2009》

**Table Annex 3-12: Emission factor of fossil fuel**

| Fuel Type | Best Efficiency (%) | Carbon emission (tC/TJ) | Oxidation factor (%) | EF (emission factor) tCO2/MWh |
|---|---|---|---|---|
| | A | B | C | D=3.6/A/1,000, 000×B×C |
| Solid | 39.08 | 87,300 | 100 | 0.8042 |
| Liquid | 51.46 | 75,500 | 100 | 0.5282 |
| Gas | 51.46 | 54,300 | 100 | 0.3799 |

*Source: NDRC grid publications, 2010*

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

| $\lambda_{Coal,y}$ | $EF_{Coal,Adv,y}$ | $\lambda_{Oil,y}$ | $EF_{Oil,Adv,y}$ | $\lambda_{Gas,y}$ | $EF_{Gas,Adv,y}$ | $EF_{Thermal,y}$ |
|---|---|---|---|---|---|---|
| 98.41% | 0.8042 | 0.07% | 0.5282 | 1.52% | 0.3799 | 0.7975 |

**Added capacity in the Northwest China Grid (2006-2008):**

**Table Annex 3-13: Installed capacity in the Northwest China Grid, 2008**

| Type | Unit | Shaanxi | Gansu | Qinghai | Ningxia | Xinjiang | Total |
|---|---|---|---|---|---|---|---|
| Thermal power | MW | 17850 | 8980 | 2000 | 7540 | 8200 | 44570 |
| Hydro power | MW | 1810 | 5440 | 5910 | 430 | 2190 | 15780 |
| Nuclear power | MW | 0 | 0 | 0 | 0 | 0 | 0 |
| Wind farm and others | MW | 0 | 600 | 0 | 170 | 510 | 1280 |
| Total | MW | 19660 | 15020 | 7910 | 8140 | 10900 | 61630 |

Data source: China Electricity Yearbook 2009

**Table Annex 3-14: Installed capacity in the Northwest China Grid, 2007**

| Type | Unit | Shaanxi | Gansu | Qinghai | Ningxia | Xinjiang | Total |
|---|---|---|---|---|---|---|---|
| Thermal power | MW | 12290 | 7840 | 1900 | 7030 | 6560 | 35620 |
| Hydro power | MW | 1790 | 4400 | 5830 | 430 | 2140 | 14590 |
| Nuclear power | MW | 0 | 0 | 0 | 0 | 0 | 0 |
| Wind farm and others | MW | 72.5 | 346 | 0 | 50 | 330 | 798.5 |
| Total | MW | 14152.5 | 12586 | 7730 | 7510 | 9030 | 51008.5 |

Data source: China Electricity Yearbook 2008

**Table Annex 3-15: Installed capacity in the Northwest China Grid, 2006**

| Type | Unit | Shaanxi | Gansu | Qinghai | Ningxia | Xinjiang | Total |
|---|---|---|---|---|---|---|---|
| Thermal power | MW | 9723 | 6448 | 1517 | 6002 | 5937 | 29627 |
| Hydro power | MW | 2165 | 4291 | 5423 | 429 | 1766 | 14074 |
| Nuclear power | MW | 0 | 0 | 0 | 0 | 0 | 0 |
| Wind farm and others | MW |  | 199 | 0 | 11 | 189 | 399 |
| Total | MW | 11888 | 10938 | 6940 | 6442 | 7892 | 44100 |

Data source: China Electricity Yearbook 2007

**Table Annex 3-16: Capacity Change**

| Capacity | 2006 (MW) | 2007 (MW) | 2008 (MW) | Capacity addition (CAP) 2006-2008 (MW) | Added between 2007-2008 (MW) | 2006-2008 increased ratio (%) |
|---|---|---|---|---|---|---|
| **Thermal** | 29,627 | 35,620 | 44,570 | **16,216** | 9,609 | 86.24% |
| **Hydro** | 14,074 | 14,590 | 15,780 | 1,707 | 1,190 | 9.08% |
| **Nuclear** | 0 | 0 | 0 | 0 | 0 | 0.00% |
| **Wind farm and others** | 399 | 799 | 1,280 | 881 | 482 | 4.69% |
| **Total** | 44,100 | 51,009 | 61,630 | **18,804** | 11,281 | 100.00% |
| **Capacity addition share from 2008** | | | | 30.51% | 18.30% | |

**Table Annex 3-17:Capacity decrease, due to Plant closure and pumped storage**

| | MW |
|---|---|
| Thermal | 1273 |
| Hydro | 1 |
| Nuclear | 0 |
| **Wind farm and others** | 0 |

*Source: NDRC grid publications, 2010*

**Build Margin:**

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

| $CAP_{Thermal,y}$ | $CAP_{Total,y}$ | $EF_{Thermal,y}$ | $EF_{grid,BM,y}$ |
|---|---|---|---|
| 16216 | 18804 | 79.75% | 0.6878 |

**Combined Margin**

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$$

| $EF_{grid,OM}$ | $w_{OM}$ | $EF_{grid,BM}$ | $w_{BM}$ | $EF_{grid,CM}$ |
|---|---|---|---|---|
| 0.9947 | 0.75 | 0.6878 | 0.25 | **0.9180** |

# Annex 4

## MONITORING INFORMATION

- - -

## Annex 5

### Table Annex 5-1 Wind Projects in Gansu Province

| Name of CDM Project | | Project Starting Date | Capacity (KW) | CDM (Y/N) | Tariff inc. VAT (RMB/kwh) | Reference | Investment Costs (RMB) | Investment ratio (RMB/kw) | O&M (RMB) | O&M ratio (RMB /kw) | Load Factor (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Gansu Yumen Wind Power 13.2MW Technical Innovation Project | | Dec. 2002 | 7800 | No | 0.585 | Gan jia Shang [2004]35[19] | N/A | N/A | N/A | N/A | N/A |
| | | Aug. 2003 | 5400 | | | | | | | | |
| Gansu Jieyuan 88.4 MW Yumen Windpark Project, Gansu Province, China[20] | Key Technical Innovation Project of Yumen windpark | Apr. 2004 | 30600 | Yes | 0.585 | | 709,730,000 | 8,029 | N/A | N/A | 26.00% |
| | Second Phase Basic Construction Project of Yumen Windpark | Apr. 2004 | 11900 | | 0.54 | Fa Gai Jia Ge [2007]1260[21] | | | | | |
| | Third Phase Basic Construction Project of Yumen Windpark | Apr. 2004 | 13600 | | 0.54 | | | | | | |
| | | Apr. 2004 | 32300 | | | | | | | | |

[19] http://www.gswj.gov.cn/jfcx/jfcx/_nyjg_dljg_swdj.asp?F_LB=%B7%E7%B5%E7

[20] http://www.dnv.com/certification/climatechange/Upload/20061008%20PDD%20Gansu%20Jieyuan%20final%20for%20validation.pdf

[21] http://www.hebwj.gov.cn/upfiles/xy_col32gjc___20070718164220007126.htm

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Gansu Yumen Sanshilijingzi Wind Power Project (2193)[22] | Apr. 2007 | 49,300 | Yes | 0.5599 | Fa Gai Jia Ge [2006]2908 | 435,250,000 | 8,829 | 9,800,000 | 198.8 | 25.00% |
| Gansu Yumen Diwopu Wind Power Project (2680)[23] | Sep. 2008 | 49500 | Yes | 0.54 | Ganjiadianli [2009]197 | 452,120,000 | 9,134 | 10,130,000 | 204.6 | 24.60% |
| Gansu Anxi Wind Farm Project (Developer is currently developing it as a Gold Standard VER project) | Dec. 2006 | 750 | No | 0.4616[24] | Fa Gai Ban Neng Yuan [2005]2037 | N/A | N/A | N/A | N/A | N/A |
| | Oct. 2007 | 99750 | | | | | | | | |
| CGN Gansu Anxi Daliang 49.5 MW Wind Power Project (2109)[25] | Mar. 2007 | 49,500 | Yes | 0.518 | Fa Gai Jia Ge [2006]2908 | 463,630,000 | 9,366 | 13,930,000 | 281.4 | 27.00% |
| Gansu Anxi Xiangyang Wind Power Project[26] | Jul. 2007 | 49,500 | Yes | 0.506 | Fa Gai Jia Ge [2006]2908 | 358,320,000 | 7,239 | 8,052,800 | 162.7 | 22.86% |
| CECIC HKC Gansu Changma Wind Power project[27] | May 2008 | 201,000 | Yes | 0.5206 | | 1,637,130,000 | 8,145 | 61,440,000 | 305.7 | 24.50% |

[22] http://cdm.unfccc.int/Projects/DB/TUEV-SUED1218655051.51/view

[23] http://cdm.unfccc.int/Projects/DB/DNV-CUK1244612185.44/view

[24] http://www.86ne.com/Wind/200805/Wind_139705_6.html

[25] http://cdm.unfccc.int/Projects/DB/DNV-CUK1218548297.8/view

[26] http://www.netinform.net/KE/files/pdf/Anxi_Xiangyang_PDD.pdf

[27] http://cdm.unfccc.int/UserManagement/FileStorage/EMY5WA4OT91D2UN3RGQHLPS8VZ70BC

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Gansu Datang Yumen 49 MW Wind Power Project (1081)[28] | Dec. 2006 | 49,300 | Yes | 0.54 | Fa Gai Jia Ge [2007]1260[29] | 455,699,000 | 9,243 | 12,580,000 | 255.2 | 24.54% |
| Gansu Jingtai 45MW Wind Power Project (2766)[30] | Aug. 2007 | 45,000 | Yes | 0.54 | Fa Gai Jia Ge[2008]1876[31] | 408,110,000 | 9,069 | 9,788,000 | 217.5 | 21.36% |
| Gansu Baiyin Pingchuan Jiancaitang 45MW Wind Farm Concession Project (2883)[32] | Oct. 2007 | 45,000 | Yes | 0.54 | Fa Gai Jia Ge[2008]1876[33] | 425,030,000 | 9,445 | 10,990,000 | 244.2 | 25.20% |
| Gansu Guazhou Xiangyang Phase II Wind Power Project (3253)[34] | Feb. 2009 | 49,500 | Yes | 0.577 | | 451,540,000 | 9,122 | 10,647,500 | 215.1 | 25.66% |
| Gansu Guazhou 300 MW Wind Power Project[35] | Jul. 2009 | 300,000 | Yes | 0.54 | | 2,377,860,000 | 7,926 | N/A | N/A | 25.53% |

28 http://cdm.unfccc.int/Projects/DB/DNV-CUK1176356451.51/view

29 http://www.hebwj.gov.cn/upfiles/xy_col32gjc___20070718164220007126.htm

30 http://cdm.unfccc.int/Projects/DB/TUEV-RHEIN1247703700.0/view

31 http://www.gov.cn/zwgk/2008-08/14/content_1071728.htm

32 http://cdm.unfccc.int/Projects/DB/TUEV-SUED1249417862.09/view

33 http://www.gov.cn/zwgk/2008-08/14/content_1071728.htm

34 http://cdm.unfccc.int/Projects/DB/DNV-CUK1262853821.64/view

35 http://cdm.unfccc.int/UserManagement/FileStorage/236NATCEQDXY7FSOW4JHK98PZMUL0G

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Gansu Tianrun Liuyuan 1st Stage 49.5MW Wind Park Project (3919)[36 37] | Mar. 2009 | 49,500 | Yes | 0.54 | | 477,804,800 | 9,653 | 15,619,700 | 315.5 | 26.99% |
| Huadian Gansu Guazhou Ganhekou No. 7 Wind Farm Project (3241)[38 39] | Jan. 2009 | 201,000 | Yes | 0.5206 | | 1,954,110,000 | 9,722 | 46,820,000 | 232.9 | 26.00% |
| Gansu Yumen Diwopu Phase II Wind Power Project (3167)[40] | Dec. 2008 | 49,500 | Yes | 0.5348 | | 426,710,000 | 8,620 | 10,930,000 | 220.8 | 26.24% |
| Gansu Guazhou Daliangxi Wind Power Project (2916)[41 42 43] | Apr. 2008 | 49,500 | Yes | 0.54 | Fa Gai Jia Ge [2008]1876[44] | 462,417,000 | 9,342 | 10,468,950 | 211.5 | 26.55% |
| Gansu Datang Changma Wind Power Project (3512)[45] | May 2009 | 201,000 | Yes | 0.5206[46] | | 1,923,720,000 | 9,571 | 45,056,000 | 224.2 | 26.00% |

[36] http://www.gspc.gov.cn/xxgk/ShowArticle.asp?ArticleID=3255

[37] http://cdm.unfccc.int/Projects/DB/China%20Quality1281942894.84/view

[38] http://www.chdne.com.cn/jb_show.asp?ArticleID=224&classid=20&smallclassid=76

[39] http://cdm.unfccc.int/Projects/DB/DNV-CUK1261995235.23/view

[40] http://cdm.unfccc.int/Projects/DB/DNV-CUK1259389674.51/view

[41] http://www.guazhou.gov.cn/ReadNews.asp?NewsID=9604

[42] http://www.serc.gov.cn/jgyj/ztbg/200912/W020091201583488256140.pdf

[43] http://cdm.unfccc.int/Projects/DB/BVQI1250066972.19/view

[44] http://www.gov.cn/zwgk/2008-08/14/content_1071728.htm

[45] http://cdm.unfccc.int/Projects/DB/DNV-CUK1269082989.12/view

[46] http://www.gspc.gov.cn/dongtai/ShowArticle.asp?ArticleID=3283

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| Gansu Guazhou Ganhekou No 1 Wind Farm Project (4325)[47] | May 2009 | 199,500 | Yes | 0.5206 | | 1,910,477,000 | 9,576 | 45,455,400 | 227.8 | 24.8% |
| Gansu Guazhou Qiaowan Wind Farm Project (4253)[48] | Sep. 2009 | 201,000 | Yes | 0.5206 | | 1,942,040,000 | 9,662 | 33,930,000 | 168.8 | 24.7% |
| Ganhekou V 201MW Wind Farm Project (4278)[49] | Sep. 2009 | 201,000 | Yes | 0.5206 | | 1,920,793,000 | 9,556 | N/A | N/A | 24.6% |
| Gansu Guazhou Ganhekou No.3 Wind Power Plant Project[50] | Sep. 2009 | 201,000 | Yes | 0.54 | | 1,908,851,000 | 9,497 | 45,273,834 | 225.2 | 24.5% |
| Gansu Guazhou Ganhekou No.8 Wind Farm Project (4138)[51] | Dec. 2009 | 201,000 | Yes | 0.5206 | | 1,955,950,000 | 9,731 | 45,670,000 | 227.2 | 25.2% |
| Gansu Guazhou Ganhekou Fourth Wind Farm Power Generation Project[52] | Dec. 2009 | 199,500 | Yes | 0.5206 | | 1,957,020,000 | 9,810 | 43,730,000 | 219.2 | 25.3% |

[47] http://cdm.unfccc.int/Projects/DB/BVQI1293766971.23/view

[48] http://cdm.unfccc.int/Projects/DB/ERM-CVS1292508956.74/view

[49] http://cdm.unfccc.int/Projects/DB/ERM-CVS1292948623.58/view

[50] http://cdm.unfccc.int/UserManagement/FileStorage/T3BPKX78LFNQUCWE6V9M40ROYSDZ21

[51] http://cdm.unfccc.int/Projects/DB/DNV-CUK1290404178.75/view

[52] http://cdm.unfccc.int/UserManagement/FileStorage/F9E6DY3AH027MPUKTVWN1SCQOB4ILG

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|---|---|---|---|---|---|---|---|---|---|---|
| Gansu Guazhou Beidaqiao Wind Power Project[53] | Nov. 2009 | 201,000 | Yes | 0.5206 | | 1,913,147,600 | 9,518 | N/A | N/A | 27.3% |
| Huaneng Gansu Guazhou Ganhekou No.2 Wind Farm[54] | Sep. 2009 | 199,500 | Yes | 0.5206 | | 1,983,200,000 | 9,941 | 46,600,000 | 233.6 | 25.1% |
| CECIC Gansu Yumen Changma No.3 Wind Farm Project | Apr. 2009 | 201,000 | Yes | 0.5206 | | 1,980,023,000 | 9,851 | 43,019,000 | 214.0 | 26.34% |
| | | | | | | **Average** | 9,156 | - | 230 | 25.2% |
| | | | | | | **Min** | 7,239 | - | 163 | 21.4% |
| | | | | | | **Max** | 9,941 | - | 316 | 27.3% |

[53] http://cdm.unfccc.int/UserManagement/FileStorage/Y0IHF9T78VMNLUKQEGBSD246ZCXRO5

[54] http://cdm.unfccc.int/UserManagement/FileStorage/R4WM058K9TGYHQ6PC1B3XVSEU7DJAO