



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

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**SECTION A. General description of project activity****A.1. Title of the project activity:**

&gt;&gt;

Title of document: Xinjiang Kaiduhe River Chahan Wusu Hydropower Project

Version of document: Version 04

The date of the document: 11/03/2009

Revision history of the document:

| Version of the document | Date of the document | Reason for revision                                                               |
|-------------------------|----------------------|-----------------------------------------------------------------------------------|
| Version 01              | 20/11/2007           | -                                                                                 |
| Version 02              | 19/05/2008           | Revised in accordance with the request of China's DNA.                            |
| Version 03              | 18/07/2008           | Revised in accordance with the request of the correction actions of LRQA.         |
| Version 04              | 11/03/2009           | Revised in accordance with the further request of the correction actions of LRQA. |

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

&gt;&gt;

Xinjiang Kaiduhe River Chahan Wusu Hydropower Project (hereafter the "Project") is located on the lower section of the middle reaches of Kaiduhe River in Hejing County of Bayin'gholin Mongol Prefecture, Xinjiang Uygur Autonomous Region, and P. R. China. The project involves the construction and operation of a 309 MW hydropower plant consists of a water-retaining rock dam, a water release structure, a water intake system, a 309 MW (103MW×3) powerhouse, and 3 main transformers. The proposed project will generate an annual output of 1,080,000 MWh and provide on-grid power supply of 1,069,200 MWh per annum that will be connected to Northwest China Power Grid (NWPG) finally.

The electricity generated by the project activity could replace the electricity otherwise supplied by the NWPG (prior to the implementation of the project activity.) Thus the baseline scenario is the same as the scenario existing prior to the implementation of the project activity.

Thermal power is the dominant power source of NWPG. The proposed project is a non-GHG emitting technology, which will reduce CO<sub>2</sub> emissions by avoiding the operation of existing thermal power plants and its further expansion in the carbon-intensive NWPG. It's estimated that the proposed project will achieve GHG emission reductions of 908,606 tCO<sub>2</sub>e per annum.

The Project provides a combination of positive environmental, economic, and sustainable development benefits described as below:

- To supply reliable, non-emission renewable energy to the provincial grid to offset local power shortage; It is recorded that electricity demand in Xinjiang Grid witnessed an average year-on-year increase of 9.8% from 1990 to 2002. And it is anticipated that the power demand will keep soaring till 2020 attribute to rapid economy development in local area<sup>1</sup>. The proposed project which is constructed making use of renewable water resources will definitely supply local area with clean and reliable electricity, and further ease the tight supply-demand situation;
- To improve local air quality by displacing operation of fossil fuel-fired power plants;

<sup>1</sup> Page 4-4 and Page 4-5 of Feasibility Study report.



- To create job opportunities: 3000 positions will be created during the construction period and 200 permanent staffs will be positioned during operation and maintenance period; and
- To contribute to poverty alleviation and improve living standard of the remote located minority residents: Hejing County where the proposed project located is a remote and poverty-hit area dominated by Uygur minority, who lead an extremely impoverished life mainly depending on separated and household-based sheep breeding.

**A.3. Project participants:**

| Name of Party involved (*)<br>(host) indicates a host<br>Party)                                                                                                                                                                                                                                 | Private and/or public entity(ies)<br>project participants (*)<br>(as applicable) | Kindly indicate if<br>the Party involved<br>wishes to be<br>considered as<br>project participant<br>(Yes/No) |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| People's Republic of China<br>(host)                                                                                                                                                                                                                                                            | Guodian Xinjiang Kaidu River Valley<br>Hydro-power Developing Co., Ltd.          | No                                                                                                           |
| Japan                                                                                                                                                                                                                                                                                           | Mitsubishi Corporation                                                           | No                                                                                                           |
| (*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its <u>approval</u> . 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:**

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

&gt;&gt;

The People's Republic of China

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

&gt;&gt;

Xinjiang Uygur Autonomous Region

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

&gt;&gt;

Hejing County, Bayin'gholin Mongol Prefecture

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

&gt;&gt;

The proposed project is located on the lower section of the middle stream of Kaiduhe River, in Hejing county, Bayin'gholin Mongol Prefecture, Xinjiang Uygur Autonomous Region, P. R. China. With the geographical coordinates of 85°31'00'' E and 42°19'00'' N, it is 92 km away from Hejing County centre and 152 km away from prefecture capital of Korla city. The location of the proposed project is shown in figure1~3 below:



Figure 1: The Location of Xinjiang Uygur Autonomous Region



Figure 2: The location of Bayin'gholin Mongol Prefecture

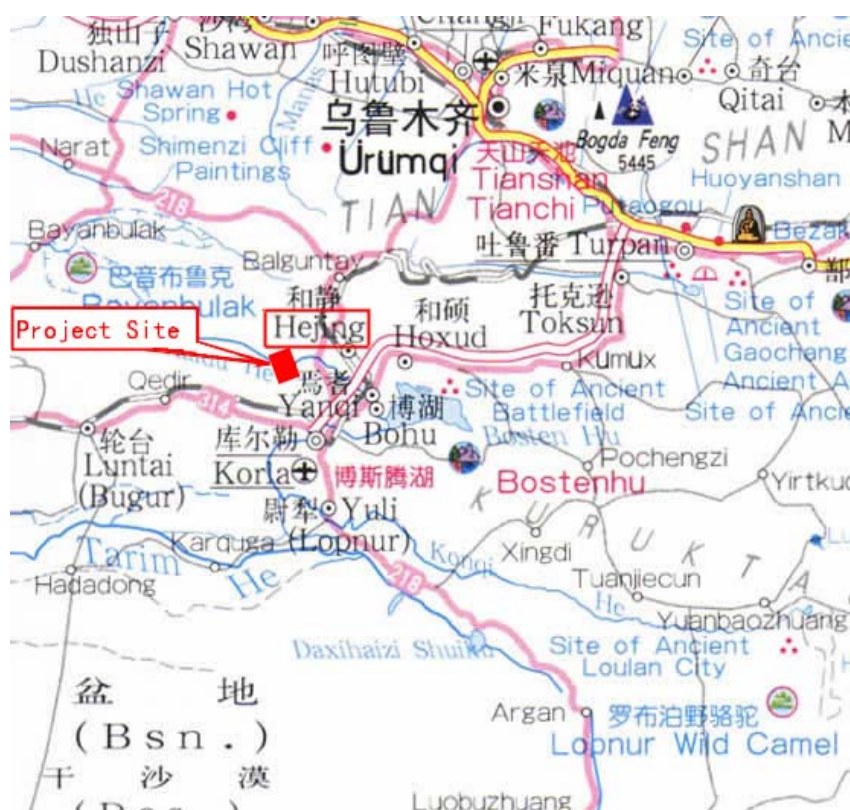


Figure 3: The location of the proposed project

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

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The proposed project falls into:

Sectoral Scope Number: 1. Energy Industry

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

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The proposed project is a newly established hydropower plant, based on the feasibility study report, the main components of the project are as follows:

- A water-retaining rock dam to create a reservoir with effective storage of 74 million m<sup>3</sup> at normal water level of 1,649 m, and flooded surface area of 3.294 km<sup>2</sup> (power density at 93.8 W/m<sup>2</sup>);
- A water release structure mainly composed of a 660 m long overflowing tunnel and a 750 m long pressured-release tunnel with designed discharge capacity of 978 m<sup>3</sup>/s and 706 m<sup>3</sup>/s, respectively;
- A water intake system of 3,824.51 m long mainly composed a bank-tower intake, an intake tunnel, a surge chamber, 2 penstocks bifurcated into two branch pipes, respectively, to create a rated water head of 130 m and rated intake flow of 256.8 m<sup>3</sup>/s;
- A 309 MW (103MW×3) powerhouse installed with 3 sets of turbine-generator units with rated capacity of 109 MW, respectively;



| Equipment | Quantity | Model          | Producer                            |
|-----------|----------|----------------|-------------------------------------|
| Turbine   | 3        | HLA855A-LJ-310 | Harbin Electric Machinery Co., Ltd. |
| Generator | 3        | SF103-22/6730  | Harbin Electric Machinery Co., Ltd. |

- 3 220 kV main transformers with rated voltage of 12000 KVA;

All the equipments are produced domestically. Thus, the project involves no technology transfer.

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

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The Project chooses 7 ×3-year renewable crediting period. It is estimated that the Project will achieve GHGs emission reductions of 908,606 tCO<sub>2</sub>e per annum, resulting in a total GHGs mitigation of 6,360,243 tCO<sub>2</sub>e throughout the first crediting period calculated as follows:

| <b>Years</b>                                                                                                | <b>Annual estimation of emission reductions<br/>in tonnes of CO<sub>2</sub>e</b> |
|-------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| 01/05/2009~30/04/2010                                                                                       | 908,606                                                                          |
| 01/05/2010~30/04/2011                                                                                       | 908,606                                                                          |
| 01/05/2011~30/04/2012                                                                                       | 908,606                                                                          |
| 01/05/2012~30/04/2013                                                                                       | 908,606                                                                          |
| 01/05/2013~30/04/2014                                                                                       | 908,606                                                                          |
| 01/05/2014~30/04/2015                                                                                       | 908,606                                                                          |
| 01/05/2015~30/04/2016                                                                                       | 908,606                                                                          |
| <b>Total estimated reductions<br/>(tonnes of CO<sub>2</sub>e)</b>                                           | 6,360,243                                                                        |
| <b>Total number of crediting years</b>                                                                      | 7                                                                                |
| <b>Annual average over the crediting<br/>period of estimated reductions<br/>(tonnes of CO<sub>2</sub>e)</b> | 908,606                                                                          |

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

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No public fund from Annex I countries is involved in this project.

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

&gt;&gt;

The Project applies Approved consolidated baseline and monitoring methodology ACM0002: “Consolidated baseline methodology for grid-connected electricity generation from renewable sources” (ACM0002/Version 07, Sectoral Scope 01, EB36); Tool to calculate the emission factor for an electricity system (Version 01.1) and Tool for the demonstration and assessment of additionality (Version 05.2). Please refer to UNFCCC website for the methodologies mentioned above:

<http://cdm.unfccc.int/methodologies/DB/T978BR87OSXVDVGWPU6WDBZ2DZP7UL/view.html>

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

&gt;&gt;

The application of the proposed project is justified as follows:

- The project activity is the installation of a new hydropower plant with a reservoir with power density of 93.8 W/m<sup>2</sup>, which is greater than the threshold of 4 W/m<sup>2</sup>;
- The project does not involve switching from fossil fuels to renewable energy at the site of the project activity.
- The geographic and system boundaries for Northwest China Power Grid can be clearly identified and information on the characteristics of the grid is available.

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

|                  | Source                                                                                                                                 | Gas              | Included? | Justification / Explanation                                                                                                                                                                       |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Baseline         | CO <sub>2</sub> emission from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. | CO <sub>2</sub>  | Yes       | Main emission source.                                                                                                                                                                             |
|                  |                                                                                                                                        | CH <sub>4</sub>  | No        | Minor emission source.                                                                                                                                                                            |
|                  |                                                                                                                                        | N <sub>2</sub> O | No        | Minor emission source.                                                                                                                                                                            |
| Project Activity | Emissions of CH <sub>4</sub> from the reservoir.                                                                                       | CO <sub>2</sub>  | No        | Minor emission source.                                                                                                                                                                            |
|                  |                                                                                                                                        | CH <sub>4</sub>  | No        | Main emission source. As the power density of the Project is 93.8 W/m <sup>2</sup> , larger than 10 W/m <sup>2</sup> , in accordance with ACM0002, the reservoir emission need not be considered. |
|                  |                                                                                                                                        | N <sub>2</sub> O | No        | Minor emission source.                                                                                                                                                                            |

Northwest China Power Grid (NWPG) is made up of several sub-grids including Gansu Grid, Qinghai Grid, Shaanxi Grid, Ningxia Grid and Xinjiang Grid. NWPG is clearly defined with spatial and geographical extent. All the power plants within NWPG can be dispatched by the grid operator without significant transmission constraints. Furthermore, according to the “Explain of confirming baseline emission factors of regional power grid in China” issued by China’s DNA, NWPG is defined to be a

regional grid in China for the purpose of calculating the build margin (BM) and operating margin (OM)<sup>2</sup>. Therefore, NWPG is considered as the project boundary for the Project for determining the BM and OM emission factors. The figure 4 below illustrates the structure of NWPG.

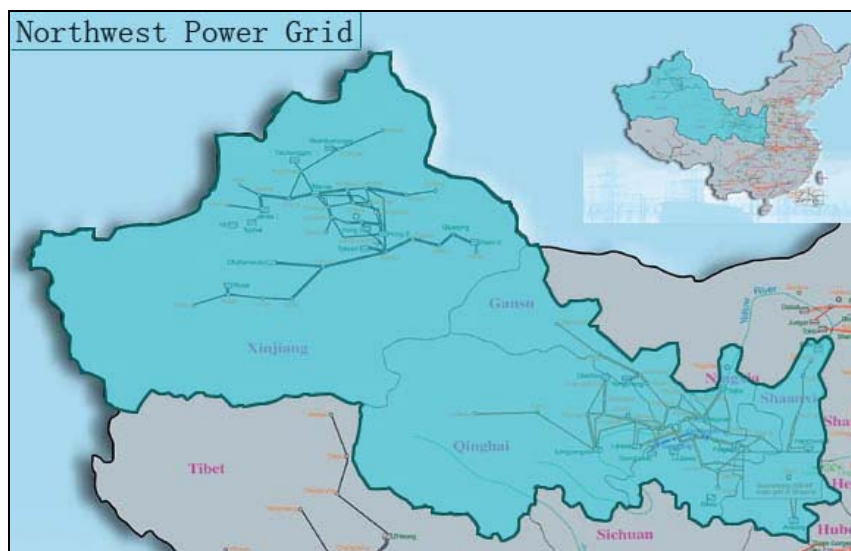


**Figure 4: The Structure of Northwest Power Grid**

The Project boundary included is showed in the figure 5 below.

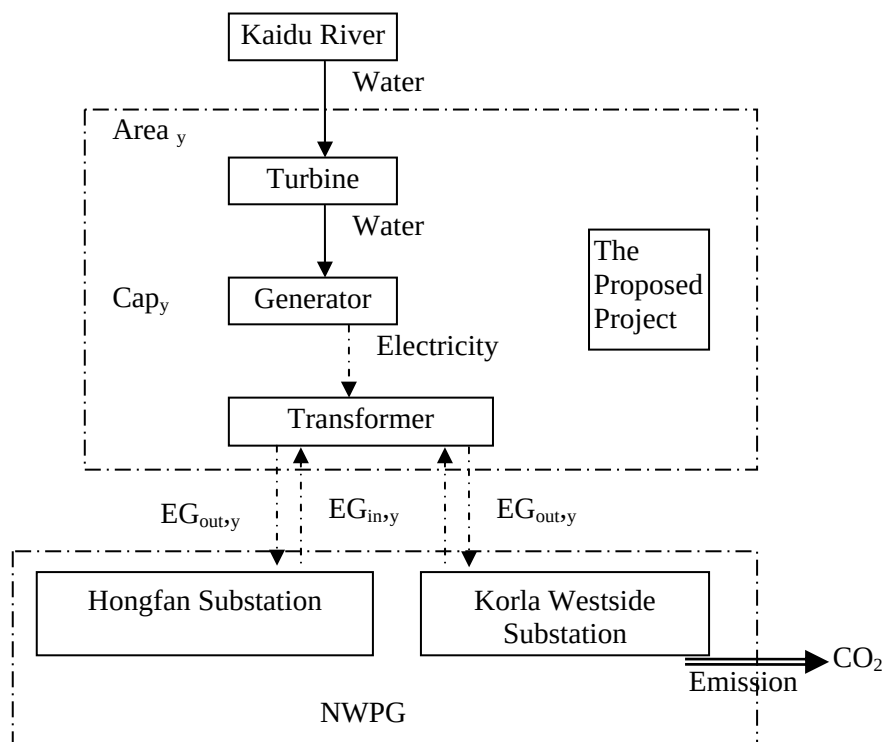


**Figure 5: Structure of the project boundary**

<sup>2</sup> <http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1364.pdf>

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

The baseline scenario of the Project is the continued operation of the existing power plants in the NWPG and the addition of new generation sources. The project activity involves construction of a new zero-emission power source. Thus, the emission reductions are equal to the baseline emissions.

In accordance with the approved methodology ACM0002, baseline emissions are equal to power generated by the project activity and delivered to the grid, multiplied by the emission coefficient.

In the absence of the proposed project, there would be four alternatives:

1. Construction of a fossil fuel-fired plant with equivalent amount of annual electricity output;
2. Construction of a power plant using other renewable power sources with equivalent output;
3. The propose project not undertaken as CDM project activity; and
4. Provision of equivalent amount of annual power output by the grid (Northwest China Power Grid) with which the Project connected.

**For Alternative I**, According to the Eleventh Five-Year Program for Energy Development, China is targeted to reduce energy consumption for unit GDP production by 20% in 2010, and reduce the total sulphur dioxide emission by 8.4 million tonnes and the carbon dioxide emission by 360 million tonnes in the recent 5 years<sup>3</sup>. Therefore, the Program encourages the construction of large scale thermal power plant with high efficient technology especially cogeneration power plant and super critical coal-fired power plant but discourage the construction of small scale ones.

Correspondingly, some new power regulations were established in order to cut down the existence and construction of small-scale thermal power. For example, it prescribes that thermal power plants with unit capacity less than 135 MW, if without special permission, are strictly prohibited in large layered grids<sup>4</sup>. And the new thermal power plants constructed should employ generators of unit capacity of 300 MW or above with high parameter and high efficiency since the Ninth Five-year period<sup>5</sup> (1996~2000). In addition, as defined in the regulation, a construction of a new thermal power plant should be installed at least 2 generation units<sup>6</sup>.

According to the China Electric Power Yearbook (2006), the average annual power generation hour of coal fired power plants is 5,261 h while is 3,112 h for the hydropower plants. If generating the equivalent amount of electricity as the Project, the new thermal power plant ought to be a small one with total installed capacity of 200 MW at maximum, thus its unit capacity cannot exceed 100 MW.

Therefore, alternative I is not a feasible and credible alternative to the proposed project.

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<sup>3</sup> <http://www.ndrc.gov.cn/zjgx/P020070410516458967992.pdf>

<sup>4</sup> Notice on Strictly Prohibiting the Installation of Fuel-fired Generation with the Capacity of 135 MW or below issued by the General Office of the State Council, decree no. 2002-6.

<sup>5</sup> Temporary Stipulation of the Construction Management of Small Scale Units of Fuel-fired Power Generation (Aug., 1997) [http://www.lawyee.net/Act/Act\\_Display.asp?RID=18734](http://www.lawyee.net/Act/Act_Display.asp?RID=18734)

<sup>6</sup> Opinion of Accelerating to Prohibit Small Scale units of Fuel-fired Power Generation, [http://www.ndrc.gov.cn/zcfb/zcfbqt/2007qita/t20070131\\_115037.htm](http://www.ndrc.gov.cn/zcfb/zcfbqt/2007qita/t20070131_115037.htm)



**For Alternative II**, the proposed project is located in Xinjiang Uygur Autonomous Region, where it is provided with other renewable energy resources such as wind power, solar power and biomass. However, considering the financial feasibility of those alternatives, all of them are less attractive comparing with the proposed project. The generation cost for small-scale hydropower project in China is similar with conventional thermal power plants. Whereas, the generation costs of wind power and solar power are around RMB 0.4~0.6 yuan/kWh, and RMB 3.5 yuan/kWh<sup>7</sup>, respectively, about 1.5 and 10 times of thermal power. The generation cost for biomass power generation project is also higher as much as 1.5 times more than the thermal power plants<sup>8</sup>. Therefore, alternative 3 is not financial attractive, and is not a feasible baseline scenario.

**For Alternative III**, according to the Investment Analysis in B.5, without the injection of CERs sales revenue from CDM, the proposed project is not financially attractive. Thus, Alternative III is not a credible baseline scenario.

**For Alternative IV**, Presently, the power shortage is offset by the electricity imported from Northwest China Power Grid. In the absence of the proposed project, the equivalent amount of electricity will be continued to be purchased from the Grid. And there are no significant barriers to block it from continuation. And this scenario is in compliance with all the laws and policies requirements. Therefore, Alternative IV is a credible baseline scenario.

Therefore, alternative IV is the only feasible baseline scenario for the proposed project.

**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):**

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#### **Prior consideration of CDM**

The milestones of the Project to be developed as CDM project activity is demonstrated in the table below:

**Table: CDM implementation schedule of the Project**

| Time                  | Milestone                                                                             |
|-----------------------|---------------------------------------------------------------------------------------|
| 04/2005               | FSR finished;                                                                         |
| 25/04/2005~26/04/2005 | CDM training;                                                                         |
| 10/05/2005            | Board resolution adopted to develop the Project as CDM project activity;              |
| 21/06/2005            | FSR approved;                                                                         |
| 10/07/2005            | LoI of CDM consulting;                                                                |
| 04/08/2005            | Equipment Purchase Contract signed;                                                   |
| 31/08/2005            | Construction activities began.                                                        |
| 09/2005               | EIA finished;                                                                         |
| 13/04/2006            | The project owner attended a CDM training;                                            |
| 18/10/2006            | Signed the CDM consulting contract for the 1 <sup>st</sup> time;                      |
| 05/2007               | Specific survey on local stakeholders' comments about CDM development of the project; |
| 29/08/2007            | MC carried out the site inspection;                                                   |
| 02/04/2008            | ERPA signed;                                                                          |

<sup>7</sup> [www.cnpower.org/biz/gting/200706/15920.html](http://www.cnpower.org/biz/gting/200706/15920.html)

<sup>8</sup>



|            |                                           |
|------------|-------------------------------------------|
| 16/04/2008 | LoA of Japanese Government;               |
| 28/05/2008 | DOE validation contract signed;           |
| 24/06/2008 | The final CDM consulting contract signed; |
| 30/06/2008 | DOE on-site visiting;                     |
| 30/07/2008 | LoA of Chinese Government;                |

In Apr, 2005, the project owner finished the required FSR. However, the FSR indicated that the project was financially unattractive due to the low IRR, and further financial incentives must be acquired to make the Project feasible. In the FSR, the financial supports generated from sales of emission reductions were considered to be a feasible solution, which indicated to develop the proposed project as CDM project.

On 25 Apr, 2005, the relevant persons involved in the CDM developing of the proposed project received CDM training, which let them learn more about CDM.

Based on such conclusions, the project owner held a board meeting on 10 May, 2005 to decide to proceed the project as CDM project activity. All the attendants agreed that the company should quicken the research of Kyoto Protocol, get hold of CDM operational procedures and develop the Project in accordance with CDM rules to combat the potential financial barriers.

On 21 June, 2005, The FSR was approved by National Development and Reform Commission, and on 10 July, 2005, the project owner signed the LoI of CDM consulting.

Then the equipment purchase contract was signed on 4 August, 2005, and the construction activities started on 31 August, 2005.

On 13 April, 2006, the project owner attend the CDM training mainly introduced the application programme of CDM projects, relevant methodology and regulations and etc.

On 18 October, 2006, the project owner signed the CDM consulting contract for the 1<sup>st</sup> time, for stipulating the periodical services contents, such as to find a buyer within one year, to finish the PDD and etc..

And during May 2007, a survey for collecting the opinions of the relevant stakeholders on the proposed project to develop as a CDM project activity was carried out, which received no negative comments.

On 29 August 2007, Mitsubishi Corporation, the Buyer, visited the project site for investigation. And the ERPA was signed on 2 April 2008. Latterly in the same month, on the 16<sup>th</sup>, the LoA of Japanese Government was issued.

On 28 May 2008, the validation contract with DOE was signed; about 28 days later, on 24 June 2008, the detailed CDM consulting contract was signed and added further requirements in the terms; and then on 30 June 2008, DOE carried the on-site visiting for validation purpose.

And on 30 July 2008, the Chinese Government issued the LoA of the proposed project.

Thus, it strongly demonstrates that the CDM incentives are essential to the successful development of the Project and that the project owner seriously and eagerly needs the Project be registered as CDM project activity to alleviate the potential risks.

According to the latest version of Tool for the Demonstration and Assessment of Additionality approved



by CDM EB, the following steps are used to demonstrate the additionality of the Project.

**Step 1: Identification of alternatives of the project activity consistent with current laws and regulations**

The step is to define realistic and credible alternatives to the proposed project activities that can be (part of) the baseline scenario through the following steps:

**Sub-step 1a: Define alternatives to the project activities:**

In the absence of the proposed project, the proposed alternatives would be as the follows:

**Alternative I:** Construction of a fossil fuel-fired plant with equivalent amount of annual electricity output;

**Alternative II:** Construction of a power plant using other renewable power sources with equivalent output;

**Alternative III:** The propose project not undertaken as CDM project activity; and

**Alternative IV:** Provision of equivalent amount of annual power output by the grid (Northwest China Power Grid) with which the Project connected.

For Alternative II, the proposed project is located in Xinjiang Uygur Autonomous Region, where it is provided with other renewable energy resources such as wind power, solar power and biomass. However, considering the financial feasibility of those alternatives, all of them are less attractive comparing with the proposed project. The generation cost for small-scale hydropower project in China is similar with conventional thermal power plants. Whereas, the generation costs of wind power and solar power are around RMB 0.4~0.6 yuan/kWh, and RMB 3.5 yuan/kWh<sup>9</sup>, respectively, about 1.5 and 10 times of thermal power. The generation cost for biomass power generation project is also higher as much as 1.5 times more than the thermal power plants<sup>10</sup>. Therefore, alternative 3 is not financial attractive, and is not a feasible baseline scenario.

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

According to China's current applicable power laws and regulations, coal-fired power plants, the rated capacity of single pure condensing steam turbine being less than 300MW, are prohibited for construction in the areas covered by large grids. And fuel-fired power plant is discouraged for construction according to China's current regulation issued by China Development and Reform Commission. In compliance to the Eleventh Five-Year Program of Energy of China and Five-Year Program of Xinjiang Autonomous Region, only large scale thermal power plant with high efficiency is advocated to construction in Xinjiang.

According to the China Electric Power Yearbook 2006, the average annual power generation hour of coal fired power plants is 5,261h while is 3,112h for the hydropower plants. The annual power generation of the proposed project is 1,080,000 MWh, if generating the equivalent amount electricity, the installed capacity of a coal fired plant should be 200MW at maximum.

<sup>9</sup> [www.cnpower.org/biz/gting/200706/15920.html](http://www.cnpower.org/biz/gting/200706/15920.html)

<sup>10</sup>

[http://www.cei.gov.cn/loadpage.aspx?Page=ShowDoc&CategoryAlias=zonghe/ggmflm\\_zh&ProductAlias=zhuanjshj&BlockAlias=zjzjsd&filename=/doc/zjzjsd/200803242713.xml](http://www.cei.gov.cn/loadpage.aspx?Page=ShowDoc&CategoryAlias=zonghe/ggmflm_zh&ProductAlias=zhuanjshj&BlockAlias=zjzjsd&filename=/doc/zjzjsd/200803242713.xml)



However, construction of such a power plant is obviously versus the Eleventh Five-Year Program for Energy Development of China, the Eleventh Five-Year Program of Xinjiang, the Law of People's Republic of China on the Prevention and Control of Atmosphere Pollution, and The Cleaner Production Promotion Law, which although don't specially ban such plan but do make it difficult to get approved.

Alternative III and Alternative IV are in compliance with all applicable laws and regulations.

## Step 2: Investment Analysis

The objective of this step is to determine whether the proposed project activity is less economically or financially unattractive than other alternatives without the revenue from the sale of CERs.

### Sub-step 2a: Determine appropriate analysis method

According to the "Tool for the demonstration and assessment of additionality", there are three options for investment analysis as following:

- Option I: Simply cost analysis;
- Option II: Investment comparison analysis; and
- Option III: Benchmark analysis.

The simple cost analysis method (Option I) is not appropriate because the proposed project will get the revenues not only from the CDM but also from the electricity sales. The investment comparison analysis (Option II) is also not applicable for the proposed project, as the project owner has no investment options to compare with. The baseline scenario of the proposed project is the continuing operation of Northwest China Grid rather than a similar investment project alternative to the proposed project, so investment comparison analysis method (Option II) is neither appropriate. As a result, Apply benchmark analysis (Option III) is chosen to demonstrate and assess the additionality, since the data on the total investment IRR of Chinese power industry is available.

### Sub-step 2b: Benchmark Analysis Method (Option III)

According to Interim rules of on Economic Assessment of Electric Engineering Retrofit Projects, the benchmark IRR on total investment of hydropower project is 8%, which is widely used for the power project investment assessment in China. This benchmark will be used for the financial appraisal of the proposed project.

### Sub-step 2c: Calculation and comparison of financial indicators

(1) The main parameters derived from the FSR for the calculation of financial indicators are as follows:

| Parameters                      | Unit         | Value     |
|---------------------------------|--------------|-----------|
| Installed Capacity              | MW           | 309       |
| Annual Electricity Generation   | MWh          | 1,080,000 |
| Annual On-grid Power Generation | MWh          | 1,069,200 |
| Total Investment                | million yuan | 1860.63   |
| Fixed assets investment         | million yuan | 1747.10   |
| Project Lifetime                | years        | 33        |
| Construction Period             | years        | 3         |
| Operational Period              | years        | 30        |
| Bus-bar tariff (With VAT)       | yuan/kWh     | 0.1877    |



|                                        |          |        |
|----------------------------------------|----------|--------|
| Bus-bar tariff(Without VAT)            | yuan/kWh | 0.1604 |
| VAT tax                                |          | 17%    |
| Income Tax Rate                        |          | 33%    |
| Urban Maintenance and Construction Tax |          | 5%     |
| Educational Surtax                     |          | 3%     |

### Comparison of the financial indicators

In accordance with the benchmark analysis, if the IRR of a project is lower than the benchmark of 8%, the project is not considered to be financially attractive.

Based on the data above, the IRR without CDM sales revenue are shown in the following table. It is clear that without CDM sales revenue, the IRR of the Project is only 5.02%, lower than the benchmark of 8%. Therefore, the proposed project is not financially attractive.

However, the extra income from CDM will improve the economic competitiveness of the Project if it is registered as a CDM project activity. The IRR (including expected CDM revenue based on assumptive CER price of 10 US\$/tCO<sub>2</sub>e) will be increased to 9.01% which is higher than the benchmark, making the Project financially feasible.

|     | Without CDM revenue | Benchmark | With CDM revenue |
|-----|---------------------|-----------|------------------|
| IRR | 5.02%               | 8%        | 9.01%            |

### Sub-step 2d. Sensitivity analysis

The objective of the sensitivity analysis is to show whether the conclusion regarding financial attractiveness is robust to reasonable variations in the critical assumptions.

The following four parameters have been selected as sensitive indicators fluctuating in the range of -10%~10% to test the financial attractiveness for the Project:

- (1) O&M cost;
- (2) Bus-bar tariff;
- (3) Annual output; and
- (4) Total investment.

Table 2 and Figure 6 show that within a realistic range of critical assumptions of the three parameters, the IRR of total investment of the proposed project is still lower than the benchmark, which obviously demonstrates that the project is less financial attractive.

**Table 2 Sensitivity analysis of the Proposed Project (without CDM)**

| Range<br>Parameter | -10.0% | -7.5% | -5.0% | -2.5% | 0.0%  | 2.5%  | 5.0%  | 7.5%  | 10.0% |
|--------------------|--------|-------|-------|-------|-------|-------|-------|-------|-------|
| O&M cost           | 5.21%  | 5.16% | 5.11% | 5.07% | 5.02% | 4.97% | 4.93% | 4.88% | 4.83% |
| Bus-bar Tariff     | 4.09%  | 4.33% | 4.58% | 4.81% | 5.02% | 5.22% | 5.42% | 5.61% | 5.80% |
| Annual Output      | 4.10%  | 4.34% | 4.58% | 4.81% | 5.02% | 5.22% | 5.42% | 5.61% | 5.80% |
| Total investment   | 5.81%  | 5.60% | 5.40% | 5.21% | 5.02% | 4.83% | 4.64% | 4.45% | 4.27% |

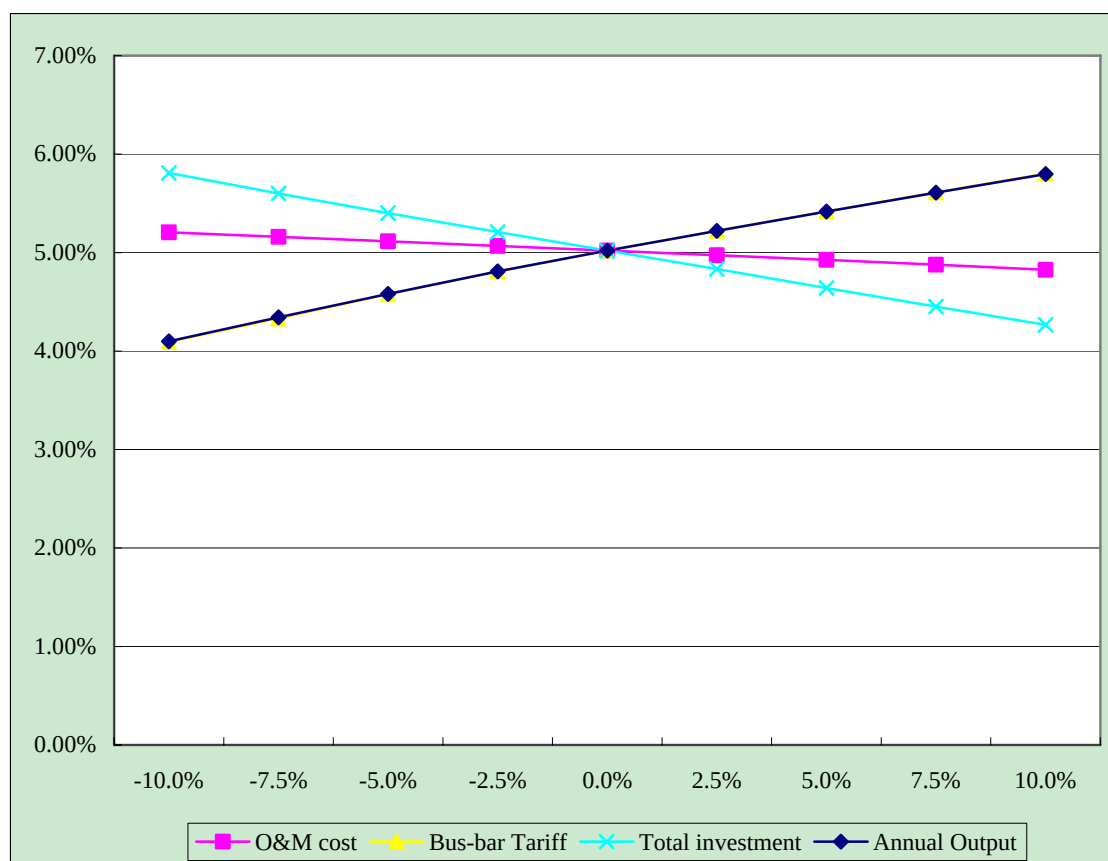


**Figure 6: Sensitivity analysis to Different Financial Parameters (Without CERs Revenue)**

Fig.6 shows that none of variations can raise the project IRR of the proposed project higher than the threshold of 8% and the sensitivity of the annual operational cost is very low.

Wider variations in the remaining critical assumptions are impossible due to the following reasons:

- With a decrease in the O&M cost by 10%, the project IRR only raises slightly; therefore, obviously, it is difficult to adjust the O&M cost to raise the project IRR..
- With an increase in the bus-bar tariff by 10%, the project IRR of the project is also lower than 8%. Based on the calculation, the project IRR will reach 8% when the bus-bar tariff increased by 44%. However, an increase of 44% is improbable due to the stability of bus-bar tariff tightly controlled by the government.
- With an increase in the annual output by 10%, the IRR of the proposed project is still lower than the benchmark. And the expected power generation from FSR is a rational result calculated on a strong water resource statistical basis, namely on 47 years of water flow measurements (1956-2002) by the "Dashankou Hydrological Station". Therefore, a significant change in average annual power generation of the project during the operating period is not likely to occur.
- With a decrease in the static investment by 10%, the project IRR is still lower than 8%. Furthermore, this assumption is highly unlikely because the price of equipment and material, etc., is expected to increase; therefore the investment costs for the proposed project will be increased.



Therefore, the results of the sensitivity analysis confirm that the project faces significant economic and financial barriers without CDM revenue. And Alternative III was not a possible alternative. Therefore, alternative IV is the only feasible baseline scenario for the proposed project.

#### **Step 4: Common Practice Analysis**

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

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

###### **Choose the similar area**

As for the area selection when doing common practice, China is so large and the development policy and each province has some difference, so Each Province in China was set as the area for common practice. As for the proposed project, Xinjiang Uygur Autonomous Region was chosen as the similar area.

###### **Choose the similar construction year**

According to the Notice on Issuing *Electric Power Sector Reform Programme* by State Council on 10<sup>th</sup> February 2002<sup>11</sup>, China began undertaking significant electric power sector reform including dividing the former single national power company into regional companies and separating generation and distribution responsibilities. And the core content of this electric power sector reform was price competition, cost reduction and forming new electricity pricing system. The new pricing system designed by this electric power sector reform is, differentiating grid-in tariff, transmission/distribution tariff, and terminal sale tariff. The grid-in tariff was consisted of capacity price fixed by the state and electricity price from market competition price. For grid corporations still in operation/management monopoly status, their transmission/distribution pricing mechanism should be fixed by the government under strict efficiency principle, cost restriction and incentive policy, and their terminal sale price should be based on the above mentioned prices and the established grid-in electricity tariff linkage mechanism. If possible, electricity generation enterprises can supply electricity to big clients directly through negotiation, implement transmission/distribution price fixed by the state, and finally form relatively reasonable electricity sale price.

Therefore, the projects which started its construction before 10<sup>th</sup> February 2002 had the essential difference and were excluded from the similar projects.

###### **Choose the similar installed capacity scale**

According to *Classification & design safety standard of hydropower projects (DL5180-2003)* issued by State Economic and Trade Commission of People's Republic of China in 2003: hydropower plant, with capacity less than 50MW, is defined as small scale hydropower projects; hydropower plant, with capacity less than 300MW and more than 50MW, is defined as middle scale hydropower project; hydropower plant, with capacity more than 300MW, is defined as large scale hydropower projects. The proposed project has the installed capacity of 309MW, which is far from the range of small scale hydropower projects; in consideration of conservativeness, the projects with the installed capacity over 50MW were selected as the similar scale range for the common practice analysis of the proposed project.

There are 2 stations in total in the *Yearbook of China Water Resources 2007*, and there are another 5

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<sup>11</sup> <http://www.nanjiang.gov.cn/zcfg/ShowArticle.asp?ArticleID=22>



stations which were not include stations in the *Yearbook of China Water Resources 2007*. The hydropower stations are listed in Table B.5.

**Table 4: The Hydropower plants with similar installed capacity over 50 MW in Xinjiang Uygur Autonomous Region**

| No. | Project Title                                                            | River Valley     | Installed Capacity (MW) | Construction Year | Total Investment (million yuan) | Project Owner                                                           | Note                                                                                                                                                     |
|-----|--------------------------------------------------------------------------|------------------|-------------------------|-------------------|---------------------------------|-------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | Wuluwati Hydro Project                                                   | Kala Kashi River | 60                      | 1995              | 1,540                           | Wuluwati Hydro project Construction Management Bureau                   | Jointly invested by central government, Xinjiang Autonomous Region Government and Xinjiang Corps and a key construction project in ninth five-year plan. |
| 2   | Qiafuqihai Hydropower Plant (QFQH)                                       | Yili River       | 320                     | 2002              | 2,000                           | Xinjiang Yili River Development and Construction Management Bureau      | The second largest hydropower plant in Xinjiang and a key construction project in Western Region Development strategy                                    |
| 3   | Manasi River Stage I Hydropower Project of Hongshanzui Hydropower Plant  | Manasi River     | 50                      | 2005              | 347                             | Xinjiang Tianfu Thermoelectric Co., Ltd.                                | CDM Applied (Ref.1103) <sup>12</sup>                                                                                                                     |
| 4   | Xinjiang Uygur Autonomous Region Tekesi River Shankou Hydropower Station | Yili River       | 141                     | 2006              | 1,094                           | Xinjiang Ili River Basin Development and Construction Management Centre | CDM Applied (Ref.1956) <sup>13</sup>                                                                                                                     |
| 5   | Hejing Dashankou                                                         | Kaidu River      | 80                      | 1987              | 160                             | Xinjiang Bazhou Power Company                                           |                                                                                                                                                          |

<sup>12</sup> <http://cdm.unfccc.int/Projects/DB/TUEV-SUED1177328282.15/view>

<sup>13</sup> <http://cdm.unfccc.int/Projects/DB/TUEV-SUED1216384032.22/view>



|   |                                                                                                      |             |    |      |     |                                                         |             |
|---|------------------------------------------------------------------------------------------------------|-------------|----|------|-----|---------------------------------------------------------|-------------|
|   | Hydropower Plant <sup>14</sup>                                                                       |             |    |      |     |                                                         |             |
| 6 | Ili Tuohai Hydropower Station <sup>15</sup>                                                          | Yili River  | 50 | 1984 | —   | Xinjiang Ili Power Company                              |             |
| 7 | Jilintai Stage II Hydropower Project, Nileke County, Xinjiang Uyghur Autonomous Region <sup>16</sup> | Kashi River | 50 | 2006 | 453 | Guodian Xinjiang Aibi Lake Valley Development Co., Ltd. | CDM Applied |

According to the analysis above, the Wuluwati hydropower Project, Hejing Dashankou Hydropower Plant and Ili Tuohai Hydropower Station should be excluded from the common practice analysis since they started construction before 2002, respectively in 1995, 1987 and 1984. And No.3, 4 and 7 projects were under CDM development, which should not be considered in common practice. Then there is only one similar project QFQH, but the existing of QFQH will not cause any impact on the additionality of the proposed project.

There are obvious differences between the Project and QFQH. QFQH is the second largest hydropower plant in Xinjiang that developed by Xinjiang Yili River Development and Construction Management Bureau and was invested by government<sup>17</sup>. Thus the project can get easier access to financing support and stronger capacity to negotiate with the grid company, which will result into less financial risk.

In addition, QFQH is a key construction project included in Western Region Development Strategy, which implies that it can enjoy some preferential policy issued by the government such lower income tax and VAT Tax. As a hydro-junction project, QFQH can also benefits from its contributions to flood control, irrigation and etc<sup>18</sup>. Owing to the factors above, the QFQH will achieve a better financial performance. It will not face the similar financial and investment barriers with the proposed project.

Therefore, the distinctions demonstrated that the Project is not common in Xinjiang Autonomous Region, and the existence of the similar project cannot affect the additionality of the Project.

**In conclusion, the Project is additional, not (part of) the baseline scenario. Without CDM support, the Project would unlikely occur.**

<sup>14</sup> <http://dianli1000.com/Photo/ShowPhoto.asp?PhotoID=98>

<sup>15</sup> <http://baike.baidu.com/view/1971693.htm>

<sup>16</sup> <http://cdm.unfccc.int/Projects/Validation/DB/Y62U0XJUAHNV96PMEX7H81MSCW039R/view.html>

<sup>17</sup> [http://ghjh.mwr.gov.cn/includ/detail\\_1.asp?category=3&DocID=1159](http://ghjh.mwr.gov.cn/includ/detail_1.asp?category=3&DocID=1159)

<sup>18</sup> [http://ghjh.mwr.gov.cn/includ/detail\\_1.asp?category=3&DocID=1159](http://ghjh.mwr.gov.cn/includ/detail_1.asp?category=3&DocID=1159)

**B.6. Emission reductions:**

&gt;&gt;

**B.6.1. Explanation of methodological choices:****1. Project emissions (PE<sub>y</sub>)**

The project activity is the installation of a new hydropower plant that results in a reservoir with power density of 93.8 W/m<sup>2</sup>, which is greater than 10 W/m<sup>2</sup>. In accordance with ACM0002, project emissions need not be accounted. Hence, the project emission is zero.

**2. Baseline emission (BE<sub>y</sub>)**

Baseline emissions include only CO<sub>2</sub> emissions from electricity generation in fossil fuel fired power plants within NWPG that are displaced due to the Project activity, calculated as follows:

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

Where:

BE<sub>y</sub> = Baseline emissions in year y (tCO<sub>2</sub>/yr).EG<sub>y</sub> = Net electricity supplied by the Project activity to the grid (MWh).EG<sub>baseline</sub> = Baseline electricity supplied to the grid in the case of modified or retrofit facilities (MWh). For new power plants this value is taken as zero.EF<sub>grid,CM,y</sub> = Combined margin CO<sub>2</sub> 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”.

As the Project activity is the installation of a new hydropower plant, formula (1) above is transformed to:

$$BE_y = EG_y \cdot EF_{grid,CM,y} \quad (2)$$

Where:

$$EG_y = EG_{out} - EG_{in}$$

where:

EG<sub>out</sub> = Electricity supplied by the Project activity to the grid (MWh).EG<sub>in</sub> = Electricity purchased by the Project activity from the grid (MWh).

The Combined margin CO<sub>2</sub> emission factor (EF<sub>grid,CM,y</sub>) is calculated by applying the following six steps in accordance with the “Tool to calculate the emission factor for an electricity system”.

**Step 1. Identify the relevant electric power system**

As the electric power system of the Project activity has been identified in section B.3 above, this step can be skipped.

**Step 2. Select an operating margin (OM) method**



There are four options to calculate the operating margin

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

For the Project activity, because the dispatch data of the Grid (including the NWPG) in China is not available to the public, options (b) and (c) can't be adopted. Furthermore, since low-cost/must-run power sources constitute 24.17%, 23.06%, 18.77%, 19.92% and 25.36%, less than 50% of the NWPG from 2001~2005, option (a) (simple OM) is the only reasonable and feasible method among the four options.

This PDD chooses ex-ante method to calculate the OM emission factor of NWPG by using the latest 3 years data vintage.

### Step 3. Calculate the OM emission factor according to the selected method

The Simple OM emission factor ( $EF_{OM, simple, y}$ ) is calculated as the generation-weighted average emissions per electricity unit ( $tCO_2/MWh$ ) of all generating sources serving the system, excluding those low-cost/must-run power plants/units. It may be calculated:

- Based on data on fuel consumption and net electricity generation of each power plant / unit (Option A), or
- Based on data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit (Option B), or
- Based on data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system (option C).

Option C is only feasible and selected to calculate OM emission factor of NWPG due to the following reasons:

- The necessary data for option A and option B are not available such as data of fuel consumption and net electricity generation of each power plant/unit serving the system;
- The low-cost/must-run power sources in NWPG only refer to hydropower and wind power; and
- The quantity of electricity supplied to NWPG by different sources is available.

According option C, the simple OM emission factor is calculated based on the net electricity supplied to NWPG by all power plants serving the NWPG, not including low-cost/must-run power plants/units, and based on the fuel type(s) and total fuel consumption of NWPG, as follows:

$$EF_{grid, OMsimple, y} = \frac{\sum_i FC_{i, y} \times NCV_{i, y} \times EF_{CO_2, i, y}}{EG_y} \quad (3)$$

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);                                                                    |
| $EF_{CO_2,i,y}$ : | $CO_2$ emission factor of fossil fuel type $i$ in year $y$ (t $CO_2$ /GJ);                                                                                              |
| $EG_y$ :          | Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year $y$ (MWh); |
| $i$ :             | All fossil fuel types combusted in power sources in the project electricity system in year $y$ ;                                                                        |
| $y$ :             | The three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option)                             |

This PDD calculates the Operating Margin (OM) emission factors of NWPG in 2003, 2004 and 2005, respectively. Then, the OM emission factor of NWPG is calculated as the weighted average of the three years.

#### Step 4. Identify the cohort of power units to be included in the build margin (BM)

The sample group of power units  $m$  used to calculate the build margin consists of either:

- (a) The set of five power units that have been built most recently, or
- (b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently<sup>19</sup>.

Because it is very difficult to obtain the data of five most recently built power plants as these data are considered as confidential business information in China, the power plant capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently is selected as the sample group  $m$ . The power plants which are CDM projects are not included in sample group  $m$ .

However, even for those built most recently power plants that comprise 20% of the system generation, it is also difficult to obtain the specific data regarding to fuel consumption and electricity generation additions by each power sources as confidential reason. Considering this situation, the following clarifications are given by EB for deviation in use of methodology AM0005 and AMS-I.D by several project activities in China when estimating  $BM$  emission coefficient:

- 1) Use of capacity additions during the last 1~3 years for estimating the build margin emission factor for grid electricity;
- 2) Use of weights estimated using installed capacity in place of annual electricity generation; and
- 3) It is suggested to use the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy, for each fuel type in estimating the fuel consumption.

Thus, the most recent built power plants are calculated as the difference of total installed power

<sup>19</sup> If 20% falls on part capacity of a unit, that unit is fully included in the calculation.



capacities in the year 2005 and 2003, respectively, which accounted for 21.02% of the total capacity in 2005 (see Table B2 in Annex 3). So the calculation by using the data in the years 2005 and 2003 satisfies the requirements.

In terms of vintage of data, ex-ante method is employed in this PDD to calculate the BM emission factor for the first crediting period based on the most recent data available in NWPG from 2004~2006.

### Step 5. Calculate the BM emission factor

According to “Tool to calculate the emission factor for an electricity system” and the clarifications by EB, the main steps for BM calculation are as following:

Sub-step 1: Calculation of weights of CO<sub>2</sub> emissions by coal-fired, oil-fired and gas-fired plants in total CO<sub>2</sub> emissions of NWPG.

$$\lambda_{\text{coal}, y} = \frac{\sum_{i,j} F_{i,j,y} \times \text{NCV}_{i,y} \times \text{EF}_{\text{CO}_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times \text{NCV}_{i,y} \times \text{EF}_{\text{CO}_2,i,j,y}} \quad (4)$$

$$\lambda_{\text{oil}, y} = \frac{\sum_{i,j} F_{i,j,y} \times \text{NCV}_{i,y} \times \text{EF}_{\text{CO}_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times \text{NCV}_{i,y} \times \text{EF}_{\text{CO}_2,i,j,y}} \quad (5)$$

$$\lambda_{\text{gas}, y} = \frac{\sum_{i,j} F_{i,j,y} \times \text{NCV}_{i,y} \times \text{EF}_{\text{CO}_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \times \text{NCV}_{i,y} \times \text{EF}_{\text{CO}_2,i,j,y}} \quad (6)$$

Where: is the total amount of fuel  $i$  (in a mass or volume unit)

$F_{i,j,y}$ : the total amount of fuel  $i$  (in a mass or volume unit) consumed by Province  $j$  in NWPG for power generation in year  $y$ ;

$\text{NCV}_{i,y}$ : Net calorific value (energy content) of fossil fuel type  $i$  in year  $y$  (GJ / mass or volume unit);

$\text{EF}_{\text{CO}_2,i,y}$ : CO<sub>2</sub> emission factor of fossil fuel type  $i$  in year  $y$  (tCO<sub>2</sub>/GJ);

This PDD employs the CO<sub>2</sub> emission weights by coal-fired, oil-fired and gas-fired plants of total CO<sub>2</sub> emission of NWPG in 2005. As result, the  $\lambda_{\text{coal}}$ ,  $\lambda_{\text{oil}}$  and  $\lambda_{\text{gas}}$  are calculated as 98.10%, 0.09% and 1.81%, respectively.

Sub-step 2: Calculation of emission factor of thermal power ( $\text{EF}_{\text{thermal power}}$ ) of NWPG.

The  $\text{EF}_{\text{thermal power}}$  is calculated as a weighted emission factor as the following formula:

$$\text{EF}_{\text{Thermal}} = \lambda_{\text{Coal}} \times \text{EF}_{\text{Coal, Adv}} + \lambda_{\text{Oil}} \times \text{EF}_{\text{Oil, Adv}} + \lambda_{\text{Gas}} \times \text{EF}_{\text{Gas, Adv}} \quad (7)$$

Where:

$\text{EF}_{\text{Coal, Adv}}$ ,  $\text{EF}_{\text{Oil, Adv}}$  and  $\text{EF}_{\text{Gas, Adv}}$  are the emission factors of the best technology for coal, oil, gas fired power plants commercially available in China, which are calculated based on the efficiency level of



the best technology for each fuel type commercially available in China (see details in Table B1 Annex 3).

According to the data issued by China DNA, the efficiency levels of domestic sub-critical 600 MW coal power unit and the 200 MW combined cycle power unit are taken as the efficiency levels of the best technology for coal-fired power plants, and oil and gas fired power plants commercially available in China, which are at 35.82% and 47.67%, respectively.

Sub-step 3: Calculation of Build Margin (BM) emission factor of NWPG.

Finally, weighted average build margin emission factor ( $EF_{BM,y}$ ) are calculated by multiplying the  $EF_{thermal\ power}$  with the weight of new capacity addition by thermal power of total capacity addition in NWPG.

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \quad (8)$$

Where:

$CAP_{Total}$  : the total capacity addition of NWPG between 2003~2005;

$CAP_{Thermal}$ : the capacity addition by thermal power of NWPG between 2003~2005.

The method of OM and BM calculation above refer to official website:

<http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1364.pdf> issued by China DNA.

### Step 6. Calculate the combined margin (CM) emissions factor

The final step is to calculate the weighted average baseline emission factor of the Project as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times W_{OM} + EF_{grid,BM,y} \times W_{BM} \quad (9)$$

Where:

$EF_{grid,BM,y}$ : Build margin CO<sub>2</sub> emission factor in year y (tCO<sub>2</sub>/MWh);

$EF_{grid,OM,y}$ : Operating margin CO<sub>2</sub> emission factor in year y (tCO<sub>2</sub>/MWh);

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

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

For the Project,  $w_{OM}$  and  $w_{BM}$ , by default, are 50% (i.e.,  $w_{OM} = w_{BM} = 0.5$ ), and  $EF_{OM,y}$  and  $EF_{BM,y}$  are calculated as described in Steps 3 and 5 above.

### 3. Leakage (LE<sub>y</sub>)

According to ACM0002 (Ver 07), leakage needs not be considered.

### 4. Emission reductions (ER<sub>y</sub>)

Emission reductions are calculated as follows:



$$ER_y = BE_y - PE_y - LE_y \quad (10)$$

Where:

$ER_y$  = Emission reductions in year  $y$  (t CO<sub>2e</sub>/yr).

$BE_y$  = Baseline emissions in year  $y$  (t CO<sub>2e</sub>/yr).

$PE_y$  = Project emissions in year  $y$  (t CO<sub>2</sub>/yr).

$LE_y$  = Leakage emissions in year  $y$  (t CO<sub>2</sub>/yr).

Since the project emission and the leakage emission ( $LE_y$ ) of the Project are zero. The emission reductions ( $ER_y$ ) is equal to the baseline emission ( $BE_y$ ) presented in the following formula:

$$ER_y = BE_y \quad (11)$$

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

|                                                                                                             |                                                                                                                                            |
|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Data / Parameter:</b>                                                                                    | $F_{i,j}$ 2003~2005                                                                                                                        |
| Data unit:                                                                                                  | Ton or m <sup>3</sup>                                                                                                                      |
| Description:                                                                                                | The total amount of fuel $i$ (in a mass or volume unit) consumed by Province $j$ in NWPG for power generation in year 2003, 2004 and 2005. |
| Source of data used:                                                                                        | China Electric Power Yearbook (2004~2006)                                                                                                  |
| Value applied:                                                                                              | See Annex 3.                                                                                                                               |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | The data selected comply with the Tool to calculate the emission factor for an electricity system.                                         |
| Any comment:                                                                                                | For OM and BM calculation.                                                                                                                 |

|                                                                                                             |                                                                                                           |
|-------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| <b>Data / Parameter:</b>                                                                                    | $GEN_j$ 2003~2005                                                                                         |
| Data unit:                                                                                                  | MWh                                                                                                       |
| Description:                                                                                                | The electricity output (MWh) supplied to the grid by the Province $j$ in NWPG in year 2003 2004 and 2005. |
| Source of data used:                                                                                        | China Electric Power Yearbook (2004~2006)                                                                 |
| Value applied:                                                                                              | See Annex 3                                                                                               |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | The data selected comply with the Tool to calculate the emission factor for an electricity system.        |
| Any comment:                                                                                                | For OM calculation.                                                                                       |

|                             |                                                                                   |
|-----------------------------|-----------------------------------------------------------------------------------|
| <b>Data / Parameter:</b>    | NCVi                                                                              |
| Data unit:                  | kJ/Kg or kJ/m <sup>3</sup>                                                        |
| Description:                | the net calorific value (energy content) per mass or volume unit of a fuel $i$    |
| Source of data used:        | China Energy Statistical Yearbook 2006                                            |
| Value applied:              | See Annex 3                                                                       |
| Justification of the choice | According to Tool to calculate the emission factor for an electricity system, the |



|                                                                                 |                            |
|---------------------------------------------------------------------------------|----------------------------|
| of data or description of measurement methods and procedures actually applied : | national value is used.    |
| Any comment:                                                                    | For OM and BM calculation. |

|                                                                                                             |                                                                                                                                                  |
|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Data / Parameter:</b>                                                                                    | $EF_{CO_2, I}$                                                                                                                                   |
| Data unit:                                                                                                  | tC/Tj                                                                                                                                            |
| Description:                                                                                                | CO <sub>2</sub> emission factor per energy unit of fuel i.                                                                                       |
| Source of data used:                                                                                        | Table 1.3 Default Value of Carbon Content, Page 1.21, Page 1.22 Chapter 1, Volume 2 2006 IPCC Guidelines for National Greenhouse Gas Inventories |
| Value applied:                                                                                              | See Annex 3.                                                                                                                                     |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | According to Tool to calculate the emission factor for an electricity system, when the national value is unavailable, IPCC default is used.      |
| Any comment:                                                                                                | For OM and BM calculation.                                                                                                                       |

|                                                                                                             |                                                                                                |
|-------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| <b>Data / Parameter:</b>                                                                                    | Installed Capacity <sub>j</sub> 2003, 2004, 2005.                                              |
| Data unit:                                                                                                  | MW                                                                                             |
| Description:                                                                                                | The installed capacity of Province j in NWPG in year 2003, 2004, 2005.                         |
| Source of data used:                                                                                        | China Electric Power Yearbook (2004~2006)                                                      |
| Value applied:                                                                                              | See Annex 3.                                                                                   |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | The data selected comply with Tool to calculate the emission factor for an electricity system. |
| Any comment:                                                                                                | For BM calculation.                                                                            |

|                                                                                                             |                                                                                                                                                                         |
|-------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Data / Parameter:</b>                                                                                    | OXID <sub>i</sub>                                                                                                                                                       |
| Data unit:                                                                                                  |                                                                                                                                                                         |
| Description:                                                                                                | The oxidation factor of the fuel.                                                                                                                                       |
| Source of data used:                                                                                        | Table 1.4 Default CO <sub>2</sub> Emission Factor For Combustion, Page 1.23, Page 1.24 Chapter 1, Volume 2 2006 IPCC Guidelines for National Greenhouse Gas Inventories |
| Value applied:                                                                                              | See Annex 3.                                                                                                                                                            |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | This data is based on IPCC default value because the national specific value is unavailable.                                                                            |
| Any comment:                                                                                                |                                                                                                                                                                         |

|                          |                                                                                                 |
|--------------------------|-------------------------------------------------------------------------------------------------|
| <b>Data / Parameter:</b> | $\eta_{Adv, I}$                                                                                 |
| Data unit:               | %                                                                                               |
| Description:             | The efficiency level of the best technology for each fuel type commercially available in China. |



|                                                                                                             |                                                                                                                                                                     |
|-------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Source of data used:                                                                                        | Official website of China DNA:<br><a href="http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1875.pdf">http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1875.pdf</a> |
| Value applied:                                                                                              | See Annex 3.                                                                                                                                                        |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | The data selected comply with Tool to calculate the emission factor for an electricity system.                                                                      |
| Any comment:                                                                                                | For BM calculation.                                                                                                                                                 |

|                                                                                                             |                                                                                                                                                                     |
|-------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Data / Parameter:</b>                                                                                    | $\lambda_i$                                                                                                                                                         |
| Data unit:                                                                                                  | %                                                                                                                                                                   |
| Description:                                                                                                | The proportion of emission from different fuel i power plant to the total emissions of NWPG.                                                                        |
| Source of data used:                                                                                        | Official website of China DNA:<br><a href="http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1875.pdf">http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1875.pdf</a> |
| Value applied:                                                                                              | See table B2 in Annex 3.                                                                                                                                            |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | The data selected comply with Tool to calculate the emission factor for an electricity system.                                                                      |
| Any comment:                                                                                                | For BM calculation.                                                                                                                                                 |

|                                                                                                             |                                                                                                                                                                     |
|-------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Data / Parameter:</b>                                                                                    | $EF_{OM,y}$                                                                                                                                                         |
| Data unit:                                                                                                  | tCO <sub>2</sub> /MWh                                                                                                                                               |
| Description:                                                                                                | The operating margin emission factor in year y.                                                                                                                     |
| Source of data used:                                                                                        | Official website of China DNA:<br><a href="http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1358.xls">http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1358.xls</a> |
| Value applied:                                                                                              | See table A1-3~A3-3 in Annex 3.                                                                                                                                     |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | The data selected comply with Tool to calculate the emission factor for an electricity system.                                                                      |
| Any comment:                                                                                                | For CM calculation.                                                                                                                                                 |

|                                                                                                             |                                                                                                                                                                     |
|-------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Data / Parameter:</b>                                                                                    | $EF_{OM, simple}$                                                                                                                                                   |
| Data unit:                                                                                                  | tCO <sub>2</sub> /MWh                                                                                                                                               |
| Description:                                                                                                | The simple operating margin emission factor of NWPG.                                                                                                                |
| Source of data used:                                                                                        | Official website of China DNA:<br><a href="http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1358.xls">http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1358.xls</a> |
| Value applied:                                                                                              | 1.1257                                                                                                                                                              |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | The data selected comply with Tool to calculate the emission factor for an electricity system.                                                                      |
| Any comment:                                                                                                | This data will not be renewed until the second crediting period since the ex-ante                                                                                   |



|  |                     |
|--|---------------------|
|  | option is selected. |
|--|---------------------|

|                                                                                                             |                                                                                                                                                                     |
|-------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Data / Parameter:</b>                                                                                    | EF <sub>BM</sub>                                                                                                                                                    |
| Data unit:                                                                                                  | tCO <sub>2</sub> /MWh                                                                                                                                               |
| Description:                                                                                                | Build Margin Emission Factor                                                                                                                                        |
| Source of data used:                                                                                        | Official website of China DNA:<br><a href="http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1358.xls">http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1358.xls</a> |
| Value applied:                                                                                              | 0.5739                                                                                                                                                              |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | The data selected comply with Tool to calculate the emission factor for an electricity system.                                                                      |
| Any comment:                                                                                                | This data will not be renewed until the second crediting period since the ex-ante option is selected.                                                               |

|                                                                                                             |                                                                                                                                                                     |
|-------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Data / Parameter:</b>                                                                                    | EF <sub>CM</sub>                                                                                                                                                    |
| Data unit:                                                                                                  | tCO <sub>2</sub> /MWh                                                                                                                                               |
| Description:                                                                                                | The baseline combine emission factor.                                                                                                                               |
| Source of data used:                                                                                        | Official website of China DNA:<br><a href="http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1364.pdf">http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1364.pdf</a> |
| Value applied:                                                                                              | 0.8498                                                                                                                                                              |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | The data is issued by China DNA.                                                                                                                                    |
| Any comment:                                                                                                | This data will not be renewed until the second crediting period since the ex-ante option is selected.                                                               |

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

&gt;&gt;

#### EF<sub>OM,simple</sub> of NWPG

According to the OM calculation of China DNA, the Simple OM emission factor of Northwest China Power Grid is at is 1.1257 tCO<sub>2e</sub>/MWh (see details in Annex 3).

#### 2. EF<sub>BM</sub> of NWPG

According to BM calculation of China DNA, based on the formula (6) and (7) in B.6.1, the EF<sub>thermal power</sub> of NWPG is at 0.9409 tCO<sub>2</sub>/MWh (See Annex 3).

The new capacity addition of thermal power in NWPG accounts for 60.99% of total capacity addition between 2003~2005. Thus, based on formula (8) above, the build margin emission factor is calculated as 0.5739 tCO<sub>2e</sub>/MWh (see details in Annex 3).

#### 3. EF of NWPG

According to equation 9, the baseline combine emission factor = (1.1257 + 0.5739 )/2=0.8498 (tCO<sub>2e</sub>/MWh).

**4. Emission reduction (ER<sub>y</sub>) by the proposed project activity**

According to formula (11):

$$ER_y = BE_y = EG_y \times EF_y = (EG_{out} - EG_{in}) \times EF_y = 1,069,200 \times 0.8498 = 908,606 \text{ tCO}_2\text{e};$$

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

&gt;&gt;

| Year                                | Estimation of project activity emissions (tCO <sub>2</sub> e) | Estimation of baseline emissions (tCO <sub>2</sub> e) | Estimation of leakage (tCO <sub>2</sub> e) | Estimation of emission reductions (tCO <sub>2</sub> e) |
|-------------------------------------|---------------------------------------------------------------|-------------------------------------------------------|--------------------------------------------|--------------------------------------------------------|
| 01/05/2009~30/04/2010               | 0                                                             | 908,606                                               | 0                                          | 908,606                                                |
| 01/05/2010~30/04/2011               | 0                                                             | 908,606                                               | 0                                          | 908,606                                                |
| 01/05/2011~30/04/2012               | 0                                                             | 908,606                                               | 0                                          | 908,606                                                |
| 01/05/2012~30/04/2013               | 0                                                             | 908,606                                               | 0                                          | 908,606                                                |
| 01/05/2013~30/04/2014               | 0                                                             | 908,606                                               | 0                                          | 908,606                                                |
| 01/05/2014~30/04/2015               | 0                                                             | 908,606                                               | 0                                          | 908,606                                                |
| 01/05/2015~30/04/2016               | 0                                                             | 908,606                                               | 0                                          | 908,606                                                |
| Total (tonnes of CO <sub>2</sub> e) | 0                                                             | 6,360,243                                             | 0                                          | 6,360,243                                              |

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

&gt;&gt;

**B.7.1. Data and parameters monitored:**

|                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Data / Parameter:</b>                                                                         | EG <sub>out</sub>                                                                                                                                                                                                                                                                                                                                                                                             |
| Data unit:                                                                                       | MWh                                                                                                                                                                                                                                                                                                                                                                                                           |
| Description:                                                                                     | Electricity evacuated to Northwest China Power Grid by the proposed project                                                                                                                                                                                                                                                                                                                                   |
| Source of data to be used:                                                                       | Ammeter                                                                                                                                                                                                                                                                                                                                                                                                       |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 1,069,200 MWh                                                                                                                                                                                                                                                                                                                                                                                                 |
| Description of measurement methods and procedures to be applied:                                 | Electricity will be measured directly and continuously by computed and precise ammeters, Recording frequency will be hourly measurement and monthly recording; Proportion of data to be monitored would be 100% throughout whole year; the data will be archived both in electronic and paper; Data monitored are to be kept for two years after the last issuance of CERs for the proposed project activity. |
| QA/QC procedures to be applied:                                                                  | Set up a special CDM project team; constitute detailed rules on monitoring management; introduce precision ammeters; two ammeters proofread each other in connected substation; keep the receipt of electricity sales as a hard proof for data quality control.                                                                                                                                               |
| Any comment:                                                                                     | This value is calculated on the actual situation that the 3% transmission loss is not in account, for expected emission reductions calculation. Double check by receipt of sales. Electronic data will be kept for 2 years                                                                                                                                                                                    |



|  |                                           |
|--|-------------------------------------------|
|  | following the end of the crediting period |
|--|-------------------------------------------|

|                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Data / Parameter:</b>                                                                         | $EG_{in}$                                                                                                                                                                                                                                                                                                                                                                                                     |
| Data unit:                                                                                       | MWh                                                                                                                                                                                                                                                                                                                                                                                                           |
| Description:                                                                                     | Annual on-grid electricity purchased from NWPG by the proposed project for the plant operation.                                                                                                                                                                                                                                                                                                               |
| Source of data to be used:                                                                       | Meter                                                                                                                                                                                                                                                                                                                                                                                                         |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 0                                                                                                                                                                                                                                                                                                                                                                                                             |
| Description of measurement methods and procedures to be applied:                                 | Electricity will be measured directly and continuously by computed and precise ammeters. Recording frequency will be hourly measurement and monthly recording; proportion of data to be monitored would be 100% throughout whole year; the data will be archived both in electronic and paper; data monitored are to be kept for two years after the last issuance of CERs for the proposed project activity. |
| QA/QC procedures to be applied:                                                                  | Set up a special CDM project team; constitute detailed rules on monitoring management; introduce precision ammeters; two ammeters proofread each other in connected substation; keep the sales receipts of electricity purchase as a hard proof for data quality control.                                                                                                                                     |
| Any comment:                                                                                     | For expected emission reductions calculation.<br>Double check by receipt of sales. Electronic data will be kept for 2 years following the end of the crediting period.                                                                                                                                                                                                                                        |

|                                                                                                  |                                                                                                                                           |
|--------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Data / Parameter:</b>                                                                         | $A_{PJ}$                                                                                                                                  |
| Data unit:                                                                                       | $m^2$                                                                                                                                     |
| Description:                                                                                     | Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full. |
| Source of data to be used:                                                                       | Project site.                                                                                                                             |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 3,294,000                                                                                                                                 |
| Description of measurement methods and procedures to be applied:                                 | Measured by maps provided by qualified parties.                                                                                           |
| QA/QC procedures to be applied:                                                                  | Yearly measured.                                                                                                                          |
| Any comment:                                                                                     | For the calculation of the power density.                                                                                                 |

|                                                                                                  |                                             |
|--------------------------------------------------------------------------------------------------|---------------------------------------------|
| <b>Data / Parameter:</b>                                                                         | $Cap_{PJ}$                                  |
| Data unit:                                                                                       | MW                                          |
| Description:                                                                                     | Installed capacity of the proposed project. |
| Source of data                                                                                   | Project site.                               |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 309                                         |



|                                 |                                                                            |
|---------------------------------|----------------------------------------------------------------------------|
| Measurement procedures (if any) | Determined in accordance with the nameplates supplied by the manufacturer. |
| Monitoring frequency:           | Yearly                                                                     |
| QA/QC procedures to be applied: | -                                                                          |
| Any comment:                    | -                                                                          |

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

>>

The project owner is the user of this monitoring plan and will be responsible for it. The project owner must maintain credible, transparent, and adequate data estimation, measurement, collection, and tracking systems to maintain the information required for an audit of an emission reduction project. These records and monitoring systems are needed to allow the selected DOE to verify project performance as part of the verification and certification process. This process also reinforces that CO<sub>2</sub> reductions are real and credible to the buyers of the Certified Emissions Reductions (CERs).

Emission reductions will be achieved through avoided power generation of fossil fuel plant due to the power generated by the proposed project. The grid-connected output is therefore defined as the key data to monitor.

#### OPERATIONAL AND MANAGEMENT STRUCTURE FOR MONITORING

The project owner has assigned a Monitoring Team to carry out the whole monitoring process as the Figure 7 below.

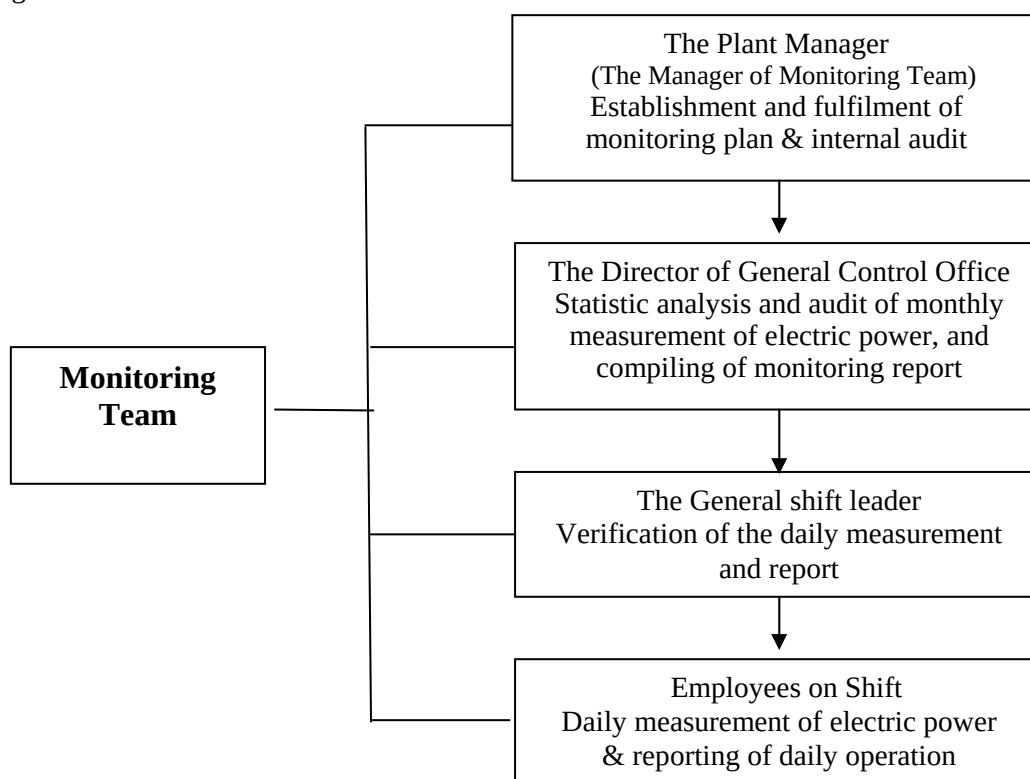


Figure 7: Monitoring and Management Structure



The plant manager will establish the monitoring team, and hold the overall responsibility for the whole process:

The first step is the measurement of the daily electrical energy supplied to the grid and reporting of daily operation, which will be conducted by the employees on the shift.

The second step is the verification of the daily measurement and report which will be carried out by the general shift leader;

The third step is the statistic analysis and audit of the daily and monthly measurement. Besides execution of quality control (QC) and quality assurance (QA) procedures mentioned above, the monitoring officer will collect the required supporting documents such as reading cards supplied by the Grid company and sales receipt provided to the Grid company, and prepare monitoring reports of the project activity including operating periods, power generation, power delivered to the grid, equipment defects, and etc.;

The final step is the internal audit of the monitoring reports, which will be carried out by the plant manager.

### **Monitoring Plan**

The approved monitoring methodology ACM0002 is used for developing the monitoring plan.

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

#### **1. Responsibility**

Overall responsibility for daily monitoring and reporting lies with the project owner. A monitoring team as mentioned above will be established by the project owner to carry out the monitoring work.

#### **2. Installation of meters**

In line with the power purchase agreement, the monitoring point is set at the power plant side. The project is connected to Korla Westside Substation and Hongfan Substation within NWPG, the power delivered to the grid will be mainly monitored and determined by the bidirectional main Meter (M1 and M2) installed by the Grid at the outlet side of the transmission lines of the project site where both a main meter (M1A, M2A) and a back-up (M1B, M2B) will be installed. And another meter (M3A/M3B) will be installed at the inlet point of the Chada line, which is for back-up use, to monitor the power downloaded from the grid when there is necessary. All of the three meters are installed for the measurement of net electricity delivered to the Grid. When the main meter is out of order, the readings from the back-up meter will be used for reference. The net on-grid power supply is defined as  $(M1_{out} + M2_{out} - M1_{in} - M2_{in} - M3_{in})$ .

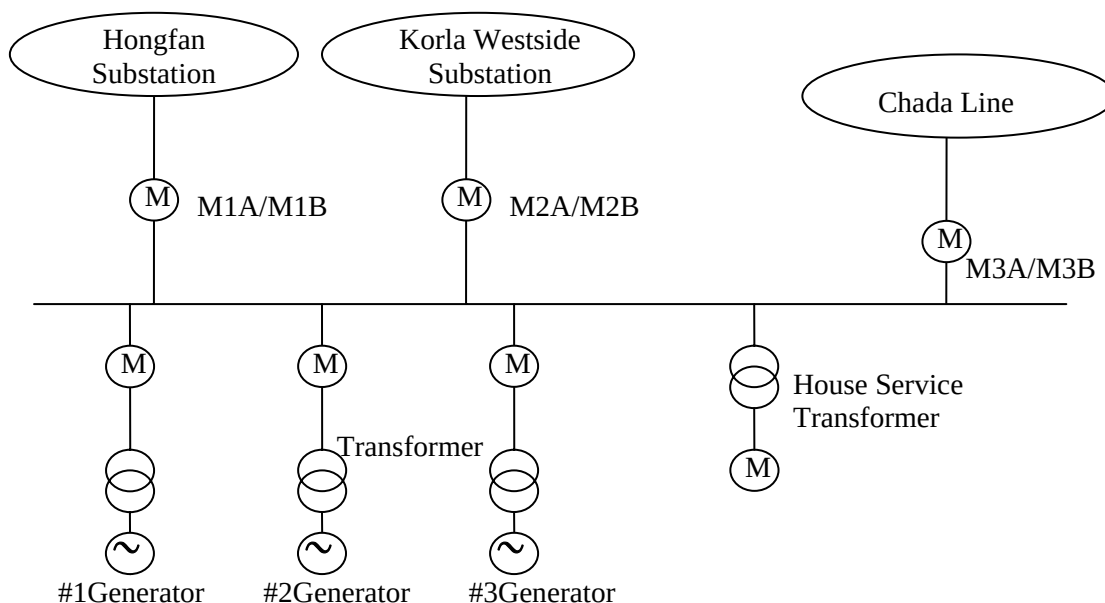


**Figure 8: Diagram of the location of the meters**

The metering equipment will be properly configured and checked annually according to the requirement from technical administrative code of electric energy metering (DL/T448-2000).

### 3. Reporting

The specific steps for data collection and reporting are listed below:

- Firstly, to read and verify the readings of the meters at the project site daily and to prepare the monthly data report;
- Secondly, to collect the reading cards from the Grid and check the recorded readings with those from the meters at the project site, and to determine the accurate net on-grid power supply with the Grid;
- Thirdly, to provide NWPG with sales receipts and to preserve the corresponding copies; and
- Fourthly, to prepare and review the monitoring report internally and to provide DOE with reading cards and copies of sales receipts and other relevant documentations for verification.

Should any previous months reading of the main meter be inaccurate by more than the allowable error, or otherwise functioned improperly, the grid-connected electricity generated by the Project shall be determined by reading the backup meter, unless a test by either party reveals it is inaccurate:

- If the backup system is not with acceptable limits of accuracy or is otherwise performing improperly the Project owner and grid company shall jointly prepare an estimate of the correct reading; and
- If the Project owner and the grid company fail to agree the estimate of the correct reading, then the matter will be referred for arbitration according to agreed procedures.



With respect to the emergency situations where both the electricity supply from the generators and the grid are not available, a battery will be used for illumination and other daily purposes. Hence, no additional emission will occur in emergency situations.

#### 4. Calibration

All the meters shall be inspected and sealed on behalf of the parties concerned and shall not be interfered with by either party except in the presence of the other party or its accredited representative. And all the meters shall be calibrated specified as follows:

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

Calibration is carried out in accordance with Verification regulation of electric watt-hour meters (JJG596-1999) by qualified parties with the records being supplied to the project owner, and these records will be preserved and maintained both by the project owner and the appointed parties. And the calibration shall ensure sufficient accuracy of 0.2s so that any error resulting from such equipment shall not exceed the allowable error of full-scale rating.

## II. Monitoring of $Cap_{PJ}$ and $A_{PJ}$

Installed capacity of the hydro power plant after the implementation of the project activity will be monitored by checking the rated capacity on the nameplate of the generator.

Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full is monitored by calculations based on relevant maps supplied by qualified parties.

#### Data management system

All data collected as part of monitoring will be archived electronically. All information will be stored by the technology department of the project owner and all the material will have a physical copy for backup. In order to facilitate auditors' reference of relevant literature relating to the project, the project material and monitoring results will be indexed. And all data including calibration records is kept until 2 years after the end of the total credit time of the CDM project.

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

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The baseline study and monitoring plan of the proposed project were completed on 11/03/2009 by the Beijing Changjiang River International Holding.

Ms. Kai MEI, [mabery@126.com](mailto:mabery@126.com), Beijing Changjiang River International Holding, No.1, Baiguang Road 2nd Alley, Xuanwu District, Beijing 100761, P.R. China;

Mr. Youchun GE, [geyouchun@yahoo.cn](mailto:geyouchun@yahoo.cn), Beijing Changjiang River International Holding, No.1, Baiguang Road 2nd Alley, Xuanwu District, Beijing 100761, P.R. China.



Ms. Shunrong LIN, [linnet2001@hotmail.com](mailto:linnet2001@hotmail.com), Beijing Changjiang River International Holding, No.1, Baiguang Road 2nd Alley, Xuanwu District, Beijing 100761, P.R. China.

Ms. Jiayuan GUO, [yongheng\\_0306@163.com](mailto:yongheng_0306@163.com), Beijing Changjiang River International Holding, No.1, Baiguang Road 2nd Alley, Xuanwu District, Beijing 100761, P.R. China;

The entity and persons listed above are not considered to be project participants.

**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:**

&gt;&gt;

04/08/2005 when the equipment purchase contract was signed.

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

&gt;&gt;

30 years, 0 months

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

&gt;&gt;

**C.2.1. Renewable crediting period**

&gt;&gt;

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

&gt;&gt;

01/05/2009 or the registration date whichever is later.

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

&gt;&gt;

7 years, 0 months

**C.2.2. Fixed crediting period:****C.2.2.1. Starting date:**

&gt;&gt;

Not applicable

**C.2.2.2. Length:**

&gt;&gt;

Not applicable

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

&gt;&gt;

According to the Environmental Protection Law of the People's Republic of China, the project developer delegated Xinjiang Water Conservatory & Hydropower Survey and Planning Research Institution to conduct the environmental impact assessment (EIA). The Institute is qualified for EIA consultancy services and is independent from the project owner. The EIA report was approved by the State Environmental Protection Administration in 2006.

According to the EIA report, the impacts arising from the proposed project were identified. And the corresponding mitigation methods are illustrated as follows:

**Water pollution**

Because of the foundation excavation, mineral material processing and washing, concrete mixing and maintenance, machine and vehicle washing and maintenance etc, some construction waste water will be caused which will be a great threaten to Kaiduhe River if not treated properly. In accordance with Integrated Wastewater Discharge Standard of the People's Republic Of China (GB8978-1996) II and Environmental Surface Water Quality (GB3838-2002) I, some measures will be taken to protect local water environment, for example, the waste water rising from mineral material processing will be firstly disposed in sand reclamation unit, and then be disposed in the setting pits and sedimentation basin, finally be recycled for watering or irrigation when it can meet the requirement. As for the oil water from the machine and vehicle washing and maintenance will be treated in the sedimentation tanks for twice and then be used for green or watering. Because the wastewater generated by tunnel excavation, containing some nitryl and sulphide, will be treated in the sedimentation tanks until it can meet the standard then be evaporated etc.

Owing that there are some working staff living in the project site in the construction and operation phase, the domestic sewage will be formed. In order to protect the environment and the employees, the domestic sewage will be treated in the WSH—A—20 type wastewater treatment facilities and then be used for de-dust purposed or green purpose.

All of the residue that left in the bottom of the pits and sedimentation tanks will be collected and backfilled for green.

**Noise**

During the construction period, explosion, mixing, sieving and the vehicles are the main noise sources. For the sake of keeping the staff from being disturbed, some noise mitigation measures will be adopted according to Noise Limited of Construction Site of the People's Republic of China (GB12523-90) II, such as set the operation timetable of the material process plant and the vehicles properly, set up a operation region for the machines, protect the working personnel with earplug, protective helmet etc.

**Solid waste**

In the construction phase, sand-rock excavation will be the main sources for the construction soil waste while the working personnel are for the domestic garbage. For the construction solid waste, it will be piled in 7 refuse collection points. Regarding the dejecta caused by the working personnel, it will be collected in the environment-friendly toilets and then carried to the refuse disposal plants in Hejing County.



The domestic residue caused by the working personnel will be collected in the refuse collection points and be carried to the refuse disposal plants in Hejing County. The dejecta will be discharged into the wastewater treatment system and then be treated by the methods mentioned above.

#### **Air pollution**

In compliance with Ambient air quality standard (GB 3095—1996) II, some measures will be taken to alleviate the impact that may be caused by the dust and exhaust gases rising from excavation, explosion, machine and vehicles, coal consumption etc such as watering regularly, use cross ventilation method in the tunnel drilling, adopt hybrid type airiness remove dust in explosion, protect the working personnel with mask and glasses etc.

#### **Soil erosion**

In order to prevent soil erosion and reserve the water and soil, some measures will be taken including building shelter walls and retaining walls, minimize the area that will be disturbed by construction, install some drainage ditches, ramp the land, backfill the construction residue, carry out some natural terrestrial recovery projects and green project etc.

#### **Ecosystem Impact**

In order to protect local fish resources, a fish proliferation programme was included in the EIA and will be executed strictly. The project is located in the desert and semi-deserted area in the northwest China. Thank to the poor soil condition, sparse vegetation are identified in this area. In addition, no national and region-level protected species are identified. In order to protect the wild animals, some punitive regulation will be put forward including forbid hunting and fishing, set up artificial propagation points for fish etc..

The runoff of the downstream river courses will be reduced attribute to the water diversion of the intake channels. In order to ensure an adequate water flow to protect local species, ecosystems and livelihoods, discharge orifices will be incorporated to maintain an environmental flow of 43.5 m<sup>3</sup>/s.

**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:**

>>

The environmental impacts of the proposed project are not considered to be significant due to the mitigation methods mentioned above.

**SECTION E. Stakeholders' comments**

&gt;&gt;

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

&gt;&gt;

For the sake of making the public better know the proposed project and acquiring the comment and opinion of the local stakeholders toward the proposed project, the project owner requested local government to carry out a project specific survey by publishing notice and distributing questionnaires to local stakeholders in May 2007.

The questionnaires included the introduction of the project, a series of the questions and other prompts for the invitation of the public comments. The questionnaires involved no leading questions and were easy to understand.

The questionnaires were distributed to stakeholders including local residents, representatives from relevant entities and local government in Bayin'gholin Mongol Prefecture. 50 copies were distributed, and since the Project is located in a remote area where few residents exist, 50 copies are sufficient enough to reflect local stakeholders' comments.

All the responded questionnaires were collected and the results were summarized and kept. The questionnaire is list in the table below:

**Table 4: Questionnaires for the Public on Impact Assessment of Xinjiang Kaiduhe River Chanhuan Wusu Hydropower Project**

| Name                                                                                                                                                                                                                                                                                                                                                                                                                         | Gender                  | Age                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-------------------------|
| Nationality                                                                                                                                                                                                                                                                                                                                                                                                                  | Education level         | Profession              |
| Project Introduction:                                                                                                                                                                                                                                                                                                                                                                                                        |                         |                         |
| The proposed project is designed to construct a 309 MW hydropower plant located on the middle reaches of Kaiduhe River in Hejing County of Bayin'gholin Mongol Prefecture, Xinjiang Uygur Autonomous Region, P. R. China, which will generate an annual output of 1,080,000 MWh and provide on-grid power supply of 1,037,124 MWh per annum to be connected to Xinjiang Grid and subsequently to Northwest China Power Grid. |                         |                         |
| In order to get fully understanding of the comments hold by you local stakeholders, and also to respect public ideas and choices, we hereby send you this questionnaire. Please read it through carefully and fill in the following paper sheet to express all your opinions and suggestions. Great thanks!                                                                                                                  |                         |                         |
| 1. Do you know this project well?                                                                                                                                                                                                                                                                                                                                                                                            | A. Yes                  | B. A little C. No       |
| 2. Do you support the Project developed as a CDM project?                                                                                                                                                                                                                                                                                                                                                                    | A. Yes                  | B. No clear C. No       |
| 3. Do you think this project would ease the electric deficiency situation in local area?                                                                                                                                                                                                                                                                                                                                     | A. Yes                  | B. No idea C. No        |
| 4. Do you think the proposed project will stimulate local economic development?                                                                                                                                                                                                                                                                                                                                              | A. Yes                  | B. No idea C. No        |
| 5. How do you think the impact of the project on the local employment?                                                                                                                                                                                                                                                                                                                                                       | A. Positive             | B. No idea C. Negative  |
| 6. Whether the project will improve the living standard of local residents or not?                                                                                                                                                                                                                                                                                                                                           | A. Yes                  | B. No idea C. No        |
| 7. How do you think the impact of the project on the local environment?                                                                                                                                                                                                                                                                                                                                                      | A. Positive C. Negative | B. No impact D. No idea |



|                                                                                       |        |            |       |
|---------------------------------------------------------------------------------------|--------|------------|-------|
| 8. Do you support the construction of the proposed project?                           | A. Yes | B. No idea | C. No |
| 9. Do you have any suggestion or advice about the project? Please write down, if any: |        |            |       |

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

&gt;&gt;

There were 50 copies distributed and 50 received, at responding rate of 100%.  
The results of the investigation are summarized as follows:

1. All of the respondents know the proposed project well;
2. All the respondents support the project develop as a CDM project;
3. 100% of the respondents believe that the project will supply additional electricity to local area and further ease the electric deficiency situation;
4. 94% of the respondents think the proposed project can stimulate the local economic development and the rest have no idea;
5. All of the respondents believe the proposed project will improve the local employment;
6. 96% of the respondents consider that the proposed project can improve their living standard, and the rest have no idea;
7. 90% of the respondents believe that the proposed project has no impact on local environment and the remaining 10% have no idea;
8. All the respondents support the construction of the Project.

In conclusion, the public hold positive attitudes toward the proposed project and most of them believe the construction and operation of the Project would bring multiple benefits to local areas, such as providing clean and renewable power, contributing to local economic development, and improving their living standard and etc.. All of the respondents support the construction of the proposed project.

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

&gt;&gt;

Since stakeholders showed universal agreement on the project, there is no need to modify the proposed project.

**Annex 1****CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY**

|                  |                                                                      |
|------------------|----------------------------------------------------------------------|
| Organization:    | Guodian Xinjiang Kaidu River Valley Hydro-power Developing Co., Ltd. |
| Street/P.O.Box:  | Renmin Road                                                          |
| Building:        | Huayu Business Building                                              |
| City:            | Ku'erle                                                              |
| State/Region:    | Xinjiang Uygur Autonomous Region                                     |
| Postfix/ZIP:     | 841000                                                               |
| Country:         | P. R. China                                                          |
| Telephone:       | +86 996 5396017                                                      |
| FAX:             | +86 996 8820222                                                      |
| E-Mail:          | samon@vip.sina.com                                                   |
| URL:             |                                                                      |
| Represented by:  | Chao Ma                                                              |
| Title:           | Manager                                                              |
| Salutation:      | Mr                                                                   |
| Last Name:       | Ma                                                                   |
| Middle Name:     |                                                                      |
| First Name:      | Chao                                                                 |
| Department:      |                                                                      |
| Mobile:          |                                                                      |
| Direct FAX:      | +86 996 8820222                                                      |
| Direct tel:      | +86 996 5396017                                                      |
| Personal E-Mail: | samon@vip.sina.com                                                   |



|                  |                                                                                            |
|------------------|--------------------------------------------------------------------------------------------|
| Organization:    | Mitsubishi Corporation                                                                     |
| Street/P.O.Box:  | 3-1, Marunouchi 2-Chome                                                                    |
| Building:        |                                                                                            |
| City:            | Chiyoda-ku                                                                                 |
| State/Region:    | Tokyo                                                                                      |
| Postfix/ZIP:     | 100-8086                                                                                   |
| Country:         | Japan                                                                                      |
| Telephone:       | +81-3-3210-7534                                                                            |
| FAX:             | +81-3-3210-7708                                                                            |
| E-Mail:          | ml.en-x@mitsubishicorp.com                                                                 |
| URL:             | <a href="http://www.mitsubishicorp.com/en/">http://www.mitsubishicorp.com/en/</a>          |
| Represented by:  |                                                                                            |
| Title:           | Assistant Manager                                                                          |
| Salutation:      | Mr.                                                                                        |
| Last Name:       | Matsuda                                                                                    |
| Middle Name:     |                                                                                            |
| First Name:      | Tatsuki                                                                                    |
| Department:      | Emissions Reduction Business Unit                                                          |
| Mobile:          |                                                                                            |
| Direct FAX:      | +81-3-3210-7708                                                                            |
| Direct tel:      | +81-3-3210-7534                                                                            |
| Personal E-Mail: | <a href="mailto:tatsuki.matsuda@mitsubishicorp.com">tatsuki.matsuda@mitsubishicorp.com</a> |



**Annex 2**

**INFORMATION REGARDING PUBLIC FUNDING**

>>

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



**Annex 3**  
**BASELINE INFORMATION**

&gt;&gt;

Please refer to the following official websites issued by DNA for the procedure of OM and BM calculation of Northwest China Power Grid:  
<http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1358.xls>  
<http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1374.pdf>

**Table A Calculation of simple OM emission factor of NWPG**

**Table A1-1 Electricity generation by thermal power in NWPG in 2003**

| Province                                        | Electricity generation and supply by thermal power plants |                             |                                   |
|-------------------------------------------------|-----------------------------------------------------------|-----------------------------|-----------------------------------|
|                                                 | Electricity generation<br>(MWh)                           | Captive power rate<br>(%)   | Power supply to the Grid<br>(MWh) |
| Shanxi                                          | 38,144,000                                                | 6.94                        | 35,496,806                        |
| Gansu                                           | 29,494,000                                                | 6.35                        | 27,621,131                        |
| Qinghai                                         | 6,446,000                                                 | 4.50                        | 6,155,930                         |
| Ningxia                                         | 19,175,000                                                | 5.25                        | 18,168,313                        |
| Xinjiang                                        | 19,834,000                                                | 8.19                        | 18,209,595                        |
| Sum                                             | 113,093,000                                               | —                           | 105,651,775                       |
| Electricity Import<br>(MWh)                     | 0                                                         | Total power supply<br>(MWh) | 105,651,775                       |
| Data source: China Electric Power Yearbook 2004 |                                                           |                             |                                   |



Table A1-2 Calculation of simple OM emission factor of NWPG in 2003

|                                                                                  | Fi                                                                 |                                                                   |                                                                     |                                                                     |                                                                      |                                                                   | Carbon<br>Emission<br>Factors<br>(tC/Tj) | EF <sub>CO<sub>2</sub>,i</sub><br>(tCO <sub>2</sub> /Tj) | NCV<br>(Kj/Kg)<br>(Kj/m <sup>3</sup> ) | OXID <sub>i</sub> | Emission<br>(tCO <sub>2</sub> e) |
|----------------------------------------------------------------------------------|--------------------------------------------------------------------|-------------------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------|----------------------------------------------------------------------|-------------------------------------------------------------------|------------------------------------------|----------------------------------------------------------|----------------------------------------|-------------------|----------------------------------|
|                                                                                  | Shanxi<br>(10 <sup>4</sup> t)<br>(10 <sup>8</sup> m <sup>3</sup> ) | Gansu<br>(10 <sup>4</sup> t)<br>(10 <sup>8</sup> m <sup>3</sup> ) | Qinghai<br>(10 <sup>4</sup> t)<br>(10 <sup>8</sup> m <sup>3</sup> ) | Ningxia<br>(10 <sup>4</sup> t)<br>(10 <sup>8</sup> m <sup>3</sup> ) | Xinjiang<br>(10 <sup>4</sup> t)<br>(10 <sup>8</sup> m <sup>3</sup> ) | Total<br>(10 <sup>4</sup> t)<br>(10 <sup>8</sup> m <sup>3</sup> ) | F                                        | G=F*44/12                                                | H                                      | I                 | J=E*G*H*I*10 <sup>-2</sup>       |
| RAW COAL                                                                         | 2,002.26                                                           | 1,479.62                                                          | 330.67                                                              | 682.00                                                              | 1,065.75                                                             | 5,560.30                                                          | 25.8                                     | 94.60                                                    | 20,908.00                              | 1                 | 109,976,995.77                   |
| Clean Coal                                                                       | 0.00                                                               | 0.00                                                              | 0.00                                                                | 0.00                                                                | 0.00                                                                 | 0.00                                                              | 25.8                                     | 94.60                                                    | 26,344.00                              | 1                 | 0.00                             |
| OTHER WASHED COAL                                                                | 0.00                                                               | 0.00                                                              | 0.00                                                                | 27.00                                                               | 3.64                                                                 | 30.64                                                             | 25.8                                     | 94.60                                                    | 8,363.00                               | 1                 | 242,405.23                       |
| COKE                                                                             | 0.00                                                               | 0.00                                                              | 0.00                                                                | 0.00                                                                | 0.00                                                                 | 0.00                                                              | 25.8                                     | 94.60                                                    | 28,435.00                              | 1                 | 0.00                             |
| COKE OVEN GAS                                                                    | 0.00                                                               | 1.54                                                              | 0.00                                                                | 0.00                                                                | 0.00                                                                 | 1.54                                                              | 12.1                                     | 44.37                                                    | 16,726.00                              | 1                 | 114,279.84                       |
| Other gas                                                                        | 0.00                                                               | 0.12                                                              | 0.00                                                                | 0.00                                                                | 0.00                                                                 | 0.12                                                              | 12.1                                     | 44.37                                                    | 5,227.00                               | 1                 | 2,782.85                         |
| Crude oil                                                                        | 0.00                                                               | 0.00                                                              | 0.00                                                                | 0.00                                                                | 0.00                                                                 | 0.00                                                              | 20                                       | 73.33                                                    | 41,816.00                              | 1                 | 0.00                             |
| Gasoline                                                                         | 0.00                                                               | 0.00                                                              | 0.00                                                                | 0.00                                                                | 0.00                                                                 | 0.00                                                              | 18.9                                     | 69.30                                                    | 43,070.00                              | 1                 | 0.00                             |
| Diesel                                                                           | 3.12                                                               | 0.00                                                              | 0.00                                                                | 0.04                                                                | 0.40                                                                 | 3.56                                                              | 20.2                                     | 74.07                                                    | 42,652.00                              | 1                 | 112,463.66                       |
| Fuel oil                                                                         | 0.00                                                               | 1.19                                                              | 0.00                                                                | 0.00                                                                | 1.02                                                                 | 2.21                                                              | 21.1                                     | 77.37                                                    | 41,816.00                              | 1                 | 71,497.14                        |
| LPG                                                                              | 0.00                                                               | 0.00                                                              | 0.00                                                                | 0.00                                                                | 0.00                                                                 | 0.00                                                              | 17.2                                     | 63.07                                                    | 50,179.00                              | 1                 | 0.00                             |
| Refinery gas                                                                     | 0.00                                                               | 0.00                                                              | 0.00                                                                | 0.00                                                                | 3.48                                                                 | 3.48                                                              | 18.2                                     | 66.73                                                    | 46,055.00                              | 1                 | 106,954.45                       |
| Natural gas                                                                      | 0.10                                                               | 0.54                                                              | 0.00                                                                | 0.00                                                                | 5.95                                                                 | 6.59                                                              | 15.3                                     | 56.10                                                    | 38,931.00                              | 1                 | 1,439,275.18                     |
| Other petroleum products*                                                        | 0.00                                                               | 0.00                                                              | 0.00                                                                | 0.00                                                                | 0.00                                                                 | 0.00                                                              | 20                                       | 73.33                                                    | 38,369.00                              | 1                 | 0.00                             |
| Other energy                                                                     | 0.00                                                               | 0.00                                                              | 0.00                                                                | 0.00                                                                | 0.00                                                                 | 0.00                                                              | 25.8                                     | 94.60                                                    | 28,435.00                              | 1                 | 0.00                             |
| Total emission of the Northwest China<br>Power Grid (tCO <sub>2</sub> e)         | 112,066,654.11                                                     |                                                                   |                                                                     |                                                                     |                                                                      |                                                                   |                                          |                                                          |                                        |                   |                                  |
| Fossil power generation of the Northwest<br>China Power Grid (MWh)               | 105,651,775.30                                                     |                                                                   |                                                                     |                                                                     |                                                                      |                                                                   |                                          |                                                          |                                        |                   |                                  |
| OM emission factor of the Northwest China<br>Power Grid (tCO <sub>2</sub> e/MWh) | 1.060717                                                           |                                                                   |                                                                     |                                                                     |                                                                      |                                                                   |                                          |                                                          |                                        |                   |                                  |

Data source: China Energy Statistical Yearbook 2004;

2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy



Table A2-1 Electricity generation by thermal power in NWPG in 2004

| Province                    | Electricity generation and supply by thermal power plants |                             |                                   |
|-----------------------------|-----------------------------------------------------------|-----------------------------|-----------------------------------|
|                             | Electricity generation<br>(MWh)                           | Captive power rate<br>(%)   | Power supply to the Grid<br>(MWh) |
| Shanxi                      | 44,439,000                                                | 7.50                        | 41,106,075                        |
| Gansu                       | 33,242,000                                                | 6.21                        | 31,177,672                        |
| Qinghai                     | 6,208,000                                                 | 7.96                        | 5,713,843                         |
| Ningxia                     | 25,298,000                                                | 5.45                        | 23,919,259                        |
| Xinjiang                    | 22,752,000                                                | 9.07                        | 20,688,394                        |
| Sum                         | 131,939,000                                               | —                           | 122,605,243                       |
| Electricity Import<br>(MWh) | 0                                                         | Total power supply<br>(MWh) | 122,605,243                       |

Data source: China Electric Power Yearbook 2005

Table A2-2 Calculation of simple OM emission factor of NWPG in 2004

|                   | Fi                                                                          |                                                                            |                                                                              |                                                                              |                                                                               |                                                                                      | Carbon<br>Emission<br>Factors<br>(tC/Tj)<br><br>F | EF <sub>CO2,i</sub><br>(tCO <sub>2</sub> /Tj)<br><br>G=F*44/12 | NCV<br>(Kj/Kg)<br>(Kj/m <sup>3</sup> )<br><br>H | OXID <sub>i</sub><br><br>I | Emission<br>(tCO <sub>2</sub> e)<br><br>J=E*G*H*I*10 <sup>-2</sup> |
|-------------------|-----------------------------------------------------------------------------|----------------------------------------------------------------------------|------------------------------------------------------------------------------|------------------------------------------------------------------------------|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------|----------------------------------------------------------------|-------------------------------------------------|----------------------------|--------------------------------------------------------------------|
|                   | Shanxi<br>(10 <sup>4</sup> t)<br>(10 <sup>8</sup> m <sup>3</sup> )<br><br>A | Gansu<br>(10 <sup>4</sup> t)<br>(10 <sup>8</sup> m <sup>3</sup> )<br><br>B | Qinghai<br>(10 <sup>4</sup> t)<br>(10 <sup>8</sup> m <sup>3</sup> )<br><br>C | Ningxia<br>(10 <sup>4</sup> t)<br>(10 <sup>8</sup> m <sup>3</sup> )<br><br>D | Xinjiang<br>(10 <sup>4</sup> t)<br>(10 <sup>8</sup> m <sup>3</sup> )<br><br>E | Total<br>(10 <sup>4</sup> t)<br>(10 <sup>8</sup> m <sup>3</sup> )<br><br>F=A+B+C+D+E |                                                   |                                                                |                                                 |                            |                                                                    |
| RAW COAL          | 2,428.70                                                                    | 1,595.90                                                                   | 322.80                                                                       | 1,270.10                                                                     | 1,240.90                                                                      | 6,858.40                                                                             | 25.8                                              | 94.60                                                          | 20,908.00                                       | 1                          | 135,652,074.13                                                     |
| Clean Coal        | 0.00                                                                        | 0.00                                                                       | 0.00                                                                         | 0.00                                                                         | 0.00                                                                          | 0.00                                                                                 | 25.8                                              | 94.60                                                          | 26,344.00                                       | 1                          | 0.00                                                               |
| OTHER WASHED COAL | 0.00                                                                        | 0.00                                                                       | 0.00                                                                         | 102.64                                                                       | 10.50                                                                         | 113.14                                                                               | 25.8                                              | 94.60                                                          | 8,363.00                                        | 1                          | 895,095.57                                                         |
| COKE              | 0.78                                                                        | 0.00                                                                       | 0.00                                                                         | 0.00                                                                         | 0.00                                                                          | 0.78                                                                                 | 25.8                                              | 94.60                                                          | 28,435.00                                       | 1                          | 20,981.62                                                          |
| COKE OVEN GAS     | 0.00                                                                        | 0.30                                                                       | 0.00                                                                         | 0.00                                                                         | 0.00                                                                          | 0.30                                                                                 | 12.1                                              | 44.37                                                          | 16,726.00                                       | 1                          | 22,262.31                                                          |
| Other gas         | 0.74                                                                        | 1.26                                                                       | 0.00                                                                         | 0.00                                                                         | 0.00                                                                          | 2.00                                                                                 | 12.1                                              | 44.37                                                          | 5,227.00                                        | 1                          | 46,380.91                                                          |
| Crude oil         | 0.01                                                                        | 0.00                                                                       | 0.00                                                                         | 0.00                                                                         | 0.06                                                                          | 0.07                                                                                 | 20                                                | 73.33                                                          | 41,816.00                                       | 1                          | 2,146.55                                                           |
| Gasoline          | 0.02                                                                        | 0.00                                                                       | 0.00                                                                         | 0.00                                                                         | 0.00                                                                          | 0.02                                                                                 | 18.9                                              | 69.30                                                          | 43,070.00                                       | 1                          | 596.95                                                             |



|                                                                               |                |      |      |      |      |      |      |       |           |   |              |
|-------------------------------------------------------------------------------|----------------|------|------|------|------|------|------|-------|-----------|---|--------------|
| Diesel                                                                        | 2.16           | 0.36 | 0.00 | 0.05 | 0.41 | 2.98 | 20.2 | 74.07 | 42,652.00 | 1 | 94,140.93    |
| Fuel oil                                                                      | 0.01           | 0.69 | 0.00 | 0.00 | 0.30 | 1.00 | 21.1 | 77.37 | 41,816.00 | 1 | 32,351.65    |
| LPG                                                                           | 0.00           | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 17.2 | 63.07 | 50,179.00 | 1 | 0.00         |
| Refinery gas                                                                  | 0.00           | 0.00 | 0.00 | 0.00 | 3.26 | 3.26 | 18.2 | 66.73 | 46,055.00 | 1 | 100,192.96   |
| Natural gas                                                                   | 1.61           | 0.59 | 0.00 | 0.00 | 6.27 | 8.47 | 15.3 | 56.10 | 38,931.00 | 1 | 1,849,872.65 |
| Other petroleum products*                                                     | 0.00           | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 20   | 73.33 | 38,369.00 | 1 | 0.00         |
| Other energy                                                                  | 0.00           | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 25.8 | 94.60 | 28,435.00 | 1 | 0.00         |
| Total emission of the Northwest China Power Grid (tCO <sub>2</sub> e)         | 138,716,096.22 |      |      |      |      |      |      |       |           |   |              |
| Fossil power generation of the Northwest China Power Grid (MWh)               | 122,605,242.60 |      |      |      |      |      |      |       |           |   |              |
| OM emission factor of the Northwest China Power Grid (tCO <sub>2</sub> e/MWh) | 1.131404       |      |      |      |      |      |      |       |           |   |              |

Data source: China Energy Statistical Yearbook 2005;

2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy

**Table A3-1 Electricity generation by thermal power in NWPG in 2005**

| Province                                        | Electricity generation and supply by thermal power plants |                             |                                   |
|-------------------------------------------------|-----------------------------------------------------------|-----------------------------|-----------------------------------|
|                                                 | Electricity generation<br>(MWh)                           | Captive power rate<br>(%)   | Power supply to the Grid<br>(MWh) |
| Shanxi                                          | 41,100,000                                                | 7.16                        | 38,157,240                        |
| Gansu                                           | 33,106,000                                                | 4.23                        | 31,705,616                        |
| Qinghai                                         | 5,500,000                                                 | 2.69                        | 5,352,050                         |
| Ningxia                                         | 27,643,000                                                | 5.73                        | 26,059,056                        |
| Xinjiang                                        | 26,560,000                                                | 8.80                        | 24,222,720                        |
| Sum                                             | 133,909,000                                               | —                           | 125,496,682                       |
| Electricity Import<br>(MWh)                     | 0                                                         | Total power supply<br>(MWh) | 125,496,682                       |
| Data source: China Electric Power Yearbook 2004 |                                                           |                             |                                   |



Table A3-2 Calculation of simple OM emission factor of NWPG in 2005

|                                                                               | Fi                                                                 |                                                                   |                                                                     |                                                                     |                                                                      |                                                                   | Carbon<br>Emission<br>Factors<br>(tC/Tj) | EF <sub>CO<sub>2</sub>i</sub><br>(tCO <sub>2</sub> /Tj) | NCV<br>(Kj/Kg)<br>(Kj/m <sup>3</sup> ) | OXIDi | Emission<br>(tCO <sub>2</sub> e) |
|-------------------------------------------------------------------------------|--------------------------------------------------------------------|-------------------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------|----------------------------------------------------------------------|-------------------------------------------------------------------|------------------------------------------|---------------------------------------------------------|----------------------------------------|-------|----------------------------------|
|                                                                               | Shanxi<br>(10 <sup>4</sup> t)<br>(10 <sup>8</sup> m <sup>3</sup> ) | Gansu<br>(10 <sup>4</sup> t)<br>(10 <sup>8</sup> m <sup>3</sup> ) | Qinghai<br>(10 <sup>4</sup> t)<br>(10 <sup>8</sup> m <sup>3</sup> ) | Ningxia<br>(10 <sup>4</sup> t)<br>(10 <sup>8</sup> m <sup>3</sup> ) | Xinjiang<br>(10 <sup>4</sup> t)<br>(10 <sup>8</sup> m <sup>3</sup> ) | Total<br>(10 <sup>4</sup> t)<br>(10 <sup>8</sup> m <sup>3</sup> ) |                                          |                                                         |                                        |       |                                  |
|                                                                               | A                                                                  | B                                                                 | C                                                                   | D                                                                   | E                                                                    | F=A+B+C+D+E                                                       | F                                        | G=F*44/12                                               | H                                      | I     | J=E*G*H*I*10 <sup>-2</sup>       |
| RAW COAL                                                                      | 2,461.28                                                           | 1,597.00                                                          | 345.10                                                              | 1,467.70                                                            | 1,358.09                                                             | 7,229.17                                                          | 25.8                                     | 94.60                                                   | 20,908.00                              | 1     | 142,985,522.10                   |
| Clean Coal                                                                    | 16.22                                                              | 0.00                                                              | 0.00                                                                | 0.00                                                                | 0.00                                                                 | 16.22                                                             | 25.8                                     | 94.60                                                   | 26,344.00                              | 1     | 404,225.50                       |
| OTHER WASHED COAL                                                             | 35.56                                                              | 0.00                                                              | 0.00                                                                | 101.95                                                              | 10.20                                                                | 147.71                                                            | 25.8                                     | 94.60                                                   | 8,363.00                               | 1     | 1,168,592.60                     |
| COKE                                                                          | 3.23                                                               | 0.00                                                              | 0.00                                                                | 0.00                                                                | 0.00                                                                 | 3.23                                                              | 25.8                                     | 94.60                                                   | 28,435.00                              | 1     | 86,885.42                        |
| COKE OVEN GAS                                                                 | 0.00                                                               | 0.00                                                              | 0.00                                                                | 0.00                                                                | 0.00                                                                 | 0.00                                                              | 12.1                                     | 44.37                                                   | 16,726.00                              | 1     | 0.00                             |
| Other gas                                                                     | 0.00                                                               | 0.00                                                              | 0.00                                                                | 0.00                                                                | 0.00                                                                 | 0.00                                                              | 12.1                                     | 44.37                                                   | 5,227.00                               | 1     | 0.00                             |
| Crude oil                                                                     | 0.00                                                               | 0.00                                                              | 0.00                                                                | 0.00                                                                | 0.18                                                                 | 0.18                                                              | 20                                       | 73.33                                                   | 41,816.00                              | 1     | 5,519.71                         |
| Gasoline                                                                      | 0.02                                                               | 0.00                                                              | 0.00                                                                | 0.00                                                                | 0.01                                                                 | 0.03                                                              | 18.9                                     | 69.30                                                   | 43,070.00                              | 1     | 895.43                           |
| Diesel                                                                        | 2.24                                                               | 0.46                                                              | 0.06                                                                | 0.00                                                                | 0.50                                                                 | 3.26                                                              | 20.2                                     | 74.07                                                   | 42,652.00                              | 1     | 102,986.38                       |
| Fuel oil                                                                      | 0.01                                                               | 0.57                                                              | 0.00                                                                | 0.00                                                                | 0.25                                                                 | 0.83                                                              | 21.1                                     | 77.37                                                   | 41,816.00                              | 1     | 26,851.87                        |
| LPG                                                                           | 0.00                                                               | 0.00                                                              | 0.00                                                                | 0.00                                                                | 0.00                                                                 | 0.00                                                              | 17.2                                     | 63.07                                                   | 50,179.00                              | 1     | 0.00                             |
| Refinery gas                                                                  | 0.00                                                               | 0.00                                                              | 0.00                                                                | 0.00                                                                | 7.71                                                                 | 7.71                                                              | 18.2                                     | 66.73                                                   | 46,055.00                              | 1     | 236,959.42                       |
| Natural gas                                                                   | 1.46                                                               | 0.52                                                              | 1.33                                                                | 0.00                                                                | 7.81                                                                 | 11.12                                                             | 15.3                                     | 56.10                                                   | 38,931.00                              | 1     | 2,428,640.36                     |
| Other petroleum products*                                                     | 0.00                                                               | 0.00                                                              | 0.00                                                                | 0.00                                                                | 0.00                                                                 | 0.00                                                              | 20                                       | 73.33                                                   | 38,369.00                              | 1     | 0.00                             |
| Other energy                                                                  | 0.00                                                               | 0.00                                                              | 0.00                                                                | 0.00                                                                | 0.00                                                                 | 0.00                                                              | 25.8                                     | 94.60                                                   | 28,435.00                              | 1     | 0.00                             |
| Total emission of the Northwest China Power Grid (tCO <sub>2</sub> e)         | 147,447,078.78                                                     |                                                                   |                                                                     |                                                                     |                                                                      |                                                                   |                                          |                                                         |                                        |       |                                  |
| Fossil power generation of the Northwest China Power Grid (MWh)               | 125,496,682.30                                                     |                                                                   |                                                                     |                                                                     |                                                                      |                                                                   |                                          |                                                         |                                        |       |                                  |
| OM emission factor of the Northwest China Power Grid (tCO <sub>2</sub> e/MWh) | 1.174908                                                           |                                                                   |                                                                     |                                                                     |                                                                      |                                                                   |                                          |                                                         |                                        |       |                                  |

Data source: China Energy Statistical Yearbook 2005

**Table A4 Simple OM emission factor of NWPG**

| Year                          | Annual CO <sub>2</sub> Emission (tCO <sub>2</sub> ) | Annual Electricity Supply (MWh) |
|-------------------------------|-----------------------------------------------------|---------------------------------|
| 2003                          | 112,066,654                                         | 105,651,775                     |
| 2004                          | 138,716,096                                         | 122,605,242.60                  |
| 2005                          | 147,447,079                                         | 125,496,682                     |
| Sum                           | 398,229,829                                         | 353,753,700                     |
| EF_OM (tCO <sub>2</sub> /MWh) |                                                     | 1.1257                          |

**Table B Calculation of BM emission factor of NWPG****Table B1-1 Installed capacity of NWPG in 2003**

|          | Installed capacity (MW) |                  |               |        |           |
|----------|-------------------------|------------------|---------------|--------|-----------|
|          | Hydro power             | Fuel-fired power | Nuclear power | Other  | Total     |
| Shanxi   | 1,462.30                | 7,326.40         | 0.00          | 0.00   | 8,788.70  |
| Gansu    | 3,280.60                | 4,745.00         | 0.00          | 21.60  | 8,047.20  |
| Qinghai  | 3,341.10                | 905.80           | 0.00          | 0.00   | 4,246.90  |
| Ningxia  | 308.20                  | 3,102.00         | 0.00          | 10.00  | 3,420.20  |
| Xinjiang | 989.80                  | 4,413.50         | 0.00          | 91.30  | 5,494.60  |
| Sum      | 9,382.00                | 20,492.70        | 0.00          | 122.90 | 29,997.60 |
| Share    | 31.28%                  | 68.31%           | 0.00%         | 0.41%  | 100.00%   |

Data source: China Energy Statistical Yearbook 2004;

**Table B1-2 Installed capacity of NWPG in 2004**

|          | Installed capacity (MW) |                  |               |        |           |
|----------|-------------------------|------------------|---------------|--------|-----------|
|          | Hydro power             | Fuel-fired power | Nuclear power | Other  | Total     |
| Shanxi   | 1,876.50                | 7,640.40         | 0.00          | 0.00   | 9,516.90  |
| Gansu    | 3,566.10                | 4,975.60         | 0.00          | 138.20 | 8,679.90  |
| Qinghai  | 4,053.40                | 889.80           | 0.00          | 0.00   | 4,943.20  |
| Ningxia  | 366.20                  | 3,782.00         | 0.00          | 42.50  | 4,190.70  |
| Xinjiang | 973.00                  | 4,959.70         | 0.00          | 95.30  | 6,028.00  |
| Sum      | 10,835.20               | 22,247.50        | 0.00          | 276.00 | 33,358.70 |
| Share    | 32.48%                  | 66.69%           | 0.00%         | 0.83%  | 100.00%   |

Data source: China Energy Statistical Yearbook 2005

**Table B1-3 Installed capacity of NWPG in 2005**

|          | Installed capacity (MW) |                  |               |        |           |
|----------|-------------------------|------------------|---------------|--------|-----------|
|          | Hydro power             | Fuel-fired power | Nuclear power | Other  | Total     |
| Shanxi   | 1,578.00                | 9,132.10         | 0.00          | 46.00  | 10,756.10 |
| Gansu    | 4,036.20                | 5,715.00         | 0.00          | 109.10 | 9,860.30  |
| Qinghai  | 4,825.00                | 886.80           | 0.00          | 0.00   | 5,711.80  |
| Ningxia  | 428.50                  | 4,577.00         | 0.00          | 112.20 | 5,117.70  |
| Xinjiang | 1,352.10                | 5,051.70         | 0.00          | 132.20 | 6,536.00  |
| Sum      | 12,219.80               | 25,362.60        | 0.00          | 399.50 | 37,981.90 |
| Share    | 32.17%                  | 66.78%           | 0.00%         | 1.05%  | 100.00%   |

Data source: China Energy Statistical Yearbook 2006

**Table B2-1 Thermal power capacity of Northwest China Power Grid in 2005**

[illegible]

**Table B2-2 Emission factor of thermal power in NWPG**

|                 | Carbon Emission Factors (tC/Tj) <sup>1)</sup> | EF <sub>CO2</sub> (tCO2/Tj) | OXID <sub>i</sub> | Power Supply Efficiency of The Best Power Technology (%) | Emission Factor of Best Technology (tCO2e/MWh) | The mix of thermal power capacity of Northwest China Power Grid in 2005 | EF <sub>thermal power</sub> (tCO2e/MWh) |
|-----------------|-----------------------------------------------|-----------------------------|-------------------|----------------------------------------------------------|------------------------------------------------|-------------------------------------------------------------------------|-----------------------------------------|
|                 | A                                             | B=A*44/12                   | C                 | D                                                        | E=3.6/D/1000*B*C                               | H                                                                       | I                                       |
| Standard Coal   | 25.8                                          | 94.60                       | 1                 | 35.82%                                                   | 0.9508                                         | 98.10%                                                                  | 0.9409                                  |
| Fuel Oil/diesel | 21.1                                          | 77.37                       | 1                 | 47.67%                                                   | 0.5843                                         | 0.09%                                                                   |                                         |
| Natural Gas     | 15.3                                          | 56.10                       | 1                 | 47.67%                                                   | 0.4237                                         | 1.81%                                                                   |                                         |

**Table B3 Weighted Average Build Margin Emission Factor of NWPG**

|                                              | Installed Capacity 2001 (MW) | Installed Capacity 2002 (MW) | Installed Capacity 2004 (MW) | New Capacity Additions (MW) | Split of Electricity generation from New Capacity | Emission Factor of Thermal Power (tCO2e/MWh) | Weighted Average Build Margin Emission Factor $EF_{BM,y}$ (tCO2e/MWh) |
|----------------------------------------------|------------------------------|------------------------------|------------------------------|-----------------------------|---------------------------------------------------|----------------------------------------------|-----------------------------------------------------------------------|
|                                              | A1                           | A2                           | B                            | C                           | D                                                 | E                                            | F                                                                     |
| Source                                       | Table B1-1                   | Table B1-2                   | Table B1-3                   | C=B-A1                      | D=C/Total C1)                                     | Table B2                                     | F=E*D                                                                 |
| Hydro Power Plant                            | 9,382.00                     | 10,835.20                    | 12,219.80                    | 2,837.80                    | 35.54%                                            | 0                                            | 0                                                                     |
| Thermal Power Plant                          | 20,492.70                    | 22,247.50                    | 25,362.60                    | 4,869.90                    | 60.99%                                            | 0.9409                                       | 0.5739                                                                |
| Nuclear Power                                | 0.00                         | 0.00                         | 0.00                         | 0.00                        | 0.00%                                             | 0                                            | 0                                                                     |
| Others                                       | 122.90                       | 276.00                       | 399.50                       | 276.60                      | 3.46%                                             | 0                                            | 0                                                                     |
| Total                                        | 29,997.60                    | 33,358.70                    | 37,981.90                    | 7,984.30                    | 100.00%                                           |                                              | 0.5739                                                                |
| Percentage of the Installed Capacity of 2004 | 78.98%                       | 87.83%                       | —                            | 21.02%                      |                                                   |                                              |                                                                       |



**Table C Baseline emission factor of the proposed project**

| EF_OM<br>(tCO <sub>2</sub> e/MWh) | EF_BM<br>(tCO <sub>2</sub> e/MWh) | EF<br>(tCO <sub>2</sub> e/MWh) |
|-----------------------------------|-----------------------------------|--------------------------------|
| 1.1257                            | 0.5739                            | 0.8498                         |



**Annex 4**

**MONITORING INFORMATION**

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Please refer to Section B.7.2. of the PDD.

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