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

## CONTENTS



## Annexes

## SECTION A. General description of project activity

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

Yunnan Dayingjiang Meng'e Hydro Power Station
Ver. 6.0
Date: 07/04/2008

Revision History of the PDD

| Version | Date | Comments |
|---|---|---|
| Version 1.0 | 12 September 2006 | Draft PDD |
| Version 2.0 | 18 October 2006 | Complete version of the PDD, prepared for the host country approval process |
| Version 3.0 | 19 December 2006 | Revised draft PDD; prepared for validation |
| Version 4.0 | 21 June 2007 | Revised draft PDD, prepared on the basis of corrective action requests in the Validation protocol of TUV SUD. |
| Version 5.0 | 30 September 2007 | Revised draft PDD, prepared on the basis of the first response of corrective action requests in the Validation protocol of TUV SUD. |
| Version 6.0 | 7 April 2008 | Revised draft PDD, prepared on the basis of the second response of corrective action requests in the Validation protocol of TUV SUD. |

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

**Summary:**

The proposed project activity is located in the lower reaches of the trunk stream of the Daying River in Yingjiang County, Dehong Dai-Jingpo Autonomous Prefecture, Yunnan Province, China. The project is a run-of-river diversion type hydro power station with a small reservoir. The total installed capacity of the hydropower station is 99MW and the surface area at full reservoir level is 0.58km$^2$ thus the power density is 171W/m$^2$. On average, the project activity is expected to operate 5,373 hours thus an annual average power generation is 531,980MWh, considering the absorption ability of local grid, the power produced loss is 71%[1] and annual average electricity supplied to the grid is 381,240MWh. The power generated by the station will be connected to the Yingjiang transformer substation, then to the Yunnan Grid and, finally, to the Southern Grid.

**Contribution to sustainable development:**

The project activity contributes significantly to the region's sustainable development in the following ways:

- In recent years, China has witnessed a huge increase in power consumption. Both public and private parties are struggling to meet the demand for electricity.
The proposed hydropower project will contribute in a sustainable manner to bridging the gap between supply and demand of power on a regional and national level.
- In China, more than 80% of total electricity production is derived from coal based power plants. Being

1 Since absorption ability of local grid is relatively lower, there is large amount of abundant electricity that could not be utilized efficiently. The actual average power loss in local grid is only 66% (come from FSR) which lower than 71% of the power produced loss. Therefore, considering the actual situation, the power produced loss of 71% is conservative.

so heavily dependant on coal for its energy requirements, this project carries environmental benefits for the country's air, soil and water sources. The project activity will displace the generation of fossil fuel power plants, reducing $CO_2$, $SO_x$ and $NO_x$ emissions significantly, thus mitigating the air pollution and its adverse impacts on human health.

The project activity promotes the growth of sustainable and renewable capacity in China and makes it less dependent on exhaustible and polluting fossil fuels.

- The project will definitely contribute to the province's economic development by improving the local energy generation infrastructure and providing employment opportunities during both the construction and the operation of the power plant.

The proposed hydropower project is grid-connected electricity generation from renewable sources, which will be supplied to the Southern Grid and will replace electricity generated by thermal power plants, which are predominant in the Southern Grid. This will reduce anthropogenic emissions of greenhouse gases.

## A.3. Project participants:

| Name of Party involved (*) ((host) indicates a host Party) | Private and/or public entity(ies) project participants (*) (as applicable) | Kindly indicate if the Party involved wishes to be considered as project participant（Yes/No） |
|---|---|---|
| People's Republic of China (host) | Dehong Furong Dayingjiang Hydroelectric Power Development Co., Ltd. (as the project owner) | No |
| The Netherlands | ENEL Trade SpA (as the CER buyer) | No |

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

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

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

People's Republic of China

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

Yunnan Province

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

Meng'e Village, Mangxian Hamlet, Nongzhang Town, Yingjiang County, Dehong Dai-Jingpo Autonomous Prefecture

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

The proposed project activity is located in the lower reaches of the trunk stream of the Daying River, in Meng'e Village, Mangxian Hamlet, Nongzhang Town, Yingjiang County, Dehong Dai-Jingpo

Autonomous Prefecture, Yunnan Province, China. It is 42km from the Capital of Yingjiang County and 786km from the City of Kunming. It is located at a longitude of 97°43′00″E, and latitude of 24°28′13.5″N. To visualize the exact location of the project please refer to the map presented in Fig A.1:

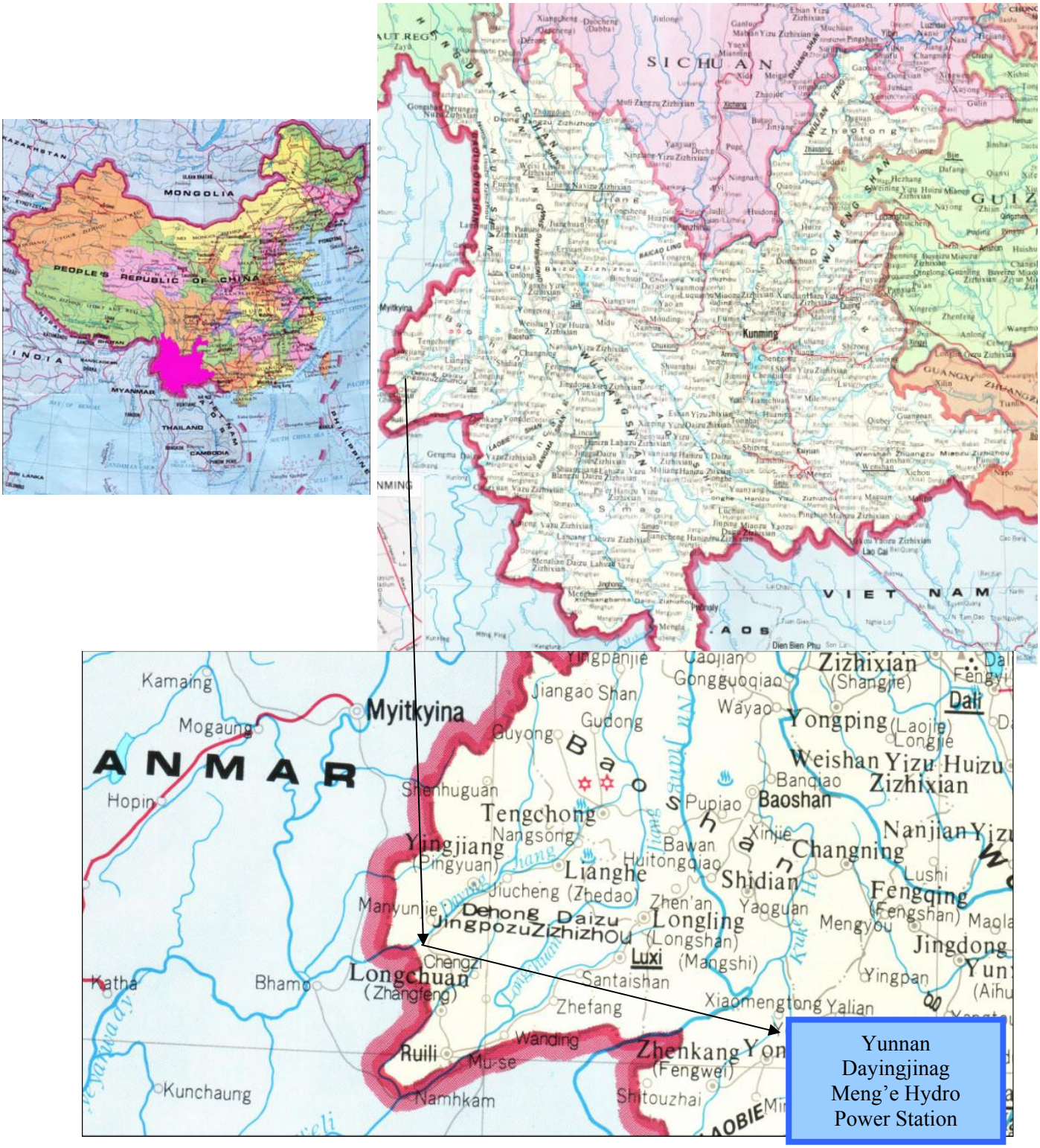



Fig A.1 the Location of Yunnan Dayingjiang Meng'e Hydro Power Station

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

The project activity falls under the category described under CDM as "Sectoral Scope Number 1: Energy Industries – Renewable Sources".

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

The project is a run-of-river diversion type hydro power station. The construction of the project power station mainly consists of head hinge, diversion system and plant section. The head hinge consists of gate dam, flood discharge hole and water gap. The diversion system consists of access tunnel, pressure steel tube. The plant section consists of powerhouse, transformer substation, dam for prevent flood and traffic. The diversion tunnel is located in left bank of the Daying River. The turbines and generator are produced by Fujian Nanping Nandian Equipment Manufacture Co., Ltd. and the specific technical data is listed is Table A.1.

Table A.1 Technical data of the turbine / generator units

| **Turbine Unit** | **Amount** | **Type** | **Rated flow** | **Designed water head** | **Rated output** |
|---|---|---|---|---|---|
| | 3 | HLN276-LJ-305 | 80.2$m^3$/s | 46.5m | 33,840kW |
| **Generator Unit** | **Amount** | **Type** | **Rated voltage** | **Rated factor** | **Rated Capacity** |
| | 3 | SF33—32/6200 | 10.5kV | 0.85 | 33,000kW |

The project employs a 220kV circuit to connect it to the Yingjiang transformer substation. It will then be connected to the Yunnan Grid and, finally, to the Southern Grid.

Experienced experts monitor and coordinate project operations. The Fujian Nanping Nandian Equipment Manufacture Co., Ltd. will train the project workers on correct use and maintenance of the turbines. As the hydropower technology is common practice in China, there is no need for an extensive initial training on safe and maintenance operation.

With relevance to CDM monitoring, a monitoring officer will receive training on monitoring methodologies, procedures and archiving by Beijing Tianqing Power International CDM Consulting Co. Ltd. (hereinafter referred to as Tianqing). Then, the monitoring officer will train the project staff in charge for CDM monitoring.

Table A.2 The time schedule

| **Date** | **Main event** | **Source** |
|---|---|---|
| 5-2004 | Feasibility Study Report of the proposed project has been finished. | Feasibility Study Report of the proposed project |
| 6-2004 | The Environmental Impact Assessment of the proposed project has been finished. | Environmental Impact Assessment of the proposed project |
| 30-6-2004 | The Environmental Impact Assessment of the proposed project has been approved by Yunnan Environment Protection Bureau. | Approval of Environmental Impact Assessment Report |
| 7-7-2004 | The project owner acquired a letter of Power Enterprise Association of Dehong Prefecture who recommended the project owner to apply CDM. | The notice from the Power Enterprise Association of |

| | | |
|---|---|---|
| | | Dehong Prefecture |
| 15-7-2004 | The project owner decided to apply to CDM in directorate meeting. | Directorate decision for applying CDM |
| 20-7-2004 | The Feasibility Study Report has been approved by the Development and Reform Commission of Yunnan Province. | Approval of Feasibility Study Report |
| 18-8-2004 | Temporary grid connection agreement was signed. | Temporary grid connection agreement |
| 8-9-2004 | The project owner signed the cooperation agreement of Clean Development Mechanism with the Power Enterprises Association of Dehong Prefecture. | The cooperation agreement of Clean Development Mechanism between the project owner and the Power Enterprises Association of Dehong Prefecture |
| 6-10-2004 | The project signed the purchase agreement of turbine and generator. | The purchase agreement of turbine and generator. |
| 3-4-2005 | The main construction started construction. | Permission for Starting Construction from the Fujian Province Sanming City Engineering Supervise and Consulting, Co., Ltd. |
| 7-4-2005 | The Power Enterprises Association of Dehong Prefecture consigned the Beijing Tianqing Power International CDM Consulting, Co., Ltd to complete application work of the proposed project. | Letter of Commitment for CDM Application |
| 12-10-2005 | The Measures on the Administration of the Clean Development Mechanism Project was issued jointly by the National Development and Reform Commission, Ministry of Science and Technology, and Ministry of Foreign Affairs. | The Regulation from China DNA. |
| 18-2-2006 | The diversion tunnel was finished. | |
| 30-3-2006 | The project owner applied CDM project for the National Development and Reform Commission. | The application Form to apply CDM project for NDRC. |
| 27-7-2006 | The powerhouse was finished. | |
| 8-8-2006 | The project owner signed ERPA with ENEL Trade SpA. | ERPA |
| 9-9-2006 | The dam was finished. | |
| | The PDD dated 19/12/2006 was delivered to DOE and started of the validation process from April 11 to May 10, 2007. | PDD for GSP. |
| 16-1-2007 | The project began to commissioning. | The Approval of Operation and Inspection for generator. |
| 17-1-2007 | The project owner acquired LOA of China DNA. | LOA of China DNA |

| | | |
|---|---|---|
| 10-2007 | The project was completed. | |

On May 2004, the feasibility report study for this proposed project has been finished, but the IRR for this project is low. On 7th July, the project owner has been informed by Power Enterprises Association of Dehong Prefecture that the <Provisional Regulation on Clean Development Mechanism> has been promulgated, the Power Enterprises Association of Dehong Prefecture stated that they could help the project owner to apply CDM project. Thus, the project owner has comprehended that the CDM support could improve the financial indexes for this project. After serious consideration, the project owner held the directorate meeting and decided to apply CDM project on 15th July. Temporary grid connection agreement was signed on 18th August, 2004. On 8th September, 2004, the project owner and Power Enterprise Association of Dehong Prefecture signed the CDM development cooperation agreement. Considering that the CDM support could improve the economic indexes and the corresponding cooperation agreement has been signed, the project owner has begun the preparing work for construction, and signed the turbine and generators cooperation agreement on 6th October, 2004. On 3rd April, the project has been started for construction. Meanwhile, the Power Enterprise Association of Dehong Prefecture was preparing the applying work for CDM application positively. Since not experienced and professional in applying work, Power Enterprise Association of Dehong Prefecture consigned Beijing Tianqing Power International CDM Consulting Co., Ltd. to carry out the applying work on 7th April 2004, after reaching agreement with project owners. Evaluating that the policy issued by the government is only the provisional regulation and there existing some risks, Tianqing has not start the applying work. On 12th October, 2005, National Development and Reform Commission promulgated the <Clean Development Mechanism Management Regulation> formally. Then, on 30th March 2006, the project owner presented application letter for National Development and Reform Commission as CDM project after drafting PDD and preparing applying material documents for nearly 5 months. On 8th August, 2006, the project owner has signed the Emission Reduction Purchase Agreement with buyers. On 19th December, 2006, after finished modifying PDD, Tianqing presented PDD to DOE for validation work. Currently, the project has been operation.

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

The project activity employs the renewable crediting period (3*7 years) and the estimated emission reductions for the first crediting period (October 15, 2008 to October 14,2015) are presented in Table A.2. Estimated Emission Reductions throughout the first crediting period are 2,250,633t$CO_2$e.

Table A.3 the Estimation of the Emission Reductions in the Crediting Period

| Years | Annual estimation of emission reductions in tones of $CO_2$e |
|---|---|
| Year 1: 15/10/2008-14/10/2009 | 321,519 |
| Year 2: 15/10/2009-14/10/2010 | 321,519 |
| Year 3: 15/10/2010-14/10/2011 | 321,519 |
| Year 4: 15/10/2011-14/10/2012 | 321,519 |
| Year 5: 15/10/2012-14/10/2013 | 321,519 |
| Year 6: 15/10/2013-14/10/2014 | 321,519 |
| Year 7: 15/10/2014-14/10/2015 | 321,519 |
| Total estimated reductions（tonnes of $CO_2$e） | 2,250,633 |
| Total number of crediting years | 7 |
| Annual average over the crediting period of estimated reductions(tonnes of $CO_2$e) | 321,519 |

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

There is no public funding from Annex I countries available to the project.

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

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

**Baseline methodology:**

Approved consolidated baseline methodology ACM0002 (Version 6): "Consolidated baseline methodology for grid-connected electricity generation from renewable sources".

The methodology draws upon Version 03 of the "Tool for the demonstration and assessment of additionality".

**Monitoring methodology:**

Approved consolidated monitoring methodology ACM0002 (Version 6): "Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources".

Reference: UNFCCC website: http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

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

The baseline methodology ACM0002 is applicable to this specific project, because the project meets all the applicability criteria stated in the methodology:

1. The proposed Project activity involves an electricity capacity addition from a run-of-river diversion type hydro power station with a small reservoir having power density greater than 171W/$m^2$ *(the installed capacity of the hydropower station is 99MW; the surface of the reservoir is 0.58Km$^2$; hence the reservoir has power density of 171W/m$^2$*);
2. The project activity does not involve an on-site switching from fossil fuels to a renewable source;
3. The geographic and system boundaries for the relevant electricity grid, the Southern Grid, can be clearly identified and information on the characteristics of the grid is available.

The latest version of ACM0002 (version 6) has been applied.

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

According to the definition of project boundary by ACM0002, the project boundary includes the project site (the physical site of the project plant as well as the reservoir area) and the electricity system that the project is connected to.
In this specific case, the station is connected to the Yunnan Grid and, finally, to the Southern Grid. The Southern grid is a larger regional grid, which consists of four sub-grids: Guangdong, Guangxi, Yunnan and Guizhou. According to the guidance given above, and considering the substantial inter grid power exchange throughout the Southern Grid, it is justifiable to identify the Southern Grid as the correct project boundary for this specific project.

Table B.1 Description of How the Sources and Gases Included in the Project Boundary

| | Source | Gas | Included? | Justification / Explanation |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| **Baseline** | Thermal power plants in the Southern Grid | $CO_2$ | Included | According to ACM0002methodology, it is only necessary account for $CO_2$ emissions from electricity generation in fossil fuel fired power plants that is displaced due to the project activity are considered. |
| | | $CH_4$ | Excluded | According to ACM0002methodology, it is only necessary account for $CO_2$ emissions from electricity generation in fossil fuel fired power plants that is displaced due to the project activity are considered. |
| | | $N_2O$ | Excluded | According to ACM0002methodology, it is only necessary account for $CO_2$ emissions from electricity generation in fossil fuel fired power plants that is displaced due to the project activity are considered. |
| **Project Activity** | Yunnan Dayingjiang Meng'e hydropower station | $CO_2$ | Excluded | The project is grid-connected electricity generation from renewable sources, According to methodology ACM0002, without $CO_2$ emission. |
| | | $CH_4$ | Excluded | The power density of the project is 171W/$m^2$ which is greater than 10W/$m^2$, so according to methodology ACM0002, there is no need to take into account $CH_4$ emissions. |
| | | $N_2O$ | Excluded | The project is grid-connected electricity generation from renewable sources, According to methodology ACM0002, without $N_2O$ emission. |

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

There are only a few scenarios that are prima facie realistic and credible in the context of the Southern Grid:

1. The proposed hydro power activity, without being registered as a CDM project activity;
2. Thermal power plant with equivalent annual power generation;
3. Other renewable energy power plant with equivalent annual power generation;
4. The equivalent electricity is supplied by the Southern Grid.

**First scenario**

The first scenario is in compliance with the Chinese relevant laws. According to the section B.5, The IRR of the project IRR post-tax is 6.90% without CDM revenue which is lower than the benchmark rate of 8%[2] for project IRR post-tax. So the project faces obvious financial barriers without CDM revenue. The first scenario is therefore not feasible nor is it a baseline scenario.

**Second scenario**

There is a widely discrepancy between thermal power and hydropower in annual operating hours and instability of water resource quality, if taking the capacity that can generate the same annual electricity generation the alternative scenario for the proposed project should be a grid-connected fossil fuel fired

2 the Economical Assessment Temporary Regulation on Electrical Technology Improvement Project, published by China Electric Power Press

power plant with installed capacity less than 99MW. However, according to Chinese regulations, thermal fired power plants of less than 135MW are prohibited for construction in the areas covered by the large grids such as provincial grids[3]. Therefore, the second scenario doesn't accord with Chinese relevant laws and regulations, it isn't a feasible scenario.

**Third scenario**

There are no enough wind resources, solar sources, wave and tidal sources or geothermal sources in this area. The technology of biomass sources power is not mature and the cost is very high. Furthermore, no biomass sources power plant has previously been built in this area. The economic return of other renewable power plants with similar quantity of capacity should be of little commercial attractiveness. The third scenario is therefore not feasible nor the baseline scenario.

**Fourth scenario**

The fourth scenario is in compliance with Chinese relevant laws and regulations, and without financial barriers.

**Conclusion:**

From above analysis we can conclude that the fourth scenario is the only plausible alternative to the project activity. Therefore, the baseline scenario of the project is:

Electricity delivered to the grid by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources without the proposed project activity.

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

The additionality of the project activity is demonstrated using the steps described in *the Tool for the Demonstration and Assessment of Additionality (version 3)* as developed by the EB. See UNFCC website:

http://cdm.unfccc.int/methodologies/PAmethodologies/AdditionalityTools/Additionality_tool.pdf

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

**Sub-Step1a. Define alternatives to the project activity**

This methodological step requires a number of sub-steps, the first of which is the identification of realistic and credible alternatives to the project activity. There are only a few alternatives that are available and credible in the Southern Grid:

1. The proposed hydro power activity, without being registered as a CDM project activity;
2. Thermal power plant with equivalent annual power generation;
3. Other renewable energy power plant with equivalent annual power generation;
4. The equivalent annual electricity is supplied by the Southern Grid.

3 Notice on Strictly Prohibiting the Installation of Fuel fired Generators with the Capacity of 135MW or below issued by the General Office of the State Council, Decree No. [2002]6.

The third alternative is not feasible since there is not enough other renewable energy, such as wind sources, biomass, solar sources, wave and tidal sources or geothermal sources, to provide equivalent power generation in local area.

**Sub-Step1b. Enforcement of applicable Laws and Regulations**

As discussed in section B.4, the first, third and fourth alternatives are in compliance with Chinese relevant laws and regulations. However, the second alternative is not in compliance with Chinese relevant laws and regulations, so it is not a feasible alternative.

From the above analysis, the proposed activity is not the only scheme which is in accordance with Chinese relevant laws and regulations, so it presents the necessary conditions for additionality.

**Step 2 Investment Analysis**

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

The additionality tool provides three investment analysis options which are: simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III). The project activity will produce economic benefits (from electricity sales) other than CERs income and the fourth scenario is not a specific project. So, the project activity uses the benchmark analysis (Option III).

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

The installed capacity of proposed project is 99MW. Based on the benchmark revenue rate in *the Economical Assessment Temporary Regulation on Electrical Technology Improvement Project*, the IRR of electric power project total investment should not lower than the threshold of 8% for project IRR post-tax.

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

The basic parameters for calculating the key financial indexes are provided in Table B.2:

Table B.2 the Basic Financial Parameter of the Project

| Parameters | Value | Source |
|---|---|---|
| Installed Capacity (MW) | 99 | Feasibility Study Report |
| Annual Power Supplied to Grid (MWh) | 381,240 | Feasibility Study Report |
| Static Total Investment (yuan RMB) | 361,945,900 | Feasibility Study Report |
| Grid Price (yuan RMB /kWh) (without VAT) | 0. 125 | Feasibility Study Report |
| Operation Period (years) | 25 | Feasibility Study Report |
| VAT | 17% | Feasibility Study Report |
| Income Tax Rate | 33% | Feasibility Study Report |
| Annual Operation Cost | 7,300,000 | Feasibility Study Report |

| | | |
|---|---|---|
| (yuan RMB) | | |

The IRR of this project is only 6.90% without CDM revenue. The IRR of total investment is lower than the threshold of 8%. So the project faces obvious financial barriers without CDM revenue.

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

We choose the following parameters to conduct a sensitivity analysis in order to confirm whether the conclusion of low economic attraction still exists when the key hypothesis is reasonably changed:

1. Static total investment
2. Annual operational cost
3. Grid price
4. Annual power output

Variations of ±10% have been considered for the critical assumptions. Table B.3 summarizes the results of the sensitivity analysis, while Figure B.1 provides a graphic depiction.

Table B.3 Impact of Variations in Critical Assumptions on IRR

| | -10% | -5% | 0% | 5% | 10% |
|---|---|---|---|---|---|
| Grid price | 6.07% | 6.49% | 6.90% | 7.30% | 7.76% |
| Static total investment | 7.76% | 7.31% | 6.90% | 6.52% | 6.18% |
| Annual operational cost | 7.03% | 6.97% | 6.90% | 6.84% | 6.77% |
| Annual power output | 6.04% | 6.48% | 6.90% | 7.32% | 7.72% |

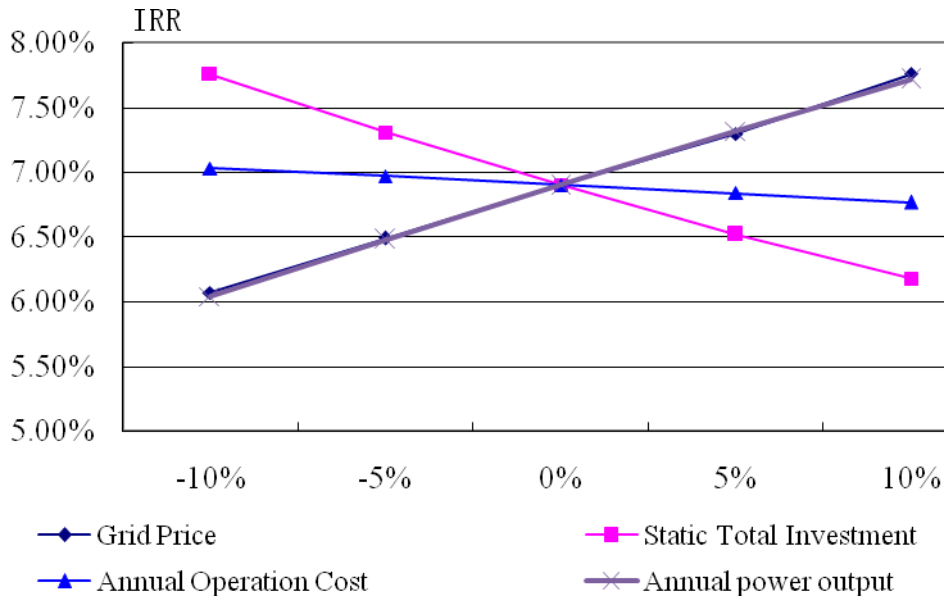



Fig B.1 the IRR Sensitivity Analysis when Static Total Investment, Annual Operation Cost, Grid price or Annual power output changed

Fig.B.1 shows that none of variations can raise the IRR of the proposed project higher than the threshold of 8% and the sensitivity of the annual operational cost is very low.

Therefore, the results of the sensitivity analysis confirm that the project faces significant economic and financial barriers without CDM revenue, so the first alternative lacks economic attraction.

On the other hand, the whole investment IRR will increase greatly when the project receives the CERs revenues. If we take the CERs price as €8/t$CO_2$e into account, the IRR of the project reaches 10.69%, thus the repayment of capital and interest will be raised and the financial situation will be improved. It is obvious that the benefits come from the CDM helps releasing the financing pressure that would otherwise obstruct the project activity.

**Step 3. Barrier Analysis**

The Investment analysis can fully demonstrate and explain the additionality of the proposed project, so the Barriers analysis is not needed.

**Step 4 Common Practice Analysis**

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

According to the tool for the demonstration and assessment of additionally, projects are considered "similar" in case they are located in the "same county/region", are of "similar scale", and "take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc". Yunnan Province with an area of 39.4 ten thousand $km^2$, is comparatively and considerably larger than many countries. According to the requirements of common practice, the projects with similar conditions, such as investment conditions and natural conditions (including geographical conditions, climate conditions, development conditions and so on), are necessary to be analyzed. Projects located in different provinces of Southern Grid have not the similar investment conditions [4] and natural conditions[5678]. In addition, Guangxi Zhuang Autonomous Region is an autonomous region, which has more different conditions [9] from normal provinces like Yunnan, Guangdong and Guizhou provinces, which located in the Southern Grid. Therefore, the PDD selects geographical area, i.e. Yunnan Province, as a common practice region.
We selected the projects with an installed capacity of between 50MW and 300MW as "similar scale" because Chinese government classifies hydropower stations between 50MW and 300MW as medium scale projects[10]. There are 10 stations in our range in *Yearbook of China Water Resources 2006*[11] and there are 6 projects started operated before 2002 [12], such as Chaishitan Hydropower Project, Yunguixiang Hydropower Project, Lazhuang Hydropower Project, Xucun Hydropower Project, Husonghe Hydropower Station and Luosiwan Hydropower Station, they were developed by the state under a power system environment that is substantially different from the current power system environment, because, the first Power System Reform Blue Print has been published by State Council in February 2002, and the reform content mainly include: Power plants separating from the power grid, reforming enterprises for power plants and power grids; bidding to power grid, building a competitive and open power market initially; changing the current situation of all power purchased by the state owned grid enterprises.[13] So they are not

4 Yearbook of China Water Resources 2006
5 http://www.checc.cn/zgsd/zgsd_zy.jsp
6http://www.checc.cn/shuigis/province/provincedetail.jsp?provinceID=17
7http://www.checc.cn/shuigis/province/provincedetail.jsp?provinceID=22
8http://www.checc.cn/shuigis/province/provincedetail.jsp?provinceID=21
9http://www.gov.cn/test/2005-07/29/content_18338.htm
10 Almanac of China's Water Power (2005), page 141.
11 Yearbook of China Water Resources 2006 page 577.
12Yearbook of China Water Resources 2002 page 505
13Power System Reform Blue Print, published by State Council, February 10, 2002.

similar with the proposed project and are excluded. Therefore, we analyzed the left 4 projects, which are listed in table B.4.

Table B. 4 Hydropower plants similar to the proposed activity

| Name of Hydropower Plant | Installed Capacity (MW) | Location | Operation Date | Investor |
|---|---|---|---|---|
| Gaoqiao Hydro Power Station | 90 | Shaotong City, Yunnan Province | August 2004[14] | Yunnan Dianneng (Group) Shaotong Gaoqiao Power Co., Ltd. |
| Malutang Hydro Power Station 1st Phase Project | 100 | Masupo County, Wenshan Prefecture | January 2005[15] | Wenshan Malutang Power Co., Ltd. |
| Ajiutian Hydro Power Station | 105 | Longling County, Baoshan City | March 2005[16] | Supahe Hydro Power Development Company |
| Zhangwo Hydro Power Station | 54 | Shuifu County, Yunnan Province | 2006[17] | Sichuan Yibin Yili Group |

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

• The primary shareholder of the Yunnan Dianneng (Group) Shaotong Gaoqiao Power Co., is Yunnan Dianneng (Group) Holding Co., Ltd[18]. Yunnan Dianneng (Group) Holding Co., Ltd is the investment holding group founded in 1997. At the end of 2002, the business revenue of the group company and the affiliates companies has reached 3.1 billion Yuan RMB, the total asset is 9.54 billion Yuan RMB[19]. In addition, the grid price of Gaoqiao station is 0.23yuan/kWh[20] (with VAT) much higher than the project (0.125Yuan RMB/kWh is without VAT and 0.151 Yuan RMB/kWh is the price with VAT).

• The Ajiutian Hydro Power Station belongs to the "*West-East Electricity Transmission Project*" (the *West-East Electricity Transmission Project*, which is a government sponsored project offering favourable conditions to electricity suppliers participating in the project with the aim to secure transmission of power from West China to East China.) and the key hydropower project in Yunnan Province[21]. The project was developed and operated by the Supahe Hydro Power Development Company whose holding company is the Yunnan Province Investment (Group) Co., Ltd., which is founded in 5th September, 1997. This group is the large scale state-owned sole proprietorship which is under the directly leadership of Yunnan Province People's Government and the State-owned Asset Supervision and Administration Commission of Yunnan Province. The registered capital of this group is 8 billion Yuan RMB.[22] In addition, Ajiutian Hydro Power Station with annual operation hours of 5,670h higher than the project (5,373h). And the grid

14http://www.ydxw.com/showinfo.asp?id=11522
15http://www.wcb.yn.gov.cn/end/index.jsp?Info_ID=668
16http://www.rf-bio.com/Article/news2/200609/Article_20060911102722_261.html
17http://xh.chinaxh.com.cn/show.aspx?cid=63&id=12919
18http://www.ydxw.com/showinfo.asp?id=11522
19http://www.ciedr.com/resource/show.php?id=358&sort=33
20http://news.sina.com.cn/o/2004-12-25/11134625395s.shtml
21Almance of China's Water Power 2003 p251
22http://www.cnyig.com/Wpublisher/displaypages/ContentDisplay_2.aspx?contentid=150

price of Ajiutian station is 0.205yuan/kWh[23] [24] (with VAT) much higher than the project (0.125Yuan RMB/kWh is without VAT and 0.151 Yuan RMB/kWh is the price with VAT).

• The Malutang Hydropower Station 1st Phase Project is located in the down stream of the Panlong River. The fall in this river trunk is comparatively concentrated and the topography and geological condition for reservoir construction and water storage is suitable, which is the quite good water resources point in Wenshan County even in South area of Yunnan Province[25], therefore the annual operation hours is 7,171h[26], which is much higher than the project (5,373h) . And the grid price of Malutang station is 0.27yuan/kWh[27] (with VAT) much higher than the project (0.125Yuan RMB/kWh is without VAT and 0.151 Yuan RMB/kWh is the price with VAT).

• The IRR of the project is 6.90%, which is lower than Zhangwo Hydro Power Station, i.e.17.5%[28].

Therefore, these projects don't have to face the barriers faced by the proposed project, and they have more commercial attraction.

In general, the project faces several barriers which would prevent the implementation of the proposed project activity without CDM. CDM helps to overcome these barriers. If the project is not implemented, the power will be supplied by the Southern China Grid. Hence, the proposed project activity isn't baseline scenario, which is additional.

## B.6. Emission reductions:

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

The electricity generated by the project is connected to the Yunnan Grid and then to the Southern Grid. The Southern Grid includes the Yunnan, Guangdong, Guangxi and Guizhou Grids. So this project selects the baseline emission factor for the Southern Grid.

**Baseline**

According to methodology ACM0002, baseline emissions are equal to the power delivered to the grid, multiplied by the baseline emission factor $EF_y$. The baseline emission factor is defined as the Combined Margin (CM): the equally weighted average of the Operating Margin (OM) emission factor ( $EF_{OM,y}$ ) and the Build Margin (BM) emission factor ( $EF_{BM,y}$ ).

The data used to calculate the grid emissions factor comes from reliable and publicly accessible statistics e.g. China Energy Statistic Yearbook and China Electric Power Yearbook, as well as Chinese DNA.
For more information on the published OM and BM emission factors, please refer to:
http://cdm.ccchina.gov.cn:80/english/NewsInfo.asp?NewsId=1891

23http://www.google.cn/search?hl=zh-CN&q=%E9%98%BF%E9%B8%A0%E7%94%B0%E7%94%B5%E7%AB%99+%E7%94%B5%E4%BB%B7&btnG=Google+%E6%90%9C%E7%B4%A2&meta=&aq=f
24http://www.ynpower.com.cn/information/509.svc
25Almance of China's Water Power 2003 p254
26http://www.wsmlt.com.cn/DisplayNews.asp?mid=&newid=4
27http://www.jrj.com.cn/NewsRead/Detail.asp?NewsID=995687
28http://www.ynnw.gov.cn/Modules/Document/InfoShow.aspx?kid=6967

**STEP 1 Calculate the Operating Margin emission factor ( $EF_{OM,y}$ )**

ACM0002 (Version 06) outlines four options for the calculation of the Operating Margin emission factor(s) ( $EF_{OM,y}$ ):

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

As per ACM0002, "Dispatch Data Analysis" should be the first methodological choice. However, the method is not selected herein, because dispatch data, let alone detailed dispatch data, are not available to the public or to the project participants. For the same reason, the simple adjusted OM methodology cannot be used.

The Simple OM method has been chosen instead. This is possible because low cost/ must run resources account for less than 50% of the power generation in the grid in most recent years. From 2001 to 2005, according to gross annual power generation statistics for the Southern Grid, the ratio of power generated by hydropower and other low cost/compulsory resources was: 36.86% in 2001, 35.99% in 2002, 33.53% in 2003, 29.95% in 2004, 30.42% in 2005 respectively, significantly lower than 50%.

The simple Operating Margin (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, not including low-operating cost and must-run power plants. A three-year average, based on the most recent fuel consumption statistics available at the time of PDD submission, is used ("ex-ante" approach).

The calculation equation of the Simple OM is as follows:

$$EF_{OM,simple,y} = \frac{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{j} GEN_{j,y}} \qquad \text{Equation (B.1)}$$

Where:
$F_{i,j,y}$ is the amount of fuel $i$ (in a mass or volume unit) consumed by relevant power sources j in years y;
$j$ refers to the power sources delivering electricity to the grid, not including low-operating cost and mustrun power plants, and including imports to the grid,
$COEF_{i,j}$ is the $CO_2$ emission coefficient of fuel $i$ ($tCO_2e$/mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources j and the percent oxidation of the fuel(coal, oil and gas) in year(s) y; and
$GEN_{j,y}$ is the electricity (MWh) delivered to the grid by relevant power sources *j*.

The $CO_2$ emission coefficient $COEF_i$ is obtained as

$$COEF_i = NCV_i \times EF_{CO_2,i} \times OXID_i \qquad \text{Equation (B.2)}$$

Where:
$NCV_i$ is the net calorific value (energy content) per mass or volume unit of a fuel $i$, using country specific values;

$OXID_i$ is the oxidation factor of the fuel *i*, according to default values from 2006 IPCC Guidelines for default values;
$EF_{CO_2,i}$ is the $CO_2$ emission factor per unit of energy of the fuel $i$, as per 2006 IPCC Guidelines for default values.

In addition, there is net imported power to the Southern Grid from the Central China Grid. Since it is not possible to identify the specific power plants exporting electricity from the Central China Grid to the Southern Grid, the average emission factor of the Central China Grid will be taken into account.

The Operating Margin emission factors for 2003, 2004 and 2005 are calculated separately and then the three-year average is calculated as a full-generation-weighted average of the emission factors. For details please refer to Annex 3.

The result of the Operating Margin emission factor ( $EF_{OM}$ ) for the Southern Grid is **1.0119tCO$_2$e/MWh**. The operating margin emission factor of the baseline is calculated ex-ante and will not be renewed in the first crediting period of the project activity. $EF_{OM,y}$ calculations adopt the most recent data announced by China's DNA in the *Notification on Determining the Regional Grid Emission Factors of China*, renewed on August 9, 2007

(available at http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1358.xls)

**STEP 2 Calculate the Build Margin emission factor ( $EF_{BM,y}$ )**

According to ACM0002, the Build Margin Emission Factor is calculated as the generation weighted average emission factor (measured in tCO$_2$e/MWh) of a sample of *m* power plants. The calculation equation is as follows:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \times COEF_{i,m}}{\sum_{m} GEN_{m,y}} \qquad \text{Equation (B.3)}$$

Where
$F_{i,m,y}$ is the amount of fuel $i$ (in a mass or volume unit) consumed by relevant power plants m in years y,
$COEF_{i,m}$ is the $CO_2$ emission coefficient of fuel $i$ (tCO$_2$e/mass or volume unit of the fuel), taking into account the carbon content of the fuels (coal, oil and gas) used by relevant power plants m and the percent oxidation of the fuel in year(s) y; and
$GEN_{m,y}$ is the electricity (MWh) delivered to the grid by power plants m.

The methodology provides the following two options:

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

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

Project participants have chosen Option 1.

The sample group *m* consists of either the five power plants that have been built most recently or 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. From these two options, project participants should use the sample group that comprises the larger annual generation.

However, in China it is very difficult to obtain the data of the five existing power plants built most recently or the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that were built most recently. Taking notice of this situation, EB accepts[29] the following deviation in methodology application:

1) Capacity addition from one year to another is used as basis for determining the build margin, i.e. the capacity addition over 1 - 3 years, whichever results in a capacity addition that is closest to 20% of total installed capacity.
2) Proportional weights that correlate to the distribution of installed capacity in place during the selected period above are applied, using plant efficiencies and emission factors of commercially available best practice technology in terms of efficiency. It is suggested to use the efficiency levels of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy.

Since there is no way to separate the different generation technology capacities based on coal, oil or gas fuel etc from the generic term "thermal power" in the present energy statistics, the following calculation measures will be taken:

First, according to the energy statistics of the selected period in which approximately 20% capacity has been added to the grid, determine the ratio of $CO_2$ emissions produced by solid, liquid, and gas fuel consumption for power generation; than multiply this ratio by the respective emission factors based on commercially available best practice technology in terms of efficiency. Finally, this emission factor for thermal power is multiplied with the ratio of thermal power identified within the approximation for the latest 20% installed capacity addition to the grid. The result is the BM emission factor of the grid.

*Sub-step 1*
Calculate the proportion of $CO_2$ emissions related to consumption of coal, oil and gas fuel used for power generation as compared to total $CO_2$ emissions from the total fossil fuelled electricity generation (sum of $CO_2$ emissions from coal, oil and gas).

$$\lambda_{Coal} = \frac{\sum_{i \in COAL, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \qquad \text{Equation (B.4)}$$

[29] This is in accordance with the „Request for guidance: Application of AM0005 and AMS-I.D in China", a letter from DNV to the Executive Board, dated 07/10/2005, available online at:
http://cdm.unfccc.int/UserManagement/FileStorage/6POIAMGYOEDOTKW25TA20EHEKPR4DM.
This approach has been applied by several registered CDM projects using methodology ACM0002 so far.

$$\lambda_{Oil} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad \text{Equation (B.5)}$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad \text{Equation (B.6)}$$

Where,

$F_{i,m,y}$, is the amount of fuel $i$ (in a mass or volume unit) consumed by power sources j in year(s) y,

$COEF_{i,j,m}$ is the $CO_2$ emission coefficient of fuel $i$ ($tCO_2e$/mass or volume unit of the fuel), taking into account the carbon content of the fuels used by power plants m and the oxidation percentage of the fuel in year(s) y,

*Coal, Oil* and *Gas* stands for solid, liquid and gas fuels respectively.

*Sub-step 2:* Calculate the operating margin emission factor of fuel-based generation.

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \quad \text{Equation (B.7)}$$

Where,

$EF_{Thermal}$ is the weighted emissions factor of thermal power generation with the efficiency level of the best commercially available technology in China in the previous three years.

$EF_{Coal,Adv}, EF_{Oil,Adv}, EF_{Gas,Adv}$ are the emission factors of coal, oil and gas-fired power generation with efficiency levels of the best commercially available technology in China in the previous three years.

A coal-fired power plant with a total installed capacity of 600MW is assumed to be the commercially available best practice technology in terms of efficiency. The estimated coal consumption of such a National Sub-critical Power Station with a capacity of 60 MW is 343.33gce/kWh, which corresponds to an efficiency of 35.82% for electricity generation.

For gas and oil power plants a 200 MW power plant with a specific fuel consumption of 258gce/kWh, which corresponds to an efficiency of 47.67% for electricity generation, is selected as commercially available best practice technology in terms of efficiency.

The main parameters used for calculation of the thermal power plant emission factors $EF_{Coal,Adv}$, $EF_{Oil,Adv}$, $EF_{Gas,Adv}$ are provided in Annex3.

*Sub-step 3*: Calculate the Build Margin emission factor

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

Where,

$CAP_{Total}$ is the total capacity addition of the selected period in which approximately 20% capacity has been added to the grid,

$CAP_{Thermal}$ is the total thermal power capacity addition of the selected period in which approximately 20% capacity has been added to the grid.

As mentioned above, the build margin emission factor of the baseline is calculated ex-ante and will not be renewed in the first crediting period. $EF_{BM,y}$ calculations adopt the most recent data announced by China's DNA in the *Notification on Determining the Regional Grid Emission Factors of China*, renewed on August 9, 2007 (available at http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1365.pdf).

The result of the Build Margin emission factor calculation is 0.6748t$CO_2$e/MWh

The data sources for calculating OM and BM are:

1. Installed capacity, power generation and the rate of internal electricity consumption of thermal power plants for the years 2003 to 2005

Source: *China Electric Power Yearbook* (2004-2006)

2. Fuel consumption and the net caloric value of thermal power plants the years 2003 to 2005

Source: *China Energy Statistics Yearbook* (2004-2006)

3. Carbon emission factor and carbon oxidation factor of each fuel

Source: *2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy*, Table 1.3 and Table 1.4 of Page 1.21-1.24 in Chapter one.

**STEP 3 Calculate the Electricity Baseline Emission Factor ( $EF_y$ )**

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

$$EF_y = w_{OM} \times EF_{OM,y} + w_{BM} \times EF_{BM,y} \quad \text{Equation (B.9)}$$

The **Operating Margin** emission factor ( $EF_{OM}$ ) of Southern Grid is **1.0119t$CO_2$e/MWh** and the **Build Margin** emission factor ( $EF_{BM}$ ) is **0.6748t$CO_2$e/MWh**. The defaults weights for hydropower projects are used as specified in ACM0002 (Version 06).

$$w_{OM} = 0.5 \; ; \; w_{BM} = 0.5$$

The result of the **Combined Margin** Baseline Emission Factor calculation is **0.84335t$CO_2$e/MWh**.

**Emission Reductions ( $ER_y$ )**

The project activity mainly reduces carbon dioxide through substitution of grid electricity generation with fossil fuel fired power plants by renewable electricity. The emission reduction $ER_y$ by the project activity during a given year y is the difference between baseline emissions ( $BE_y$ ), project emissions ( $PE_y$ ) and emissions due to leakage ( $L_y$ ), as follows:

$$ER_y = BE_y - PE_y - L_y \quad \text{Equation (B.10)}$$

where the baseline emissions ( $BE_y$ in $tCO_2$) are the product of the baseline emissions factor ( $EF_y$ in

$tCO_2$/MWh) calculated in Step 3, times the electricity supplied by the project activity to the grid ( $EG_y$ in MWh) minus the baseline electricity supplied to the grid in the case of modified or retrofit facilities ( $EG_{baseline}$ in MWh), as follows:

$$BE_y = (EG_y - EG_{baseline}) \times EF_y \quad \text{Equation (B.11)}$$

Where,

$EG_y$ is the electricity supplied to the grid in y year, it is calculated by:

$$EG_y = EG_{s,y} - PR_{g,y} \quad \text{Equation (B.12)}$$

Of which: $EG_{s,y}$ is the power supplied to the grid.

$PR_{g,y}$ is the electricity use of power plant supplied by the grid.

$EF_y$ is baseline emissions factor, in $tCO_2e$/MWh.

$EG_{baseline}$ is the baseline electricity supplied to the grid in the case of modified or retrofit facilities. There are no modified or retrofit facilities for the specific project, therefore $EG_{baseline} = 0$.

For new hydro electric power projects with reservoirs, project proponents shall account for project emissions, estimated as follows:

a) if the power density of project is greater than 4W/m$^2$ and less than or equal to 10W/m$^2$:

$$PE_y = \frac{EF_{Res} \times EG_{hydro,y}}{1000} \quad \text{Equation (B.13)}$$

where,

| | |
|---|---|
| $PE_y$ | Emission from reservoir expressed as $tCO_2e$/year |
| $EF_{Res}$ | is the default emission factor for emissions from reservoirs, and the default value as perEB23 is 90kg $CO_2e$/MWh. |
| $EG_{hydro,y}$ | Electricity produced by the hydro electric power project in year y, in MWh |

b) If power density of the project is greater than 10W/m$^2$

$PE_y$ =0.

Based on ACM0002, project participant does not need to consider leakage in applying ACM0002 methodology, i.e. Ly=0.

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

| **Data / Parameter:** | $EGP_{y,j}$ |
|---|---|
| Data unit: | MWh |
| Description: | The Power Generation of Sources j in the years y (2003-2005, including Yunnan, Guangdong, Guangxi and Guizhou) |
| Source of data used: | *China Electric Power Yearbook 2004-2006* |
| Value applied: | Provided in Annex 3 |
| Justification of the choice of data or description of measurement methods and procedures actually | Official Statistical Data |

| | |
|---|---|
| applied : | |
| Any comment: | To calculate the power delivered to the grid |

| **Data / Parameter:** | $GEN_{import,y}$ |
|---|---|
| Data unit: | MWh |
| Description: | The Power Transmitted from the Central China Grid to the Southern Grid in the years y (2003-2005) |
| Source of data used: | *State Power Information Network: http://www.sp.com.cn/zgdl/dltj/default.htm* |
| Value applied: | Provided in Annex 3 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Official Statistical Data |
| Any comment: | To calculate OM |

| **Data / Parameter:** | $PR_{m,y}$ |
|---|---|
| Data unit: | % |
| Description: | The rate of electricity consumption of thermal power plants of Province m in the years y (2003-2005 including Yunnan, Guangdong, Guangxi and Guizhou) |
| Source of data used: | *China Electric Power Yearbook 2004-2006* |
| Value applied: | Provided in Annex 3 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Official Statistical Data |
| Any comment: | To calculate the power delivered to the grid |

| **Data / Parameter:** | $F_{i,j,y}$ |
|---|---|
| Data unit: | $10^4$t/$10^8$m$^3$ |
| Description: | The Fuel i Consumption of Power Sources j in the years y (2002-2005, including Yunnan, Guangdong, Guangxi and Guizhou) |
| Source of data used: | *China Energy Statistical Yearbook 2000-2006* |
| Value applied: | Provided in Annex 3 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Official Statistical Data |
| Any comment: | To calculate OM and BM |

| **Data / Parameter:** | $NCV_i$ |
|---|---|
| Data unit: | TJ/ fuel in a mass or volume unit |
| Description: | The $NCV_i$ *of* Fuel $i$ in a mass or volume unit |
| Source of data used: | *China Energy Statistical Yearbook 2006* |
| Value applied: | Provided in Annex 3 |

| | |
|---|---|
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Official Statistical Data |
| Any comment: | To calculate OM and BM |

| **Data / Parameter:** | $EF_{CO_2,i}$ |
|---|---|
| Data unit: | tC/TJ |
| Description: | The *Emission Factor of* Fuel $i$ in a mass or volume unit |
| Source of data used: | *2006 IPCC Guidelines for National Greenhouse Gas Inventories, Workbook* |
| Value applied: | Provided in Annex 3 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | IPCC Default Value |
| Any comment: | To calculate OM and BM |

| **Data / Parameter:** | $OXID_i$ |
|---|---|
| Data unit: | **%** |
| Description: | The Oxidation Rate of Fuel $i$ |
| Source of data used: | *2006 IPCC Guidelines for National Greenhouse Gas Inventories, Workbook* |
| Value applied: | Provided in Annex 3 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | IPCC Default Value |
| Any comment: | To calculate OM and BM |

| **Data / Parameter:** | $GENE_{best,coal}$ |
|---|---|
| Data unit: | % |
| Description: | Commercially available coal-fired power plant corresponding to the best practice in terms of efficiency |
| Source of data used: | *Chinese DNA: Bulletin on Baseline Emission Factors of the China's Regional Grids-the calculation of baseline Build Margin emission factor for the China's Regional Grids* |
| Value applied: | 35.82% |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | National Fixed Value |
| Any comment: | To calculate BM |

| **Data / Parameter:** | $GENE_{best,oil/gas}$ |
|---|---|
| Data unit: | % |
| Description: | Commercially available oil and gas power plant corresponding to the best |

| | |
|---|---|
| | practice in terms of efficiency |
| Source of data used: | *Chinese DNA: Bulletin on Baseline Emission Factors of the China's Regional Grids -the calculation of baseline Build Margin emission factor for the China's Regional Grids* |
| Value applied: | 47.67% |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | National Fixed Value |
| Any comment: | To calculate BM |

| **Data / Parameter:** | $CAP_{y,j}$ |
|---|---|
| Data unit: | MW |
| Description: | The Installed Capacity of Power Sources j in the years y (2002-2005, including Yunnan, Guangdong, Guangxi and Guizhou) |
| Source of data used: | *China Electricity Power Yearbook 2003-2006* |
| Value applied: | Provided in Annex 3 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Official Statistical Data |
| Any comment: | To calculate BM |

| **Data / Parameter:** | *SRA* |
|---|---|
| Data unit: | $km^2$ |
| Description: | Surface area at full reservoir level |
| Source of data used: | *FSR* |
| Value applied: | 0.58 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | The surface area was calculated using the design schematics and area maps. Photographs of the reservoir at several key locations will be taken when the project becomes operational to check whether the actual reservoir does not deviate substantially for the design. |
| Any comment: | To calculate power density |

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

According to section B6.1 and further details in Annex 3, the combined baseline emission factor for the Southern Grid of the project is 0.84335$tCO_2e$/MWh in first crediting period. And the annual electric power supplied to the grid by the project is 381,240MWh.
Therefore, $BE_y$ in the first crediting period is to be calculated as follows:

$$BE_y = EG_y \times EF_y = 321{,}519 tCO_2e$$

Therefore, in the first crediting period, the annual emission reductions are 321,519$tCO_2e$.

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

The emission reductions of the project are 2,250,633$tCO_2e$ during first crediting period.

Table B.5 Estimate of Emission Reductions Due to the Project

| Year | Estimation of project activity emissions (tonnes of $CO_2e$) | Estimation of baseline emissions (tonnes of $CO_2e$) | Estimation of leakage (tonnes of $CO_2e$) | Estimation of overall emission reductions (tonnes of $CO_2e$) |
|---|---|---|---|---|
| Year 1: 15/10/2008-14/10/2009 | 0 | 321,519 | 0 | 321,519 |
| Year 2: 15/10/2009-14/10/2010 | 0 | 321,519 | 0 | 321,519 |
| Year 3: 15/10/2010-14/10/2011 | 0 | 321,519 | 0 | 321,519 |
| Year 4: 15/10/2011-14/10/2012 | 0 | 321,519 | 0 | 321,519 |
| Year 5: 15/10/2012-14/10/2013 | 0 | 321,519 | 0 | 321,519 |
| Year 6: 15/10/2013-14/10/2014 | 0 | 321,519 | 0 | 321,519 |
| Year 7: 15/10/2014-14/10/2015 | 0 | 321,519 | 0 | 321,519 |
| **Total(tonnes of $CO_2e$)** | 0 | 2,250,633 | 0 | 2,250,633 |

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

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

We need to monitor the power supplied to the grid ( $EG_{s,y}$ ) and the electricity use of power plant supplied by the grid $PR_{g,y}$, and according to the two data, the net power supplied to the grid ( $EG_y$ ) will be calculated ( $EG_y = EG_{s,y} - PR_{g,y}$ ).

Table B.6 Data and parameters monitored ( $EG_{s,y}$ )

| | |
|---|---|
| *Data / Parameter:* | $EG_{s,y}$ |
| *Data unit:* | *MWh* |
| *Description:* | *Power supplied to the grid in year y* |
| *Source of data to be used:* | *Measured by meter* |
| *Value of data:* | *The electricity supplied to the grid by the project is 381,540MWh* |
| *Description of measurement methods and procedures to be applied:* | *Measured continuously and recorded on a monthly basis* |
| *QA/QC procedures to be applied:* | *The meters will be periodically checked according to the relevant national electric industry standards and regulations; Power supplied to the grid and double checked according to electricity sales receipt.* |
| *Any comment:* | *Refer to B.7.2. Description of the monitoring plan* |

Table B.7 Data and parameters monitored *( $PR_{g,y}$ )*

| | |
|---|---|
| *Data / Parameter:* | $PR_{g,y}$ |
| *Data unit:* | *MWh* |
| *Description:* | *The electricity use of power plant supplied by the grid in year y* |
| *Source of data to be used:* | *Measured by meter* |
| *Value of data:* | *The electricity use of power plant supplied by the grid is estimated to be 300MWh* |

| | |
|---|---|
| *Description of measurement methods and procedures to be applied:* | *Measured continuously and recorded on a monthly basis* |
| *QA/QC procedures to be applied:* | *The meters will be periodically checked according to the relevant national electric industry standards and regulations; Power supplied to the grid and double checked according to electricity purchase receipt.* |
| *Any comment:* | *Refer to B.7.2. Description of the monitoring plan* |

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

The objective of the monitoring plan is to insure the complete, consistent, clear, and accurate monitoring and calculation of the emissions reductions during the whole crediting period. The project owner will be responsible for the implementation of the monitoring plan, and the Grid Company will cooperate with the project entity.

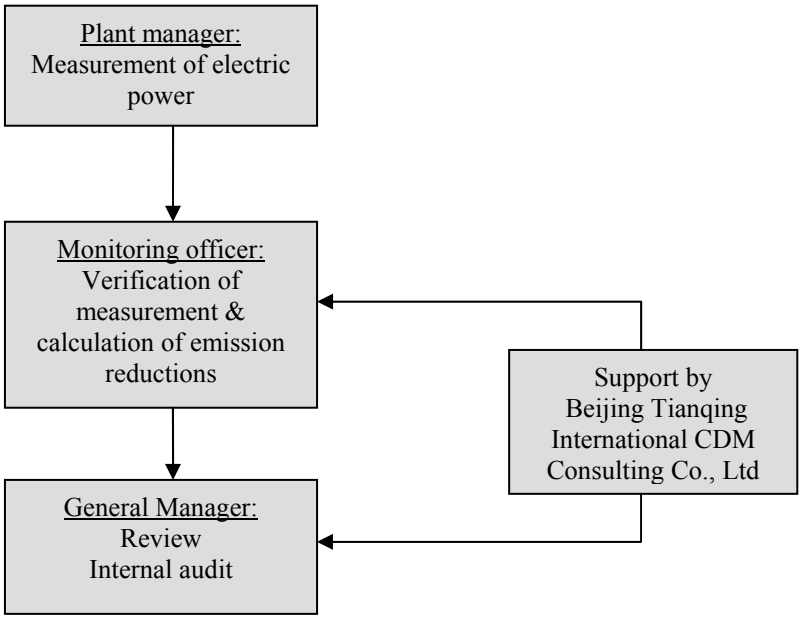
**1. Monitoring Objective**

The main monitoring data are electricity supplied to the grid because the baseline emission factor is fixed by ex-ante calculation.

**2. Monitoring Organization**

The project owner will appoint a monitoring officer, who will supervise and verify metering and recording, collection of data (e.g. sales / billing receipts), calculation of emission reductions and development of monitoring report. The plant manager will be in charge of direct electricity measurement.
The monitoring officer will receive support from Beijing Tianqing Power International CDM Consulting, Co., Ltd., Ltd in his/her responsibilities through the following actions:

- Initial training on CDM, monitoring methodology, monitoring procedures and requirements and archiving;
- Provide the monitoring officer with a calculation template in electronic form for calculation of annual emission reductions;
- Continuous advice to the monitoring officer on a need basis;
- Review of monitoring reports.



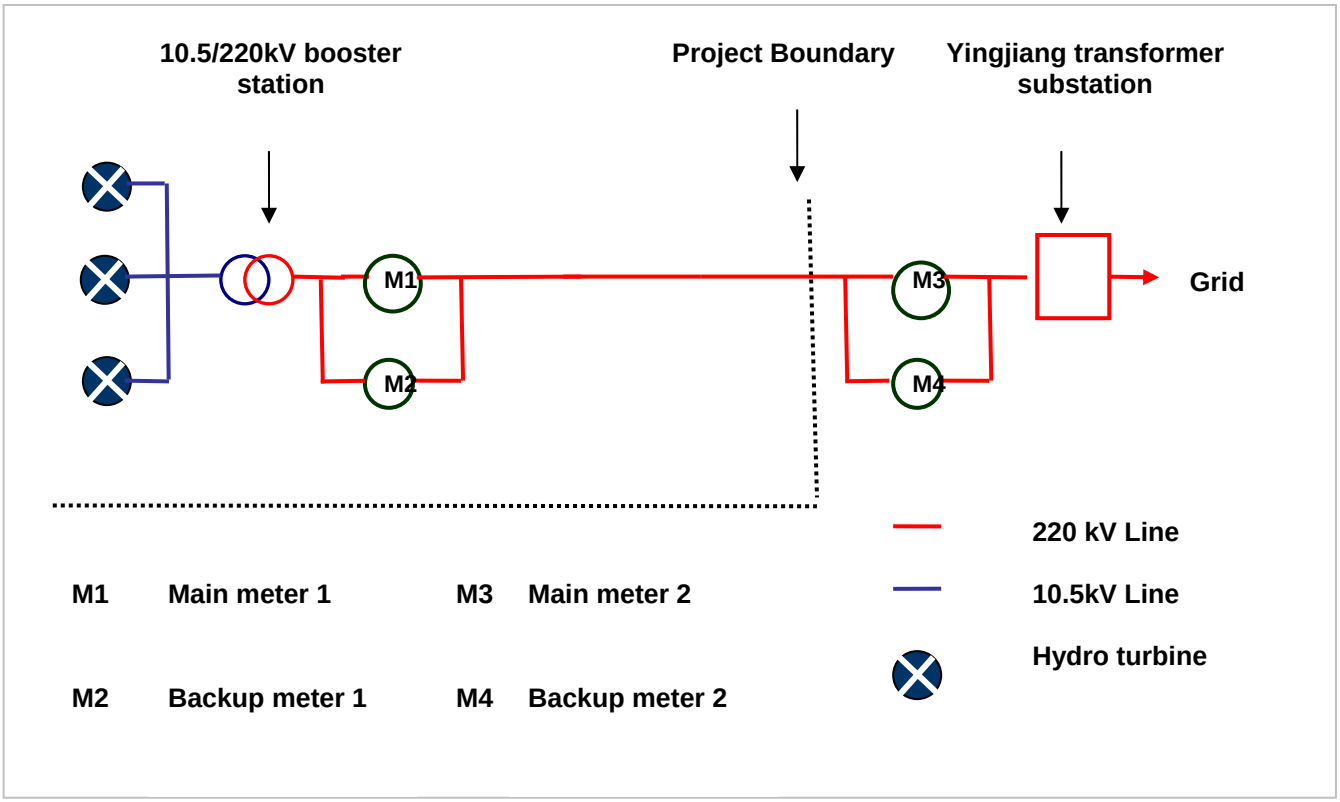
### 3. Monitoring Equipment and program

According to the *Technical Administrative Code of Electric Energy Metering (DL/T448－2000),* the electric energy metering equipment will be properly configured and the metering equipment will be checked by both the project owner and the grid company before the project is in operation.

Four meters (accuracy degree is 0.2S, bi-directional) will be required. There are two meters at the exit of the booster station of the proposed project station, one is the main meter 1, and the another one is the back-up meter 1. There are other two meters at the entrance of the Yingjiang transformer station of the grid company too, one is a main meter 2, and the another one is the back-up meter 2. When the main meter 1 is in trouble, the project owner should employ the data monitored by the backup meter 1. When the main meter 1 and the backup meter 1are in trouble, the project owner should employ the data monitored by the main meter 2. When the main meter 1, backup meter 1 and main meter 2 are in trouble, the project owner should employ the data monitored by the back-up meter 2.

Through the main meter M1 (accuracy degree is 0.2S, bi-directional), the amount of electricity supplied to the grid $M1_A$ and power supplied to the project from the grid company $M1_B$. In order to measure electricity when the main meter is out of order, a backup meter M2, M3, and M4 will be installed.

The net power supplied by the proposed project activity will be calculated as: $M1_A$-$M1_B$.




### 4. Data Collection:

The project owner and the Grid Company are responsible for operation monitoring of the backup meter and the main meter respectively and guarantee the measuring equipments are in good operation and completely sealed.

The electricity recorded by the main meter alone will suffice for the purpose of billing and emission reduction verification as long as the main meter fault is within the permissible tolerance. The main monitoring process is as follows:

i The project owner and Grid Company read and check the backup meter and the main meter and record the data at 24:00 on the last day of every month;
ii The grid company sells the electricity to the project owner;
iii The project owner provides an electricity sales invoice to the Grid Company. A copy of the invoice is stored by the project owner, together with a record of the payment by the grid company.
iv The Grid Company provides an electricity sales invoice to the project owner and the invoice is stored by the project owner.
v The project owner records the net electricity supplied to the grid;
vi The project owner keeps and safe keeps the records of the main meter's data readings for verification by the DOE.

If inaccuracy of the reading data from the main meter exceeds the allowable tolerance or the meter operate abnormally during a month, or any other unexpected problems, the grid-connected electricity generated by the proposed project shall be followed by:

i Reading the backup meter (after taking the line losses into consideration) to ensure electricity is supplied to the grid, unless a test by either party reveals it is inaccurate;
ii If the backup system is not within acceptable limits of accuracy or performed improperly, the proposed project owner and the Grid Company shall jointly prepare an new agreement of the correct readings; and
iii If the proposed project owner and the Grid Company fail to reach an agreement concerning the correct reading, then the matter will be submitted for arbitration according to agreed procedures.

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

**5. Calibration**

The verification of electric energy meter should be periodically carried out according to relevant National electric industry standards or regulations. After verification, meters should be sealed. Both meters shall be jointly inspected and sealed on behalf of the project owner and Grid Company and shall not be accessible by either party except in the presence of the other party or its accredited representatives.
All the meters installed shall be tested by the qualified metrical organization co-authorized by the project owner and the Grid Company within 10 days after:

i The detection of a difference larger than the allowable tolerance in the readings of the main meter and the backup meter;
ii Repair to the faulty meter caused by improper operation.

**6. Data Management**

Data will be archived at the end of each month using electronic spreadsheets. The electronic files will be stored on hard disk and cd-rom. In addition, a hard copy printout will be archived. In addition, the project owner will collect sales receipts for the power delivered to the grid as a cross-check. At the end of each crediting year, a monitoring report will be compiled detailing the metering results and evidence (i.e. sales receipts).
Physical documentation such as, paper-based maps, diagrams and environmental assessment, will be collected in a central place, together with the monitoring plan. In order to facilitate the auditor's reference, monitoring results will be indexed. All paper-based information will be stored by the project owner.
All data records will be kept for a period of 2 years following the end of the crediting period.

**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)**

Date of completion: 07/04/2008
Name of persons determining the baseline:

Aimin Yang, General Manager, Beijing Tianqing Power International CDM Consulting, Co., Ltd.
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(Not Project Participant)

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

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

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

06/10/2004(The date of signing the purchasing contract of turbine and generator)

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

The expected operational lifetime of the project activity 25 years

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

#### C.2.1. Renewable crediting period

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

15/10/2008 (or the date of registration, whichever is later)

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

7 years

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

Not applicable

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

##### C.2.2.2. Length:

## SECTION D. Environmental impacts

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

According to the relevant environmental laws and regulations, an environmental impact assessment had been carried out, and had been approved by Environment Protection Bureau of Yunnan Province on Jun 30, 2004. The main assessment conclusions are provided below:

**1. Impact on Land Requisition, Land Utilization and Immigration**

The total occupied land amounts to 18.721hm$^2$, the permanently occupied land to 8.209hm$^2$ and the temporarily occupied land to 10.512hm$^2$. Since the working plant for this project is centralized, the occupied tilled land is limited. The project owner will compensate for land occupation and the influence on local citizens will be comparatively small.

**2. Impact on Immigration**

This project does not involve moving the local residents.

**3. Impact on Soil and Water Loss**

The project owner will employ engineering, vegetation and management measures to control and prevent soil and water loss. After such practical measures have been taken, soil and water loss in the project area will be better than before construction, thus protecting and improving the ecological environment.

**4. Impact on Acoustic Environment**

Impact on the acoustic environment of the project will be mainly due to construction. There will be minimal impact on the local village. The project will have a major impact on the construction workmen. The workers will use earplugs in order to reduce the impact to minimum. The impact will be temporary and will disappear once the construction is complete.

**5. Impact of Solid Waste on Environment**

The amount of waste slag will be 747,200 m$^3$ which will be disposed of in 1 waste slag field and it has small impact on the environment. The domestic waste produced during the construction period will be disposed of in sanitary fill. Domestic waste produced during the construction period will be transported to the location designated by the environmental protection department for centralized disposal. Thus, the impact of waste slag and domestic waste will be very small.

**6. Impact on Ambient Air**

The main air pollution produced during the construction period will be dust, $SO_2$ and $NO_2$. After adopting watering measures etc, the construction of the project will have little influence on the quality of the ambient air in the area.

**7. Impact on Aquatic Environment**

The industrial wastewater will be treated through a setting pit, sedimentation basin and acid material and will be discharged after meeting the necessary standards. In order to treat the domestic wastewater, closed conduit toilets and sceptic tank will be built. The impact on the water quality of the Daying River will be comparatively small.

**8. Impact on Ecosystem**

The construction site is comparatively centralized, the newly built road is short and the flooding area is small, thus, the influence on plant growth will be minimized. Since the project occupies a relatively small area, the construction period is comparatively short and there are similar ecological forest systems necessary for breeding and proper habitat of the amniote, there will be little influence on the amniote. Therefore, the construction will not have much influence on the ecological environment.

**9. Impact on nature reserve and sight**

The project is 8km away from the Tongbiguan Nature Reserve, so the project will have no impact on the nature reserve.

**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:**

All of project participants and host party involved think there is little negative environmental impact of this specific project.

## SECTION E. Stakeholders' comments

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

The project owner had distributed questionnaires to local residents who may be impacted by the project to collect advice for the project and come back 20 investigation questionnaires.

Furthermore, a special stakeholder consultation meeting of the project was organized on May 14, 2006 at Zhongyu hotel, Mang City, Yunnan Province to collect opinions from all the potential stakeholders, such as local residents etc, aiming at collecting advices on the influence imposed on the local society, economy, daily life etc for the project broadly.

In order to make the potential stakeholders to receive information regarding the meeting, the project owner published a bulletin for the meeting of stakeholders on the newspaper of Dehong Comity Paper, and also published the meeting bulletin via the website of www.tqcdmchina.com. In the bulletin, the company noticed that all the potential stakeholders to know detailed information about the project of Dayingjiang Meng'e Hydropower Station. At the meeting, the project owner and the consultant invited the participants to express their comments and concerns about the project and the CDM. The main questions are as following:

1. Whether the noise during construction period will affect people's life?

2. Is there the submergence in this project? Is there any impact on the local people because of the submergence?

3. Is there any immigration? If yes, are they voluntary? Whether the immigration satisfied with the life after the migration?

4. How about the local people's life? What do the local people live on? How about the economic condition?

5. What is the impact of the project on the local environment?

6. What is the impact of construction on the local industry?

7. Whether the project has the impact on people's income?

8. Whether the cost will increase due to the implementation of the CDM project?

9. Have you known CDM before? What is the attitude for local people and government for CDM project? Whether people support this CDM project?

10 .Whether all the stakeholders agree with the construction of the hydropower stations?

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

We didn't receive any comment in the website of www.tqcdmchina.com.

There are 8 resident representatives who may be impacted by the project attended the stakeholders meeting. We obtained the following results from the stakeholders' meeting:
100% of the residents think that the construction of station will bring benefit to local people;
100% of the residents support the construction.

We have reclaimed 20 questionnaires, the investigated people are all local villagers, of which 20% are women, 80% are junior high school graduates or under, 95% think their income will be increased after construction, 100% cook with firewood, 100% think the construction of the hydropower station will bring benefits to their lives, 100% think there will be no negative impact on their lives and all of them agree with the construction of the project.

From the questionnaires and stakeholders' meeting, we find that all the local government and residents agree with the construction of the project. All stakeholders think that although it will flood some shrubbery land, aquatic area and river bottom, the project will have little impact on agricultural resources. The project involves no immigration. Furthermore, there will be no serious influence on the ecosystem after implementing the measures mentioned above. The project will provide electric power for every day life and manufacturing, improve quality of life of local residents, such as, increase the local residents' income. The impact of this project is generally positive, therefore, everyone supports the construction of this project.

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

Given the generally positive (or neutral) nature of the comments received, no action has been taken to address the comments received.

## Annex 1

## CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

The Project Entity:

| | |
|---|---|
| Organization: | Dehong Furong Dayingjiang Hydroelectric Power Development Co., Ltd. |
| Street/P.O.Box: | Zhenxing Road, Pingyuan Town,Yingjiang County |
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| State/Region: | Yunan Province |
| Postfix/ZIP: | 679300 |
| Country: | China |
| Telephone: | +86-692-8991508 |
| FAX: | +86-692- 8991508 |
| E-Mail: | / |
| URL: | / |
| Represented by: | Yonghe Zou |
| Title: | Law Consultant |
| Salutation: | Mr. |
| Last Name: | Zou |
| Middle Name: | / |
| First Name: | Yonghe |
| Department: | General Manager Office |
| Mobile: | +86-13312558996 |
| Direct FAX: | +86-871-3632232 |
| Direct tel: | +86-871-3632232 |
| Personal E-Mail: | Zouxi0706@sina.com |

The Buyer

| | |
|---|---|
| Organization: | ENEL Trade SpA |
| Street/P.O.Box: | Viale Regina Margherita, 125 |
| Building: | / |
| City: | Rome |
| State/Region: | / |
| Postfix/ZIP: | 00198 |
| Country: | Italy |
| Telephone: | +39-06-83058506 |
| FAX: | +39-06-83054394 |
| E-Mail: | / |
| URL: | http://www.enel.it |
| Represented by: | Eliano Russo |
| Title: | / |
| Salutation: | Mr. |
| Last Name: | Russo |
| Middle Name: | / |
| First Name: | Eliano |
| Department: | / |
| Mobile: | / |
| Direct FAX: | +39-06-83054394 |
| Direct tel: | +39-06-83058506 |
| Personal E-Mail: | Eliano.russo@enel.it |

## Annex 2

## INFORMATION REGARDING PUBLIC FUNDING

There is no public funding from Annex I countries used in the project activity.

## Annex 3

## BASELINE INFORMATION

### Table 1–Power Supply data for the Southern Grid, 2001-2005

| | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|
| Electricity Generation of Thermal power plant (MWh) | 162,910,000 | 185,168,000 | 222,780,000 | 263,574,000 | 287,187,000 |
| Electricity Generation of Hydro power plant (MWh) | 79,971,000 | 83,093,000 | 83,271,000 | 84,072,000 | 94,919,000 |
| Other Power (MWh) | 15,135,000 | 21,012,000 | 29,089,000 | 28,530,000 | 30,632,000 |
| Total Electricity Generation of the Southern Grid (MWh) | 258,016,000 | 289,273,000 | 335,140,000 | 376,277,000 | 412,738,000 |
| the ratio of power generated by hydropower and other low cost/compulsory resources (%) | 36.86% | 35.99% | 33.53% | 29.95% | 30.42% |

*Data Source: China Electric Power Yearbook 2002-2006.*

### Table 2–Power Supply data for the Southern Grid, 2003 (not including low operating cost and must-run power plants)

| | Guangdong | Guangxi | Guizhou | Yunnan |
|---|---|---|---|---|
| Thermal Power Generation (MWh) | 143,351,000 | 17,079,000 | 43,295,000 | 19,055,000 |
| Rate of Electricity Consumption of the Power Plant (%) | 5.50 | 8.43 | 7.40 | 8.01 |
| Power Supplied to the Grid(MWh) | 135,466,695 | 15,639,240 | 40,091,170 | 17,528,695 |
| Total Supplied to Grid of the Thermal Power (MWh) | | 208,725,800 | | |
| Net import Power from the Central China Grid (MWh) | | 11,100 | | |
| The total Power for the Southern Grid (MWh) | | 208,736,900 | | |

*Data Source: China Electric Power Yearbook 2004; State Power Information Network: http://www.sp.com.cn/zgdl/spw/04_12y/04_12_dljh.htm.*

### Table 3–Power Supply data for the Southern Grid, 2004 (not including low operating cost and must-run power plants)

| | Guangdong | Guangxi | Guizhou | Yunnan |
|---|---|---|---|---|
| Thermal Power Generation (MWh) | 169,389,000 | 20,143,000 | 49,720,000 | 24,322,000 |
| Rate of Electricity Consumption of the Power Plant (%) | 5.42 | 8.33 | 7.06 | 7.56 |
| Power Supplied to the Grid(MWh) | 160,208,116 | 18,465,088 | 46,209,768 | 22,483,257 |

| | |
|---|---|
| Total Supplied to Grid of the Thermal Power (MWh) | 247,366,229 |
| Net import Power from the Central China Grid (MWh) | 10,951,240 |
| The total Power for the Southern Grid (MWh) | 258,317,469 |

*Data Source: China Electric Power Yearbook 2005; State Power Information Network: http://www.sp.com.cn/zgdl/spw/04_12y/04_12_dljh.htm.*

**Table 4–Power Supply data for the Southern Grid, 2005 (not including low operating cost and must-run power plants)**

| | Guangdong | Guangxi | Guizhou | Yunnan |
|---|---|---|---|---|
| Thermal Power Generation (MWh) | 176,453,000 | 25,023,000 | 58,430,000 | 27,281,000 |
| Rate of Electricity Consumption of the Power Plant (%) | 5.58 | 7.95 | 7.34 | 6.94 |
| Power Supplied to the Grid(MWh) | 166,606,923 | 23,033,672 | 54,141,238 | 25,387,699 |
| Total Supplied to Grid of the Thermal Power (MWh) | | 269,169,531 | | |
| Net import Power from the Central China Grid (MWh) | | 96,363,000 | | |
| The total Power for the Southern Grid (MWh) | | 365,532,531 | | |

*Data Source: China Electric Power Yearbook 2006; State Power Information Network: http://www.sp.com.cn/zgdl/spw/05_01y/05_01_dljh.htm etc.*

**Table 5– Calculation of average emission factor for the Central China Grid in 2003-2005**

| | 2003 | 2004 | 2005 |
|---|---|---|---|
| Total $CO_2$ emission of the Central China Grid ($tCO_2e$) | 276,404,544 | 345,671,697 | 359,887,488 |
| The total power supplied to the Central China Grid (MWh) | 346,613,868 | 418,261,666 | 466,644,030 |
| Average emission factor ($tCO_2e$/ MWh) | 0.7974423 | 0.8264484 | 0.7712249 |

**Table 6–Energy Consumption Statistics of Power Generation of the Southern Grid in 2003**

| Fuel | Unit | Guangdong A | Guangxi B | Guizhou C | Yunnan D | Subtotal =A+B+C+D |
|---|---|---|---|---|---|---|
| Raw coal | Ten thousand Tons | 4,491.79 | 831.84 | 2,169.11 | 1,405.27 | 8,898.01 |
| Clean coal | Ten thousand Tons | 0.05 | 0.00 | 0.00 | 0.00 | 0.05 |
| Other washed coal | Ten thousand Tons | 0.00 | 0.00 | 36.38 | 20.37 | 56.75 |
| Coke | Ten thousand Tons | 0.00 | 0.00 | 0.00 | 0.50 | 0.50 |
| Coke oven gas | Ten thousand Tons | 0.00 | 0.00 | 0.00 | 0.04 | 0.04 |
| Other gas | $10^8$ Cubic meter | 3.21 | 0.00 | 0.00 | 11.27 | 14.48 |
| Crude oil | $10^8$ Cubic meter | 6.85 | 0.00 | 0.00 | 0.00 | 6.85 |
| Gasoline | Ten thousand Tons | 0.02 | 0.00 | 0.00 | 0.00 | 0.02 |
| Diesel oil | Ten thousand Tons | 31.90 | 0.00 | 0.00 | 0.76 | 32.66 |
| Fuel oil | Ten thousand Tons | 627.22 | 0.30 | 0.00 | 0.00 | 627.52 |
| LPG | Ten thousand Tons | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Refinery gas | $10^8$Cubic meter | 2.85 | 0.00 | 0.00 | 0.00 | 2.85 |
| Natural gas | $10^8$Cubic meter | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Other petroleum products | $10^8$Cubic meter | 11.35 | 0.00 | 0.00 | 0.00 | 11.35 |
| Other coking products | Ten thousand Tons | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Other E (standard coal) | Ten thousand Tons | 93.21 | 0.00 | 0.00 | 22.35 | 115.56 |

*Data Source: China Energy Statistical Yearbook 2004.*

**Table 7- The Operation Margin Emission Factor Calculation of the Southern Grid in 2003**

| Fuel | Unit | Fuel Consumption in the SCPG (E) | Emission Factor（tC/TJ） (F) | Oxidation Rate (%) G | Average NCV ($MJ/t,km^3$) H | $CO_2$Emission ($tCO_2e$) I=G*H*F*E*44/12/10000（in mass） I=G*H*F*E*44/12/1000 (in volume) |
|---|---|---|---|---|---|---|
| Raw coal | Ten thousand Tons | 8,898.01 | 25.80 | 100 | 20,908 | 175,993,455.05 |
| Clean coal | Ten thousand Tons | 0.05 | 25.80 | 100 | 26,344 | 1,246.07 |
| Other washed coal | Ten thousand Tons | 56.75 | 25.80 | 100 | 8,363 | 448,971.84 |
| Coke | Ten thousand Tons | 0.50 | 25.80 | 100 | 28,435 | 13,449.76 |
| Coke oven gas | $10^8$ Cubic meter | 0.04 | 12.10 | 100 | 16,726 | 2,968.31 |
| Other gas | $10^8$ Cubic meter | 14.48 | 12.10 | 100 | 5,227 | 335,797.81 |
| Crude oil | Ten thousand Tons | 6.85 | 20.00 | 100 | 41,816 | 210,055.71 |
| Gasoline | Ten thousand Tons | 0.02 | 18.90 | 100 | 43,070 | 596.95 |
| Diesel oil | Ten thousand Tons | 32.66 | 20.20 | 100 | 42,652 | 1,031,759.27 |
| Fuel oil | Ten thousand Tons | 627.52 | 21.10 | 100 | 41,816 | 20,301,304.48 |
| LPG | $10^8$Cubic meter | 0.00 | 17.20 | 100 | 50,179 | 0.00 |
| Refinery gas | $10^8$Cubic meter | 2.85 | 18.20 | 100 | 46,055 | 87,592.00 |
| Natural gas | $10^8$Cubic meter | 0.00 | 15.30 | 100 | 38,931 | 0.00 |
| Other petroleum products | Ten thousand Tons | 11.35 | 20.00 | 100 | 38,369 | 319,357.98 |
| Other coking products | Ten thousand Tons | 0.00 | 25.80 | 100 | 28,435 | 0.00 |
| Other E (standard coal) | Ten thousand Tce | 115.56 | 0.00 | 100 | 0 | 0.00 |
| $CO_2$ emission of power import from the Central China Grid | | 0.7974423×11,100= 8,851.61$tCO_2e$ | | | | |
| Total emission (Q) | | 198,755,406.84$tCO_2e$ | | | | |
| Supply to the Southern Grid (P) | | 208,736,900MWh | | | | |
| OM Emission Factor (=Q/P) | | 0.952181$tCO_2e$/MWh | | | | |

*Data sources: China Energy Statistical Yearbook 2006； 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy, p.1.21-p.1.24*

**Table 8–Energy Consumption Statistics of Power Generation of the Southern Grid in 2004**

| Fuel | Unit | Guangdong A | Guangxi B | Guizhou C | Yunnan D | Subtotal =A+B+C+D |
|---|---|---|---|---|---|---|
| Raw coal | Ten thousand Tons | 6,017.70 | 1,305.00 | 2,643.90 | 1,751.28 | 11,717.88 |
| Clean coal | Ten thousand Tons | 0.21 | 0.00 | 0.00 | 0.00 | 0.21 |
| Other washed coal | Ten thousand Tons | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coke | Ten thousand Tons | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Coke oven gas | Ten thousand Tons | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Other gas | $10^8$ Cubic meter | 2.58 | 0.00 | 0.00 | 0.00 | 2.58 |
| Crude oil | $10^8$ Cubic meter | 16.89 | 0.00 | 0.00 | 0.00 | 16.89 |
| Gasoline | Ten thousand Tons | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Diesel oil | Ten thousand Tons | 48.88 | 0.00 | 0.00 | 1.83 | 50.71 |
| Fuel oil | Ten thousand Tons | 957.71 | 0.00 | 0.00 | 0.00 | 957.71 |
| LPG | Ten thousand Tons | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Refinery gas | $10^8$Cubic meter | 2.86 | 0.00 | 0.00 | 0.00 | 2.86 |
| Natural gas | $10^8$Cubic meter | 0.48 | 0.00 | 0.00 | 0.00 | 0.48 |
| Other petroleum products | $10^8$Cubic meter | 1.66 | 0.00 | 0.00 | 0.00 | 1.66 |
| Other coking products | Ten thousand Tons | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Other E (standard coal) | Ten thousand Tons | 79.42 | 0.00 | 0.00 | 0.00 | 79.42 |

*Data Source: China Energy Statistical Yearbook 2005.*

**Table 9- The Operation Margin Emission Factor Calculation of the Southern Grid in 2004**

| Fuel | Unit | Fuel Consumption in the SCPG (E) | Emission Factor （tC/TJ） (F) | Oxidation Rate (%) G | Average NCV ($MJ/t,km^3$) H | $CO_2$Emission ($tCO_2e$) I=G*H*F*E*44/12/10000（in mass） I=G*H*F*E*44/12/1000 (in volume) |
|---|---|---|---|---|---|---|
| Raw coal | Ten thousand Tons | 11,717.88 | 25.80 | 100 | 20,908 | 231,767,573.55 |
| Clean coal | Ten thousand Tons | 0.21 | 25.80 | 100 | 26,344 | 5,233.50 |
| Other washed coal | Ten thousand Tons | 0.00 | 25.80 | 100 | 8,363 | 0.00 |
| Coke | Ten thousand Tons | 0.00 | 25.80 | 100 | 28,435 | 0.00 |
| Coke oven gas | $10^8$ Cubic meter | 0.00 | 12.10 | 100 | 16,726 | 0.00 |
| Other gas | $10^8$ Cubic meter | 2.58 | 12.10 | 100 | 5,227 | 59,831.38 |
| Crude oil | Ten thousand Tons | 16.89 | 20.00 | 100 | 41,816 | 517,932.98 |
| Gasoline | Ten thousand Tons | 0.00 | 18.90 | 100 | 43,070 | 0.00 |
| Diesel oil | Ten thousand Tons | 50.71 | 20.20 | 100 | 42,652 | 1,601,975.28 |
| Fuel oil | Ten thousand Tons | 957.71 | 21.10 | 100 | 41,816 | 30,983,494.25 |
| LPG | $10^8$Cubic meter | 0.00 | 17.20 | 100 | 50,179 | 0.00 |
| Refinery gas | $10^8$Cubic meter | 2.86 | 18.20 | 100 | 46,055 | 87,899.34 |
| Natural gas | $10^8$Cubic meter | 0.48 | 15.30 | 100 | 38,931 | 104,833.40 |
| Other petroleum products | Ten thousand Tons | 1.66 | 20.00 | 100 | 38,369 | 46,707.86 |
| Other coking products | Ten thousand Tons | 0.00 | 25.80 | 100 | 28,435 | 0.00 |
| Other E (standard coal) | Ten thousand Tce | 79.42 | 0.00 | 100 | 0 | 0.00 |
| $CO_2$ emission of power import from the Central China Grid | | 0.8264484×10,951,240=9,050,630.40$tCO_2e$ | | | | |
| Total emission (Q) | | 274,226,116.64$tCO_2e$ | | | | |
| Supply to the Southern Grid (P) | | 258,317,469MWh | | | | |
| OM Emission Factor (=Q/P) | | 1.061586$tCO_2e$/MWh | | | | |

*Data sources: China Energy Statistical Yearbook 2006； 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy, p.1.21-p.1.24*

**Table 10– Energy Consumption Statistics of Power Generation of the Southern Grid in 2005**

| Fuel | Unit | Guangdong A | Guangxi B | Guizhou C | Yunnan D | Total E=A+B+C+D |
|---|---|---|---|---|---|---|
| Raw coal | Ten thousand Tons | 6,696.47 | 1,435 | 3,212.31 | 1,975.55 | 13,319.33 |
| Clean coal | Ten thousand Tons | 0.00 | 0.00 | 0.00 | 0.15 | 0.15 |
| Other washed coal | Ten thousand Tons | 0.00 | 0.00 | 10.39 | 33.88 | 44.27 |
| Coke | Ten thousand Tons | 4.79 | 0.00 | 0.00 | 8.05 | 12.84 |
| Coke oven gas | $10^8$ Cubic meter | 0.00 | 0.00 | 0.00 | 0.79 | 0.79 |
| Other gas | $10^8$ Cubic meter | 1.87 | 0.00 | 0.00 | 15.96 | 17.83 |
| Crude oil | Ten thousand Tons | 10.91 | 0.00 | 0.00 | 0.00 | 10.91 |
| Gasline | Ten thousand Tons | 0.68 | 0.00 | 0.00 | 0.00 | 0.68 |
| Diesel oil | Ten thousand Tons | 31.96 | 2.02 | 0.00 | 1.81 | 35.79 |
| Fuel oil | Ten thousand Tons | 887.21 | 0.00 | 0.00 | 0.00 | 887.21 |
| LPG | Ten thousand Tons | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Refinery gas | Ten thousand Tons | 4.92 | 0.00 | 0.00 | 0.00 | 4.92 |
| Natural gas | $10^8$ Cubic meter | 0.93 | 0.00 | 0.00 | 0.00 | 0.93 |
| Other petroleum products | Ten thousand Tons | 1.70 | 0.00 | 0.00 | 0.00 | 1.7 |
| Other coking products | Ten thousand Tons | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Other Energy | Ten thousand Tce | 104.66 | 133.15 | 0.00 | 59.72 | 297.53 |

*Data Source: China Energy Statistical Yearbook 2006*

**Table 11– The Operation Margin Emission Factor Calculation of the Southern Grid in 2005**

| Fuel | Unit | Fuel Consumption in the SCPG (E) | Emission Factor （tC/TJ） (F) | Oxidation Rate (%) G | Average NCV ($MJ/t,km^3$) H | $CO_2$Emission ($tCO_2e$) I=G*H*F*E*44/12/10000（in mass） I=G*H*F*E*44/12/1000 (in volume) |
|---|---|---|---|---|---|---|
| Raw coal | Ten thousand Tons | 13,319.33 | 25.80 | 100 | 20,908 | 263,442,601.85 |
| Clean coal | Ten thousand Tons | 0.15 | 25.80 | 100 | 26,344 | 3,738.21 |
| Other washed coal | Ten thousand Tons | 44.27 | 25.80 | 100 | 8,363 | 350,237.59 |
| Coke | Ten thousand Tons | 12.84 | 25.80 | 100 | 28,435 | 345,389.71 |
| Coke oven gas | $10^8$ Cubic meter | 0.79 | 12.10 | 100 | 16,726 | 58,624.07 |
| Other gas | $10^8$ Cubic meter | 17.83 | 12.10 | 100 | 5,227 | 413,485.84 |
| Crude oil | Ten thousand Tons | 10.91 | 20.00 | 100 | 41,816 | 334,555.88 |
| Gasline | Ten thousand Tons | 0.68 | 18.90 | 100 | 43,070 | 20,296.31 |
| Diesel oil | Ten thousand Tons | 35.79 | 20.20 | 100 | 42,652 | 1,130,638.84 |
| Fuel oil | Ten thousand Tons | 887.21 | 21.10 | 100 | 41,816 | 28,702,703.26 |
| LPG | Ten thousand Tons | 0.00 | 17.20 | 100 | 50,179 | 0.00 |
| Refinery gas | Ten thousand Tons | 4.92 | 18.20 | 100 | 46,055 | 151,211.46 |
| Natural gas | $10^8$ Cubic meter | 0.93 | 15.30 | 100 | 38,931 | 203,114.71 |
| Other petroleum products | Ten thousand Tons | 1.70 | 20.00 | 100 | 38,369 | 47,833.35 |
| Other coking products | Ten thousand Tons | 0.00 | 25.80 | 100 | 28,435 | 0.00 |
| Other Energy | Ten thousand Tce | 297.53 | 0.00 | 100 | 0 | 0.00 |
| Emission of electricity from the Central China Grid | | 0.7712249×96,363,000=74,317,554.67$tCO_2e$ | | | | |
| Total Emission (Q) | | 369,521,974.54$tCO_2e$ | | | | |
| Thermal Power supplied to the Southern Grid (P) | | 365,532,531MWh | | | | |
| OM Emission Factor [=Q/P] | | 1.010914$tCO_2e$/MWh | | | | |

*Data sources: China Energy Statistical Yearbook 2006； 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy, p.1.21-p.1.24*

**Table 12- Calculation of average emission factor for the Southern Grid in recent 3 years**

| Years | 2003 | 2004 | 2005 |
|---|---|---|---|
| Total $CO_2$ Emission ($tCO_2e$) | 198,755,407 | 274,226,117 | 369,521,975 |
| Total supply （MWh） | 208,736,900 | 258,317,469 | 365,532,531 |
| Full-weighted average OM | = (198,755,407+274,226,117+369,521,975) / (208,736,900 +258,317,469 +365,532,531) = 1.011911$tCO_2e$/MWh | | |

**Table 13–Calculation of Ratio of Solid, Liquid and Gas fuel in total $CO_2$ Emission**

| Fuel | | Unit | Guangdong | Guangxi | Guizhou | Yunnan | Total | NCV kJ/kg kJ/m$^3$ H | Emission Factor I | Oxidation Rate J(%) | $CO_2$ emission ($tCO_2e$) | $\lambda_{Coal}$ , $\lambda_{Oil}$ $\lambda_{Gas}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Solid | Raw coal | $10^4$ Tons | 6,696.47 | 1,435.00 | 3,212.31 | 1,975.55 | 13,319.33 | 20,908 | 25.80 | 100 | 263,442,602 | - |
| | Clean coal | $10^4$ Tons | 0.00 | 0.00 | 0.00 | 0.15 | 0.15 | 26,344 | 25.80 | 100 | 3,738 | - |
| | Other washed coal | $10^4$ Tons | 0.00 | 0.00 | 10.39 | 33.88 | 44.27 | 8,363 | 25.80 | 100 | 350,238 | - |
| | Coke | $10^4$ Tons | 4.79 | 0.00 | 0.00 | 8.05 | 12.84 | 28,435 | 25.80 | 100 | 345,390 | - |
| | Subtotal | - | - | - | - | - | - | - | - | - | 264,141,967 | 89.48 % |
| Liquid | Crude oil | $10^4$ Tons | 10.91 | 0.00 | 0.00 | 0.00 | 10.91 | 41,816 | 20.00 | 100 | 334,556 | - |
| | Gasoline | $10^4$ Tons | 0.68 | 0.00 | 0.00 | 0.00 | 0.68 | 43,070 | 18.90 | 100 | 20,296 | - |
| | Coal oil | $10^4$ Tons | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 43,070 | 19.60 | 100 | 0.00 | - |
| | Diesel oil | $10^4$ Tons | 31.96 | 2.02 | 0.00 | 1.81 | 35.79 | 42,652 | 20.20 | 100 | 1,130,639 | - |
| | Fuel oil | $10^4$ Tons | 887.21 | 0.00 | 0.00 | 0.00 | 887.21 | 41,816 | 21.10 | 100 | 28,702,703 | - |
| | Other petroleum products | $10^4$ Tons | 1.70 | 0.00 | 0.00 | 0.00 | 1.70 | 38,369 | 20.00 | 100 | 47,833 | - |
| | Subtotal | - | - | - | - | - | - | - | - | - | 30,236,028 | 10.24 % |
| Gas | Natural gas | $10^7$ m$^3$ | 9.30 | 0.00 | 0.00 | 0.00 | 9.30 | 38,931 | 15.30 | 100 | 203,115 | - |
| | Coke oven gas | $10^7$ m$^3$ | 0.00 | 0.00 | 0.00 | 7.90 | 7.90 | 16,726 | 12.10 | 100 | 58,624 | - |
| | Other gas | $10^7$ m$^3$ | 18.70 | 0.00 | 0.00 | 159.60 | 178.30 | 5,227 | 12.10 | 100 | 413,486 | - |
| | LPG | $10^4$ Tons | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 50,179 | 17.20 | 100 | 0 | - |
| | Refinery gas | $10^4$ Tons | 4.92 | 0.00 | 0.00 | 0.00 | 4.92 | 46,055 | 18.20 | 100 | 151,211 | - |
| | Subtotal | - | - | - | - | - | - | - | - | - | 826,436 | 0.28% |
| Total | | - | - | - | - | - | - | - | - | - | 295,204,431 | 100% |

**Table 14–Calculation of the Emission Factor for Coal-fired, oil-fired and Gas-fired Power**

| | Variable | Supply Efficiency J | Emission Factor of fuel F (tc/TJ) | Oxidation Rate G (%) | Emission Factor ($tCO_2e$/MWh) =3.6/J/1000*F*G*44/12 |
|---|---|---|---|---|---|
| Coal-fired | $EF_{Coal,Adv}$ | 35.82% | 25.80 | 100 | 0.9508 |
| Gas-fired | $EF_{Gas,Adv}$ | 47.67% | 15.30 | 100 | 0.4237 |
| Oil-fired | $EF_{Oil,Adv}$ | 47.67% | 21.10 | 100 | 0.5843 |

The emission factor of thermal power is:

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} = 0.9117 tCO_2e/MWh.$$

**Table 15–The Installed Capacity of the Southern Grid 2003**

| Installed Capacity | Guangdong | Guangxi | Guizhou | Yunnan | Tianshengqiao | Subtotal |
|---|---|---|---|---|---|---|
| Thermal power(MW) | 27,231.40 | 3,190.10 | 3,556.80 | 6,465.80 | 0.00 | 40,444.10 |
| Hydro power(MW) | 8,107.20 | 4,525.20 | 6,543.20 | 3,713.70 | 2,520.00 | 25,409.30 |
| Nuclear power(MW) | 3,780.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3,780.00 |
| Wind power and other(MW) | 83.40 | 0.00 | 0.00 | 0.00 | 0.00 | 83.40 |
| Total (MW) | 39,202.00 | 7,715.30 | 10,100.00 | 10,179.50 | 2,520.00 | 69,716.80 |

*Data Source: China Energy Statistical Yearbook 2004.*

**Table 16–The Installed Capacity of the Southern Grid 2004**

| Installed Capacity | Guangdong | Guangxi | Guizhou | Yunnan | Subtotal |
|---|---|---|---|---|---|
| Thermal power(MW) | 30,172.90 | 4,378.10 | 4,306.90 | 7,801.80 | 46,659.70 |
| Hydro power(MW) | 8,584.60 | 5,040.40 | 7,058.60 | 6,896.50 | 27,580.10 |
| Nuclear power(MW) | 3,780.00 | 0.00 | 0.00 | 0.00 | 3,780.00 |
| Wind power and other(MW) | 83.40 | 0.00 | 0.00 | 0.00 | 83.40 |
| Total (MW) | 42,620.90 | 9,418.50 | 11,365.50 | 14,698.30 | 78,103.30 |

*Data Source: China Energy Statistical Yearbook 2005, Tianshenqiao power station is included in Guizhou.*

**Table17–The Installed Capacity of the Southern Grid 2005**

| Installed Capacity | Guangdong | Guangxi | Guizhou | Yunnan | Subtotal |
|---|---|---|---|---|---|
| Thermal power(MW) | 35,182.60 | 4,931.20 | 4,758.40 | 9,634.80 | 54,507.00 |
| Hydro power(MW) | 9,035.70 | 6,085.30 | 7,993.10 | 7,233.00 | 30,347.10 |
| Nuclear power(MW) | 3,780.00 | 0.00 | 0.00 | 0.00 | 3,780.00 |
| Wind power and | 83.40 | 0.00 | 0.00 | 0.00 | 83.40 |

| | | | | | |
|---|---|---|---|---|---|
| other(MW) | | | | | |
| Total (MW) | 48,081.70 | 11,016.50 | 12,751.50 | 16,867.80 | 88,717.50 |

*Data Source: China Energy Statistical Yearbook 2006, Tianshenqiao power station is included in Guizhou.*

**Table18–The Calculation of BM Emission Factor for the Southern Grid**

| | 2003 | 2004 | 2005 | New addition 2003-2005 | The Ratio in new addition |
|---|---|---|---|---|---|
| Thermal power(MW) | 40,444.10 | 46,659.70 | 54,507.00 | 14,062.90 | 74.01% |
| Hydro power(MW) | 25,409.30 | 27,580.10 | 30,347.10 | 4,937.80 | 25.99% |
| Nuclear power(MW) | 3,780.00 | 3,780.00 | 3,780.00 | 0.00 | 0.00% |
| Wind power (MW) | 83.40 | 83.40 | 83.40 | 0.00 | 0.00% |
| Total(MW) | 69,716.80 | 78,103.30 | 88,717.50 | 19,000.70 | 100.00% |
| Ratio of installed capacity in 2005 | 78.58% | 88.04% | 100.00% | - | - |

$EF_{BM,y} = 0.9117 \times 74.01\% = 0.6748$ $tCO_2e/MWh$.

The OM is calculated as 1.0119$tCO_2e/MWh$, the BM is calculated as 0.6748$tCO_2e/MWh$. And the baseline emission factor equal to the combined margin with equally weighted average of the operating margin emission factor and the build margin emission factor.

According to ACM0002 (version 6), the default weight of hydropower is:

$w_{OM} = 0.5 \qquad w_{BM} = 0.5$

So the Baseline Emissions Factor ( $EF_y$ in $tCO_2e/MWh$) is 0.84335$tCO_2e/MWh$.

## Annex 4

## MONITORING INFORMATION

**Selection procedure:**
The monitoring officer will be appointed by the general manager of Dehong Furong Dayingjiang Hydroelectric Power Development Co., Ltd. The monitoring officer will be selected among the senior technical or managerial staff. Before he/she commences monitoring duties, he/she will receive training on monitoring requirements and procedures by Beijing Tianqing Power International CDM Consulting, Co., Ltd.

The selection of the initial monitoring officer has taken place and the following person was appointed:
Name:
Position:

**Tasks and responsibilities:**
The monitoring officer will be responsible for carrying out the following tasks

- **Supervise and verify metering and recording:** The monitoring officer will coordinate with the plant manager to ensure and verify adequate metering and recording of data, including power delivered to the grid.
- Collection of additional data, sales / billing receipts: The monitoring officer will collect sales receipts for power delivered to the grid, billing receipts for power delivered by the grid to the hydropower station and additional data such as the daily operational reports of the hydropower station.
- Calibration: The monitoring officer will coordinate with staff of the project entity to ensure that calibration of the metering instruments is carried out periodically in accordance with regulations of the grid company.
- Calculation of emission reductions: The monitoring officer will calculate the annual emission reductions on the basis of net power supply to the grid. The monitoring officer will be provided with a calculation template in electronic form by the project's CDM advisors.
- Preparation of monitoring report: The monitoring officer will annually prepare a monitoring report which will include among others a summary of daily monthly operations, metering values of power supplied to and received from the grid, copies of sales/billing receipts, a report on calibration and a calculation of emission reductions.

**Support:**
The monitoring officer will receive support from Beijing Tianqing Power International CDM Consulting, Co., Ltd., Ltd in his/her responsibilities through the following actions:

- Initial training on CDM, monitoring methodology, monitoring procedures and requirements and archiving
- Provide the monitoring officer with a calculation template in electronic form for calculation of annual emission reductions
- Continuous advice to the monitoring officer on a need basis
- Review of monitoring reports