CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
VERSION 03 - IN EFFECT AS OF: 22 DECEMBER 2006

CONTENTS

Annexes

Revision history of this document

Version Number	Date	Description and reason of revision
Version 1.0	29/08/2006	Draft PDD
Version 2.0	28/09/2006	Revised Draft PDD
Version 3.0	30/05/2007	Revised according to on-site interview.
Version 4.0	18/09/2007	Revised PDD for validation protocol.
Version 5.0	16/01/2008	Revised according to DOE's opinions.
Version 6.0	28/04/2008	Only revise the emission factor and emission reduction based on NDRC

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

Taohua 9MW Hydro Power Project in Guizhou Province, China

The version 6.0 PDD was completed on 28/04/2008

A.2. Description of the small-scale project activity:

Taohua Hydro Power Project is located in Wangsi Town, Duyun City in Guizhou Province with the installed capacity 9MW.The proposed project was developed by the *Water Resource Bureau* of Qiannan district and started to construct in 1996, but the proposed project was shut down in 1998 because of short fund. In 2004 the project owner purchased this project and continued to develop this project according to the stipulation of CDM.

The hinge of the power project includes the arch dam with the height of 40.2m, the hydropower tunnels with the length of 206m and the power plant. There are 2 generators with the type of SF3000-22/3250 and 1 generator with the type of SF3000-20/3250, and 2 turbines with the type of HLD74-LJ-150 and 1 turbine with type of HLF13-LJ-140.The electricity generated by the proposed project will be connected to Guizhou Province Power Grid, finally to China Southern Power Grid. The annual electricity generation is 37,800MWh, and the annual feed-in electricity to the grid is 36,670MWh[1]. Electricity generated by the proposed project will displace part of the electricity generated by China Southern Power Grid which is dominated by fossil fuel-fired power plants, and thus greenhouse gas (GHG) emission reductions could be achieved. The estimated annual GHG emission reductions of Taohua project are 27,626 tCO_2e[2].

As a renewable hydro power project, the proposed project will produce positive environmental and economic benefits and contribute to the local sustainable development through following aspects:

- To be consistent with China’s national energy policy and the Western Development Strategy, will alleviate power shortage in the local areas, will improve the local poor condition and advance the standard of living of local people.
- To displace part of the electricity from coal-fired power plants, and thus will avoid environmental pollution caused by coal burning.
- To create new job opportunities for the local people. In the construction period, the rural labour force can be arranged.11 long-term job opportunities will be provided in the operation period[3].
- After the operation of the proposed project, the local people can make good use of electricity instead of biomass, especially firewood, which can reduce the destroying to local vegetation and protect the environment.

A.3. Project participants:

Table 1 The information of the project participants

1 Refer to The mainly technical-economic indices clarification document of Taohua Hydro Power Project.
2 The results were calculated by the emission reduction factor, which is announced by national Development and Reformer Commission(NDRC) and revised by DOE.
3 Refer to the actual personnel arrangement of Taohua Hydro Power Project.

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)	*Guizhou Qiannan Zhongshui Hydro Power Development Co.Ltd.(Project owner)*	*No*
United Kingdom of Great Britain and Northern Ireland	*ICECAP Carbon Portfolio Limited(buyer)*	*No*

The detailed information of participants is included in Annex 1.

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

A.4.1.1. Host Party(ies):

People's Republic of China

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

Guizhou Province

A.4.1.3. City/Town/Community etc:

Wangsi Town, Duyun City

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

The proposed project is sited on Mawei River, and sited in Wangsi Town, Duyun City, Guizhou Province. The geographical coordinates are east longitude 107°41′12″ and north latitude26°11′12″.Figure 1 shows the location of the proposed project.

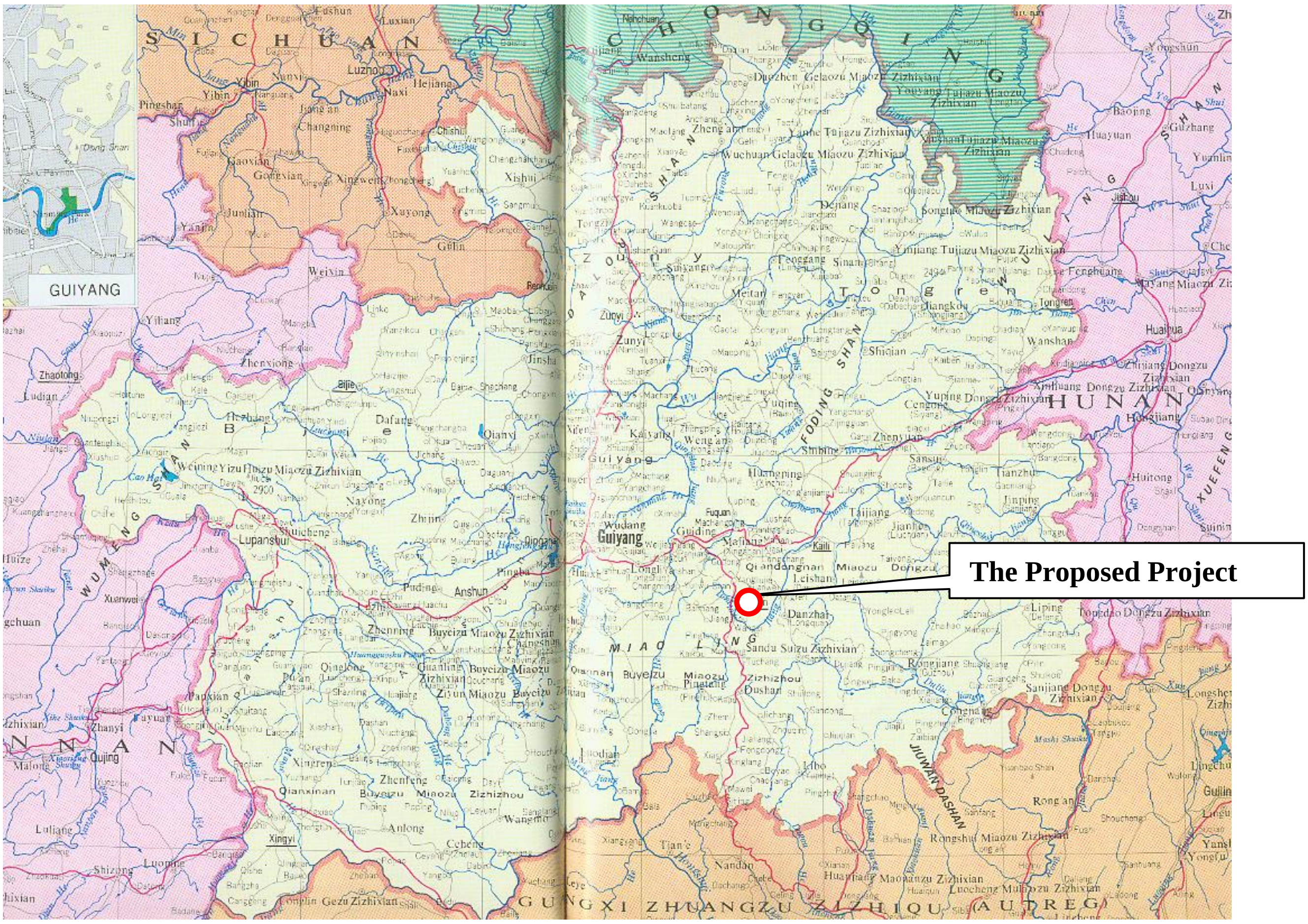

Figure 1. Geographical Location of the Proposed Project

A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

According to Appendix B of the simplified procedures for small-scale activities, the type and category of the proposed project is as follows:

Type I - *Renewable Energy Project*;

Category I.D. - *Grid Connected Renewable Electricity Generation*.

Sub-category I.D.- Hydro Power

The proposed project adopts the hydro power generation technology as follows. The constructions include the dam, the intake power tunnel, the pressure pipelines and the equipments. The height of the gravity dam is 40.2m and the normal water level is 715m.The length of the diversion tunnels is 206m.The collocation type of the pressure pipelines is "one pipeline, one machine", with the diameter of 1.8m and the length of 108m.The flux used for power generation is $3\times13.7m^3/s$, and the weighted average water head is 26.5m.The installed capacity of the proposed project is 9MW(3×3MW). There are 2 generators with the type of SF3000-22/3250 and 1 generator with the type of SF3000-20/3250, and 2 turbines with the type of HLD74-LJ-150 and 1 turbine with type of HLF13-LJ-140. There is a main substation with the type of S9-12500/35 These equipments are domestic. In terms of the connection power system, the 35KV pipelines with the length of 12km will be adopted to connect to Bagu 35KV Transformer Substation.

The technology adopted by the proposed project is national technology, so the technology transfer is not involved in the proposed project.

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

The estimated annual emission reductions of the proposed project are 27,626 tCO_2e. The renewable crediting period of 7 years×3 is chosen, and in the first crediting period from 20/02/2008 to 19/02/2015, the total emission reductions are estimated to be *193,382*tCO_2e.

Table 2 Estimated amount of emission reductions over the chosen crediting period

Year	*Annual emission reductions（tCO_2e）*
20/02/2008～19/02/2009	*27,626*
20/02/2009～19/02/2010	*27,626*
20/02/2010～19/02/2011	*27,626*
20/02/2011～19/02/2012	*27,626*
20/02/2012～19/02/2013	*27,626*
20/02/2013～19/02/2014	*27,626*
20/02/2014～19/02/2015	*27,626*

Total emission reductions (tCO_2e)	*193,382*
The length of the crediting period(Year)	*7*
Annual emission reductions in the crediting period (tCO_2e)	*27,626*

A.4.4. Public funding of the small-scale project activity:

No official development assistant (ODA) from Annex I Parties is involved in the proposed project.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

The proposed project is 4.5km away from the downstream Mingying(3.75MW) hydro power project which is now requesting small-scale CDM project too. The two projects:

- have the same project participants;
- have the same project category and technology/measure;

but:

- they have different GPS information;
- the total installed capacity of the two projects are only 12.75MW which is not bigger than 15MW.

Therefore, this proposed project is not a debundled component of a large scale project activity.

SECTION B. Application of a baseline and monitoring methodology

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

The methodology applied for the proposed project is the approved methodology for small-scale CDM project- "AMS-I.D. Grid connected renewable electricity generation" (version 10). For more information regarding the methodology, please refer to the link: http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html.

Furthermore, the ACM0002 (version 6) "Consolidated baseline and monitoring methodology for grid-connected electricity generation from renewable sources" is also adopted. For more information regarding the methodology, please refer to the link:

http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html.

B.2 Justification of the choice of the project methodology:

The methodology AMS-I.D. is applicable to renewable energy generation units that supply electricity to an electricity grid, which is the case for the proposed project. Moreover, the size of the proposed project is 9MW, which is well within the limit of 15 MW stipulated by the chosen (small-scale) methodology. the area of the reservoir is 1,670,000m^2,and the power density is 5.39W/m^2. so the project emission will be included. The proposed project qualifies as a small-scale project activity and the capacity will remain within the limits of small-scale project activity types during every year of the crediting period. Therefore, the methodology AMS-I.D. is applicable to the proposed project.

B.3. Description of the project boundary:

Based on the methodology AMS-I.D., the project boundary encompasses the physical, geographical site of the renewable generation source. The electricity displaced by the proposed project should be the electricity generated by Guizhou Power Grid, which is a part of China Southern Power Grid. According to the guideline published on December 15, 2006 by China DNA[1], the geographical range of China South Power Grid includes Guangdong Power Grid, Guangxi Power Grid, Guizhou Power Grid and Yuannan Power Grid. Therefore, the spatial scope of the project boundary covers all power plants physically connected into China Southern Power Grid.

B.4. Description of baseline and its development:

In the absence of the proposed project, the possible alternatives to the proposed project would be as follow:

1) The proposed project activity, but not undertaken as CDM project activity;

2) Construction of a fossil fuel-fired power plant with equivalent amount of annual electricity output or installed capacity;

3) Construction of a power plant using other sources of renewable energy with equivalent amount of annual electricity output; and

4) Provision of equivalent amount of annual power output by the grid (China Southern Power Grid) where the proposed project is connected into.

Of the four baseline scenarios,

Baseline scenario 1 has been excluded for it is not commercially viable as analyzed in investment analysis of section B.5.
Without CERs sales revenues,IRR of total investment of the project is lower than benchmark therefore, the Project not undertaken as a CDM project activity satisfies China's regulations, but is not economically attractive, and baseline scenario 1 is not feasible.

Baseline scenario 2, has been excluded for it conflicts with China's current regulations.

the installed capacity of the Project is 9 MW, considering the same annual electricity generation; the alternative for the Project should be a fuel-fired power plant with installed capacity lower than 9 MW. Further, as the Project is a grid-connected hydropower generation project, the alternative must be a grid-connected fuel-fired power generation project. However, according to China's regulations, construction of fuel-fired power plants with the installed capacity lower than 135 MW is prohibited in the areas which can be covered by large grids such as provincial grids. [2]

For these reasons, the possible alternative of building a fuel-fired power plant with an installed capacity lower than 9 MW conflicts with China's current regulations. Therefore, baseline scenario 2 is not feasible.
Baseline scenario 3, other renewable energy resources (such as wind power, solar power and geothermal etc.) are relatively spare. Furthermore, electricity generation from other renewable sources also faces the difficulties and barriers of technology and investment. The economic return of other renewable power plants with similar amount of capacity should be little attractiveness. Therefore, baseline scenario 3 is not feasible as a realistic and credible alternative scenario.

For Alternative 4, the installed capacity of the China Southern Power Grid for both the existing power plants and the power plants to be built in a foreseeable future satisfies China's regulations, which is also economically feasible.

In conclusion, the practical and feasible baseline scenario is baseline scenario 4, the Provision of an equivalent amount of annual power output by the China Southern Power Grid into which the Project is connected.

1 http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1364.pdf

2 Notice on Strictly Prohibiting the Installation of Fuel-fired Generators with the Capacity of 135 MW or Belowissued by the General Office of the State Council, decree no. 2002-6

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 small-scale CDM project activity:

Additionality of the proposed project is demonstrated based on the requirement of Appendix A to the *Simplified Modalities and Procedures for Small-scale CDM Project Activities*.

The additionality of the proposed project will be demonstrated from investment analysis.

According to "Economic evaluation code for small hydropower projects" (SL 16-95) issued by Ministry of Water Resources, the benchmark FIRR on total investment for hydro power projects is 10%.

Based on the important parameters of the proposed project, the IRR change of the proposed project with CDM and without CDM is calculated. The main parameters are as follows.

Table3 Main parameters for the calculation of financial indicators

Item	Unit	Value	Date source
Installed capacity	MW	9	The approval document by Qiannan district DRC
The total static investment	Million Yuan	67.89	The economic assessment
Annual O&M cost	Million Yuan	0.64	The economic assessment
Annual grid-connected electricity generation	MWh/year	36670	The economic assessment
Electricity Tariff (Including VAT)	Yuan/kWh	0.2034	The economic assessment
Value Added Tax (VAT)	%	6	The economic assessment
Town building maintenance tax	%	5	The economic assessment
Surcharge for education	%	3	The economic assessment
Income tax	%	33	The economic assessment
Expected CERs Price	EUR/ tCO_2e	8.5	
Project life time	Year	28	The economic assessment

The FIRRs with and without the income from CERs sale are listed in table 4 below. Without the income from CERs, the FIRR of the proposed project is 5.29%, greatly lower than the benchmark FIRR set in SL

16-95, so the proposed project is financially unacceptable. With the income from CERs, the FIRR is increased to 9.05%, financially acceptable[5].

Table4 Comparison of financial indicators with and without income from CERs

Item	Unit	Without the income from CERs	Benchmark rate	With the income from CERS
FIRR of total investment	%	5.29	10	9.05

The sensitive analysis is done in the following. Assuming the three factors such as total static investment, annual operation and maintenance cost and annual sales from electricity vary in the range of -10%~+10%，whether the proposed project is all the same unattractive without CDM. The influence of the three factors on FIRR of the project (without CDM) in shown in Figure 2.

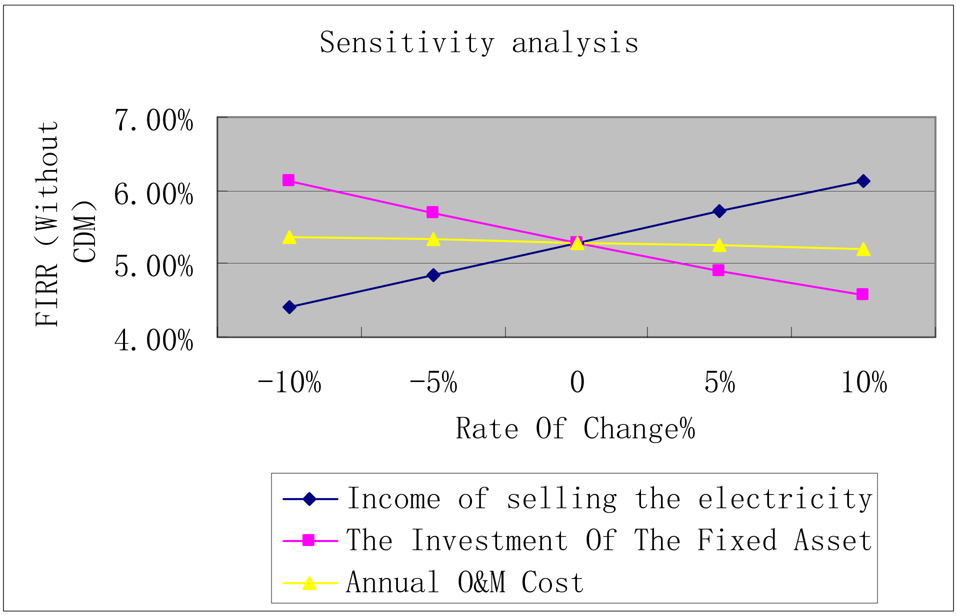

Figure 2 Sensitivity analysis of the proposed project

From the above figure 2, it can be shown that FIRR can be decreased with the increase of the investment of the fixed asset and annual O&M cost, and can be increased with the raising of the income of selling the electricity. Furthermore, if the FIRR is needed to achieve 10%, the investment of the fixed asset may be decreased by more than 10%, but the proposed project has been in construction and has broken the budgetary estimate because of increase of the material price, so it is impossible of decrease 10% of the investment of the fixed asset. Or the annual O&M cost may be decreased by more than 10%, but the related factors of annual O&M cost is relatively fixed, so it is impossible of decrease 10% of annual O&M cost. Or the income of selling the electricity may be increased by more than 10%, but the tariff is fixed through PPA and the electricity generation is relatively fixed, so it is impossible of increase 10% of the income of selling the electricity. Therefore, it is impossible for the three factors to change so much. Therefore, when the above three factors vary in the range of -10%~+10%, the proposed project has no attractiveness, still less than benchmark FIRR 10%.

5 Refer to FIRR Calculation Table.

Based on the above investment analysis, without CDM, the proposed project is not attractive below the benchmark of commercial operation. Moreover, the project are independently invested, constructed and operated by private enterprises who assume a relatively high risk in investment, technology, and plant management, which needs CDM support.

Furthermore, if the proposed project can be registered as CDM projects, the CDM revenues can improve the poor financial index of the proposed project, make the project more financial attractive, reduce the pressure from long-term investment needed by the proposed project and cash flow risks, and reduce the risks of low bus-bar tariff and unstable electricity generation. If the proposed project can't be registered as CDM project, the revenue which could contribute to the local finance and the job opportunity supported by the project would be impossible. The project also would face seriously pressure of outstanding loans. Furthermore, the project would be out of operation since the cash flow breaks off. And it is difficult to conquer the barriers and the project is not feasible. In absence of CDM, the emission reductions generated by the proposed project can come true.

In conclusion, the proposed project is additional and can reduce the greenhouse gas emission, not (part of) the baseline scenario.

B.6.Emission reductions:

B.6.1. Explanation of methodological choices:

Baseline Emissions

According to baseline methodology ACM0002, the baseline emissions are the CO_2 emissions from the equivalent electricity generation in CSPG that are displaced by the project activity. According to baseline methodology ACM0002, the baseline emission factor (EF_y) is calculated as a Combined Margin (CM), which is consisting of the weighted average of Operating Margin (OM) emission factor and Build Margin (BM) factor by utilizing an ex-ante 3 years data vintage for the CSPG. The data used for calculation are from an official source (where available) and publicly available. The calculation processes are as follows:

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

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

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

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

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

Method (a) can be used where low-cost/must run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term normals for hydroelectricity production. It can be found from Table 9 that installed capacity of low-cost/must run resources constitute less than 50% of CSPG during year 2000 to 2004. Thus, method (a) is applicable to calculate $EF_{OM,y}$. And method (d) can only be used where low-cost/must run resources constitute more than 50% of total grid generation, therefore, method (d) is not applicable to calculate $EF_{OM,y}$.

Table5 Constitution of low-cost/must run resources in CSPG during year 2001～20056

Year	2001	2002	2003	2004	2005
Percentage (%)	34.27	32.33	31.62	31.06	28.01

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

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

Where:

$F_{i,j,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources *j* in year (s) *y*; *j* refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports to the grid;
$COEF_{i,j,y}$ is the CO_2 emission coefficient of fuel *i* (tCO_2 / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources *j* and the percent oxidation of the fuel in year (s) *y*; and
$GEN_{j,y}$ is the electricity (MWh) delivered to the grid by power sources *j*. The data is not available in *China Electric Power Yearbook,* so the $GEN_{j,y}$ is calculated as follow:

$GEN_{j,y}$ ＝*Electricity generation of power plants in CSPG* ×*(1* －*Internal use rate of power plants)* (3)

The CO_2 emission coefficient $COEF_i$ is obtained as:

$$COEF_i = NCV_i \cdot EF_{CO2,i} \cdot OXID_i \quad (4)$$

Where:

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

6 *China Electric Power Yearbook 2002～2006*

According to the deviation approach7 agreed by the 22nd CDM EB meeting for OM and BM calculation for Chinese power grids, if the detailed data at the power plant level of the grids, such as power generation quantity, internal use rate of power plants, fuel types, fuel consumption and fuel emission factors, etc., are not publicly available for the $EF_{OM,y}$ calculation, then as an alternative, the statistical data on aggregated power generation quantity, the internal use rate of power plants and fuel consumption which publicly available by the fuel types *i* and by province *j* covered by the power grid, can be used. So, the average power generation efficiencies (gce/kWh) and average emission factors of fuel *i* can be used. The fuel *i* based aggregated power generation and the related fuel consumption data are publicly available in *China Electric Power Yearbook* and *China Energy Statistical Yearbook*. Thus, the data quoted from these two kinds of yearbooks are used for $EF_{OM,y}$ calculation.

At the same time, according to ACM0002, the Simple OM can be calculated using either of the two following data vintages for years(s) *y*:

- (*ex-ante*) the full generation-weighted average for the most recent 3 years for which data are available at the time of PDD submission, if or,
- the year in which project generation occurs, if $EF_{OM,y}$ is updated based on *ex-post* monitoring.

There are power imports from the Central China Power Grid (CCPG) to CSPG, thus the imports are taken into account when calculates the OM.

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

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

According to baseline methodology ACM0002, the Build Margin emission factor ($EF_{BM,y}$) is calculated by utilizing an *ex-ante* 3 years data vintage for CSPG, the formulae as follow:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m,y}}{\sum_{m} GEN_{m,y}} \qquad (5)$$

Where：

$F_{i,m,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by plants *m* in year (s) *y*;
$COEF_{i,m,y}$ is the CO_2 emission coefficient of fuel *i* (tCO_2 / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by plants *m* and the percent oxidation of the fuel in year (s) *y*;
$GEN_{m,y}$ is the electricity (MWh) delivered to the grid by plants *m*. It equals to power generation minus power plants self power consumption.

ACM0002 provides two following options to calculate BM:

7 http://cdm.unfccc.int/User/Management/FileStorage/AM_CLAR_QEJWJEF3CFBP1OZAK6V5YXPQKK7WYJ

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

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

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

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

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

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

The project participants should use from these two options that sample group that comprises the larger annual generation.

Because of the same reasons as the data unavailability at the power plant level in China, the 22nd CDM EB meeting agreed the following deviation8 approaches for $EF_{BM,y}$ calculation:

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

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

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

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

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

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

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8 http://cdm.unfccc.int/User/Management/FileStorage/AM_CLAR_QEJWJEF3CFBP1OZAK6V5YXPQKK7WYJ

3) Calculating the $EF_{BM,y}$ through emission factor of thermal power plants times the percentage share of thermal power plants installed capacity addition within all recently built installed capacity. The proper year is selected so that it is the closest time when the last 20% of installed capacity was built.

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

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

$$\lambda_{Gas} = \frac{\sum_{i \in GAS,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad \lambda_{Oil} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad \lambda_{Gas} = \frac{\sum_{i \in GAS,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \qquad (6)$$

Where:

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

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

$$EF_{Thermal} = \lambda_{coal} \times EF_{coal,adv} + \lambda_{oil} \times EF_{oil,adv} + \lambda_{gasl} \times EF_{gas,adv} \qquad (7)$$

Where:

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

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

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

Where:

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

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

Step 3: Calculating the baseline emission factor (EF_y)

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

$$EF_y = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y} \qquad (9)$$

Where:

The weighs w_{OM} and w_{BM}, by default, are 50% (i.e., $w_{OM}= w_{BM}= 0.5$), and $EF_{OM,y}$ and $EF_{BM,y}$ are calculated as described in Steps 1 and 2 above and are expressed in tCO_2e/MWh.

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

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

$$BE_y=EG_y \cdot EF_y \qquad (10)$$

Where:

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

Project Emissions

The proposed project is a new small scale hydropower station, the power density is 5.39 W/m^2, which is greater than 4 W/m^2 and less than or equal to 10 W/m^2. According to ACM0002, the project emission of the proposed project should be considered by using following formula:

$$PE_y = \frac{EF_{\mathrm{Res}} * EG_y}{1000} \qquad (1)$$

Where:

PE_y is emission from reservoir expressed as tCO_2e/yr;
EF_{Res} is the default emission factor for emissions from reservoirs, and the default value as per EB 23 is 90 kg CO_2e/MWh;
EG_y is electricity produced by the hydro electric power project in year y, in MWh

Leakage

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

Emission Reductions

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

$$ER_y\ (tCO_2e/yr) = BE_y - PE_y - L_y \quad (11)$$

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

Data / Parameter:	EF_{OM}
Data unit:	tCO_2e/ MWh
Description:	OM emission factor ,the weighted average emission factor of power plants excluding the low operating cost/must run power plants, ex-ante calculation.
Source of data used:	Please see the Report on Determination of Baseline Grid Emission Factor by China DNA NDRC at http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1358.xls
Value applied:	1.0119
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to ACM0002
Any comment:	

Data / Parameter:	EF_{BM}
Data unit:	tCO_2e/ MWh
Description:	BM emission factor, the weighted average emission factor of the 20% most recent power plants built, ex-ante calculation.
Source of data used:	Please see the Report on Determination of Baseline Grid Emission Factor by China DNA NDRC at http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1365.pdf
Value applied:	0.6748
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to ACM0002
Any comment:	

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

and procedures actually applied :	
Any comment:	

Data / Parameter:	*$EF_{CO2,i}$*
Data unit:	tCO_2/TJ
Description:	The CO_2 emission factor per unit of fuel i
Source of data used:	*Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	No specific local value available, adopt the IPCC default value.
Any comment:	

Data / Parameter:	$G_{j,\ y}$
Data unit:	MWh
Description:	the electricity (MWh) generation by source j
Source of data used:	China Electric Power Yearbook
Value applied:	The electricity generation by Guangdong Province, Yunnan Province, Guizhou Province and Guangxi Zhuang Autonomous Region of China Southern Power Grid in year 2004, 2005 and 2006 please sees the Report on Determination of Baseline Grid Emission Factor by China DNA NDRC at http://cdm.ccchina.gov.cn.
Justification of the choice of data or description of measurement methods and procedures actually applied :	This kind of data accords with the latest version of ACM0002.
Any comment:	

Data / Parameter:	*Electricity imported from Central China Power Grid*
Data unit:	MWh
Description:	The electricity imported from Central China Power Grid in year *y*.
Source of data used:	Chinese DNA's Guideline of emission factors of Chinese grids
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	

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

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

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

Data / Parameter:	*NCV_i*
Data unit:	kJ/kg or kJ/m^3 or TJ/tce
Description:	The net calorific value (energy content) per mass or volume unit of fuel *i*
Source of data used:	The values are derived from *China Energy Statistical Yearbook 2006*.
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of	Data used are from Chinese authorities.

measurement methods and procedures actually applied :	
Any comment:	

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

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

B.6.3 Ex-ante calculation of emission reductions:

Project Emissions

The power density of the proposed project is 5.39 W/m^2, greater than 4 W/m^2 and lower than 10 W/m^2. According to baseline methodology ACM0002, it is needed to calculate project emissions. According to formula (1) in section B.6.1, the annual project emissions (PE_y) is calculated as follow:

$$PE_y = 36670 \times 90/1000 = 3300 tCO_2e/yr$$

According to 6.1, the project leakage are all equal to zero.

The emission baseline of this project equals EF_y multiplied by the total electricity generation . The total annual amount of electricity generation is proposed to be 36,670 MWh, so the CM of China South Grid is calculated by $EF_y = \omega_{OM} \times EF_{OM,y} + \omega_{BM} \times EF_{BM,y}$ =0.84335[9].

9 Refer to The mainly technical-economic indices clarification document of Taohua Hydro Power Project.

BEy=EGy×EFy=36,670×0.84335=30,926 tCO_2.

ERy=BEy-PEy-Ly=30,926-3,300-0=27,626tCO_2.

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

Table 6 Summary of the ex-ante estimation of emission reductions

Year	Estimation of project activity emission (tCO_2e)	Estimation of baseline emission (tCO_2e)	Estimation of Leakage emission(tCO_2e)	Estimation of emission reduction(tCO_2e)
20/02/2008～19/02/2009	3,300	30,926	0	27,626
20/02/2009～19/02/2010	3,300	30,926	0	27,626
20/02/2010～19/02/2011	3,300	30,926	0	27,626
20/02/2011～19/02/2012	3,300	30,926	0	27,626
20/02/2012～19/02/2013	3,300	30,926	0	27,626
20/02/2013～19/02/2014	3,300	30,926	0	27,626
20/02/2014～19/02/2015	3,300	30,926	0	27,626
Total(tCO_2e)	23,100	216,482	0	193,382

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

The proposed project adopts the en-ante calculation of emission factor of the grid, so only the electricity supplied to the grid generated by the proposed hydropower plants($EG_{PJ\ to\ Grid,\ y}$) and the captive electricity bought from the power grid($EG_{Grid\ to\ PJ,\ y}$) need be monitored in the crediting period.

B.7.1 Data and parameters monitored:

Table 7 The explanation of $EG_{PJ\ to\ Grid,\ y}$

(Copy this table for each data and parameter)	
Data / Parameter:	$EG_{PJ\ to\ Grid,\ y}$
Data unit:	MWh
Description:	Electricity supplied to the grid by the proposed project
Source of data to be used:	The ammeter data
Value of data applied for the purpose of calculating expected emission reductions in section B.5	36670
Description of measurement methods	The readings of electricity meter will be hourly measured and monthly recorded. Automatic measurement and automatic recording by computers.

and procedures to be applied:	Double checking by receipt of electricity sales. Electronic data will be archived for 2 years following the end of the crediting period.
QA/QC procedures to be applied:	The uncertainty level of this data is low. The measurement/ monitoring equipment should adopt the colligated automation system complying with state standard and technology. These equipment and systems should be calibrated and checked every year.
Any comment:	

Data / Parameter:	$EG_{Grid\ to\ PJ,y}$
Data unit:	MWh
Description:	Electricity consumed by the proposed project bought from the power grid
Source of data to be used:	The ammeter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Automation measurement and automation recording by computers. Double check by receipt of sales. Electronic data will be kept for 2 years following the end of the crediting period.
QA/QC procedures to be applied:	The uncertainty level of this data is low. The project operator is responsible for recording this set of data. Measurements are being continuously recorded, and then the output will be aggregated so that monthly electricity output can be shown. The related electricity receipts will also be obtained as an additional check.
Any comment:	

B.7.2 Description of the monitoring plan:

1. Purpose of the monitoring plan and The data that need be monitored

Monitoring plan is the key part of this CDM project and the purpose of it is to accurately monitor and record both the expected power generation(effective supply to CSPG) and the external power consumption(The electricity delivered from CSPG during the equipment maintaining period), which are the basic data sources for the calculation of the GHG emission reductions.

2. The organizational structure of monitoring

The project owner will appoint one staff take the full responsibility for the implementation of the monitoring plan. The responsible staff will be supported by the Technical Department and the Financial Department of the proposed project. Please refer to Figure 3 for detailed operation and management structure.

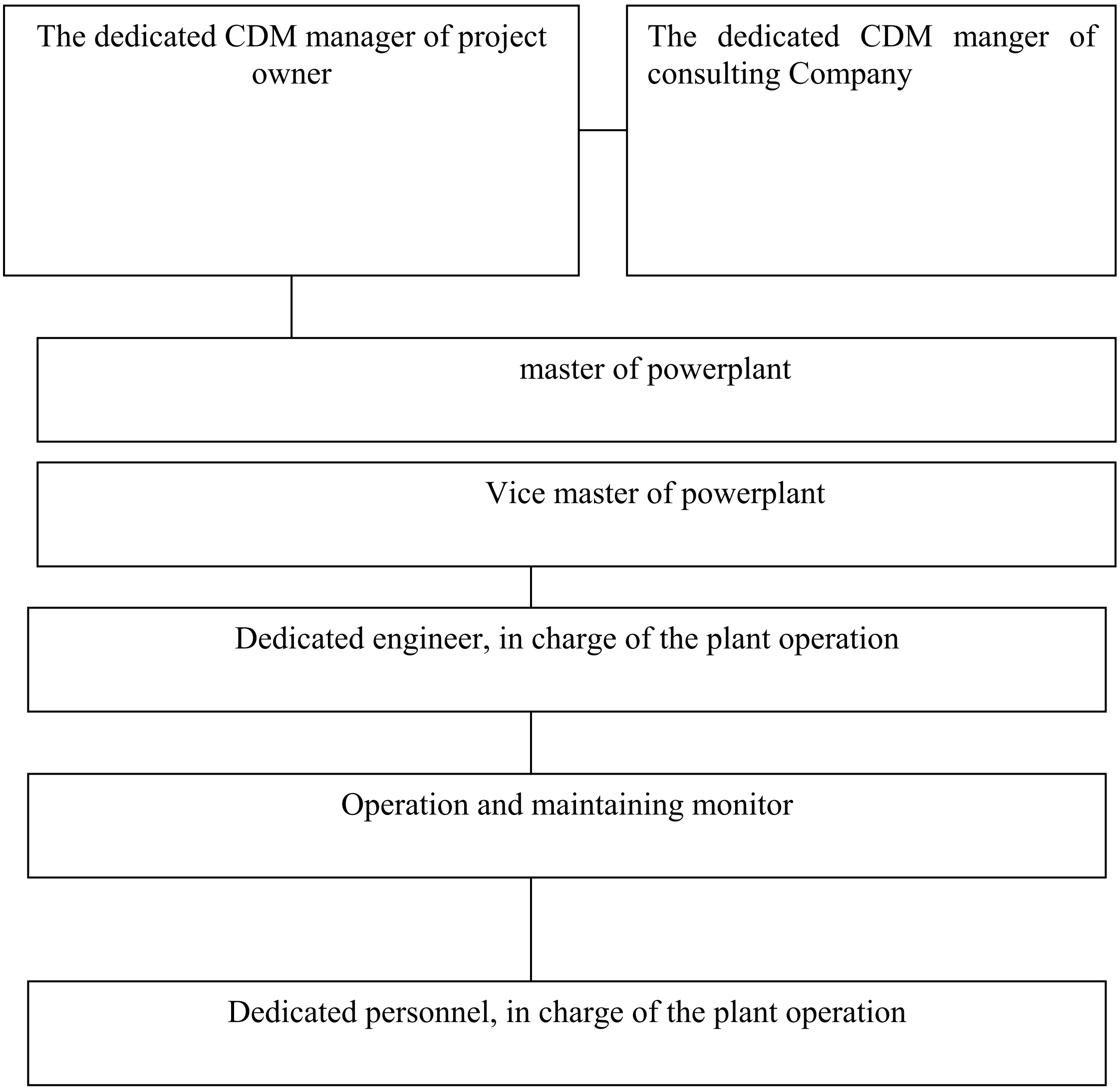

Figure3 Monitoring Structure

3. Staff and the post duty

3.1 Dedicated personnel, in charge of the plant operation

The duty of the dedicated personnel is to operate and maintain the equipment , and what's more, he/she is also in charge of the recording, collection and checkage of the date, which includes the expected power generation(effective supply to CSPG) and the external power consumption(electricity delivered from CSPG during the equipment maintaining period).

3.2 Operating and maintaining monitor

- Supervise the dedicated personnel to operate and maintain the equipment correctly;

- Preside over the collection and checkage of the date

3. 3 Dedicated engineer, in charge of the plant operation

- Carry out the company's standards and regulations;
- Supervise and organize his/her underlings to operate and maintain the equipment correctly;
- fulfill the safety in production and economic and technical norms
- Preside over the checkage, collection and reporting of the data

3.4 Vice master of powerplant

Under the direction of the station master, to be responsible for operation, maintaining, experiment , technological renovation and various administration , to totally complete various working plans, and organize and arrange various assignments of the Hydro Power Station; to be in charge of checking the monitor data of the generated power amount and supplied power amount of CDM project.

3.5 master of powerplant

Under the leadership of Head office of Zhongshui company and Zhongshui hydroelectric operation company ,to be responsible for safe and civilized production management ,administration and spiritual civilization process comprehensively; to establish various work plans and to totally organize and arrange various assignments of the Hydro Power Station.

3.6 The dedicated CDM manager of project owner

To be responsible for collecting and checking the monitor data of generated power amount and supplied power amount, gathering electric quantity invoices ,and reporting a duplicate copy to the dedicated CDM manager of consulting company.

3.7 The dedicated CDM manager of consulting Company

To be responsible for gathering collected data of the grid-connected and grid-unconnected electric quantity of each CDM project and the copy of electric quantity invoices, to calculate net generated power amount (i.e. generated power amount minus supplied power amount)after checking without any error, and then CO_2 emission reductions can be calculated according to the relevant CO_2 emission factor and be reported to DOE(Designated Operational Entity)to evaluate.

4. Quality assurance and quality control procedures

Installation, Measurement and Calibration of the ammeters

The monitoring equipments are equipments to measure the electricity output to the grid and the captive electricity. The electric energy metering should be equipped according the requirements of the *Technical Administrative Code of Electric Energy Metering* (DL/T448-2000). Before the operation of the proposed project, the project owner and the power grid corporation should examine the electric energy metering according to the *Technical Administrative Code of Electric Energy Metering* (DL/T448-2000).

Several ammeters are installed by the project owner at the following locations:

A the export place of each generator,

B the low –pressure outline of each main transformer,

C the export place of the powerplant transfer pipeline, and

D the transformer substation of CSPG as pass-meter.

Through these ammeters and the pass meter, the electricity generation by each generator, the electricity because of line loss, the captive electricity and the back-up electricity can be all monitored. The net feed-in electricity to the grid can be checked with the pass meter.

And the data should be cross-checked against relevant electricity sales receipts and/or records from the grid for quality control. Since the data required to be monitored is consist with the data required during project operation by the project owner and the grid company, the Parallel Operation Agreement and the Power Purchase Agreement between these two parties can be used as guidance on data collection and documentation.

Two series of measurement and monitoring equipments will be installed in the transformer substation, one as the main equipment and the other as standby. The pass meter should meet the standard of national I type measurement reaching 0.5S of the precision.

Calibration of Meters & Metering should be implemented according to national standards and rules. The calibration of meters & metering of the proposed project is implemented by Guizhou Electrical Test Institute. And all the calibration records should be documented and maintained by the project owner for DOE’s verification.

<u>Training, Data Collection and Monitoring Report</u>

Some technicians come from electric power colleges. The others come from old power stations. The formal training has been hold before their duty. Before the formal operation of the proposed project, the personal in charge of CDM will organize the relevant personals to participate the CDM training. The period of the training will at least last 3 working days.

At the end of each month, the monitoring data of that month should be archived electronically. E-documents should have disc backups be printed out. The project owner should also keep the copy of electricity sales/purchase receipts. Written documents such as paper-based maps, diagrams and environmental assessments will be used in addition to the monitoring plan to check the information. In order to facilitate auditors’ reference of relevant literature relating to verification of the emission reductions of the proposed project, the index of the project materials and monitoring results should be provided. All paper-based information and data shall be stored by the technology department of the project owner and all the materials shall have copies for backup. And all data will be kept until 2 years after the end of the total credit period of the proposed project.

The project owner is preparing the monitoring procedures and calibration and measurement manual which will be implemented during the operation of the proposed project. After the proposed project is registered and begins its operation, the monitoring report should be submitted at the end of every year for the verification of DOE. The report should cover the monitoring of grid-connected power generation, check report, report on calculation of the emission reductions and records of monitoring instrument repair and calibration, etc.

<u>Emergency preparedness & Reconstruction of data & Troubleshooting</u>

When finding the abnormal conditions or problems of the devices by either of the sell-purchase sides, they should inform the other side and the metering organization which is ratified by two sides immediately in order to solve the problems jointly and reach the normal condition. Normally, the final electricity amount should in accordance with the trading stoichiometric point data of the primary meter; when something abnormal appeared in the primary meter, then it should in accordance with the data of the assistant meter; if both meters of the trading stoichiometric point data appears abnormal, the data should in accordance with the primary meter of the other side or the assistant meter if the primary meter of the other side has something wrong. For other abnormal conditions, on the base of sufficient negotiation, the two sides can work out of the electric amount according to the records of voltage loss and timing which can be found in certain equipment during the abnormal period.

5 Calculation of the Net electricity supplied to the grid by the proposed project

As it is mentioned in the past sections of the PDD, there are three projects in this area, Taohua(Proposed Project) and Mingying(Related Project) have the same transfer 35KV pipeline to supply the generation electricity to the Bagu 35KV transformer substation which is one of the terminal point of the power grid, and these projects have only one pass-meter measure system, but Mingying old factory has another single 10KV pipeline to the power grid, therefore, the net electricity feed-in to the grid of this proposed project is calculated as follows:

5.1 Calculation of the total sending out electricity

$$E_{total\_out,y} = E_{pp\_out,y} + E_{rp\_out,y}$$

Where:

$E_{total\_out,y}$ is the total sending out electricity of these project in year y, in MWh ;

$E_{pp\_out,y}$ is the sending out electricity of the Proposed Project whose measure point is at the high pressure position of the main transformer in year y, in MWh;

$E_{rp\_out,y}$ is the sending out electricity of the Related Project whose measure point is at the high pressure position of the main transformer in year y, in MWh.

5.2 Calculation of the total line-loss electricity

$$E_{total\_line-loss,y} = E_{total\_out,y} - E_{total\_feed-in,y}$$

Where:

$E_{total\_line-loss,y}$ is the total line-loss electricity in year y, in MWh;

$E_{total\_feed-in,y}$ is the total electricity feed-in to the grid of these projects as the same as the pass-meter data in year y, in MWh.

5.3 Calculation of the line-loss rate

$$R_{line\_loss} = \frac{E_{total\_line-loss,y}}{E_{total\_out,y}}$$

Where:

R_{line_loss} is the rate of the line-loss electricity;

5.4 Calculation of the electricity feed-in to the grid of the Proposed Project

$$E_{pp\_feed-in,y} = E_{pp\_out,y} \times (1 - R_{line\_loss})$$

Where:

$E_{pp\_feed-in,y}$ is the electricity feed-in to the grid of the Proposed Project.

As examination, the sum of the electricity feed-in to the grid of these projects is equal to the total electricity feed-in to the grid of these projects as the same as the pass-meter data.

5.5 Calculation of the Net electricity supplied to the grid by the proposed project

$$EG_y = E_{pp\_feed-in,y} - E_{pp\_buy\_from\_grid,y}$$

Where:

EG_y is the Net electricity supplied by the proposed project to the grid in year *y*, in MWh, it is used to calculate the emission reduction of CO_2;

$E_{pp\_buy\_from\_grid,y}$ is the electricity bought from the grid in year *y*, in MWh.

Moreover, The project owner have established monitoring handbook, more information please refer to the monitoring handbook.

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

The monitoring study of the proposed projects activity was completed on 28/12/2006.Name of person/entity determining monitoring methodology:

- He Junyuan, Guizhou Hengyuan Project Management and consulting Co.Ltd, Email: lg13308598009@126.com；
- Ma Yajun， Guizhou Hengyuan Project Management and consulting Co.Ltd, Email: Yakin.ma@vip.163.com；

Guizhou Hengyuan Project Management and consulting Co.Ltd is not one of the project participants.

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

31/03/2004(Restarting date of construction)

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

28 years[10]

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

C.2.1. Renewable crediting period

7 years ×3

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

20/02/2008 or the registration date 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:

Not applicable.

C.2.2.2. Length:

Not applicable.

SECTION D. Environmental impacts

D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

According to the evidence document of the main technical-economic indices, there is no people resettled due to the project activity .

The Environmental Impact Assessment (EIA) (QNHH[2006]No.21) for this project was approved by Guizhou Province Duyun City Environmental Protection Bureau in 2005. Combined with the EIA report, the influences of the proposed project on the environment are summarized as follows in the construction period and the operation period.

1. Construction Phase

1.1 Waste water

The major pollutants in wastewater during construction period are suspending materials. Based on the production characteristics and the construction work layout, the production wastewater is settled and treated by natural sedimentation, and then to discharge to reach the required standard of discharge effluent standards 1st level in GB8978-1996.

For life wastewater, latrines and septic tanks should be constructed in the living area. Through

10 Refer to table 3 in Section B.5

sedimentation and disinfection of the waste water, the disposed water can be used as manure. Therefore, the impact on the environment is minimal.

1.2 Solid wastes

Excavation and land occupation by the construction will cause certain damage to vegetation and landscape. Therefore, the comprehensive virescence must be conducted in the construction area. After completion of the project, the temporary constructions should be dismantled and removed, and the project site should be levelled up and earthed up. The trees and grass also should be planted to strengthen the water and soil conservation.

1.3 Noise by the construction

The noise is mainly from the excavation, drilling, blasting, crushed sand aggregate, transport vehicles, and so on. The construction units must choose the construction machinery which meet the state standards to fundamentally reduce noise intensity; Meanwhile, maintenance and repair for the equipment should be enhanced to maintain lubrication of the machinery. The fuel use of single ring for the blasting should be reduced. The traffic flow at night should be reduced. Through adopting these measures, the environmental impact of noise has been greatly reduced.

1.4 Waste gas by the construction

The waste gas is mainly from transport, rock blasting, and mechanical fuel. As the construction sites are dispersed, the emissions of the waste gas are diffuse with little emissions. By taking appropriate protective measures, the impact on the environment of the waste gas is minimal.

2. Operation Phase

There are no problems for flooding and immigration. The operation of the proposed project won’t have negative impact on river ecosystem and hydrophilic biology community.

As mentioned above, the environmental impact of the project during the construction period is short, and measures will also be taken to minimize the adverse environmental impacts. The environmental impact during the operation period is negligible.

The project as a clean renewable energy project can reduce greenhouse gas emissions and also reduce the environmental pollution caused by coal consumption. It has favourable influence on the local ecological environment; especially after the project is put into operation the ecological restoration measures can improve the local ecological environment.

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

The EIA report of the proposed project has been approved by the local Environmental Protection Bureau. The construction and operation of the proposed project have no significant environmental impacts.

SECTION E. Stakeholders’ comments

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

In order to know the public’s opinions and suggestions about the proposed project, the format of the public participation is to hand out the questionnaires of the public opinions on the proposed project in August, 2006 by the project owner. The table below shows about the age distribution, occupation distribution and education level of the public.

Table 8 Summary of stakeholders

Item		Number	Proportion (%)
Total		26	100
Nationality	Miao	19	73
	Shui	7	27
	Others	0	0
Education level	Technical secondary school above	1	4
	Senior high school	4	15
	Junior high school	13	50
	Elementary school	8	31
Age distribution	18~30	1	4
	31~50	20	77
	≥51	5	19
Occupation distribution	Farmers	24	92
	Teachers	1	4
	Others	1	4

E.2. Summary of the comments received:

30 questionnaires were distributed to the local people, and 26 questionnaires had been returned. The response rate is 86.7%. Comments from these questionnaires for local people are summarized in table 9.

Table 9 Summary of questionnaires

The number	Item	Attitudes	Numbers(person)	Share %
1	Whether to know the proposed project	Know	26	100
		Be aware of	0	0

		Don't know	0	0
2	The attitude to the construction of the proposed project	Build quickly	26	100
		Not care about	0	0
		Don't agree	0	0
3	Whether to hope to participate the construction and operation of the proposed project	Hope	26	100
		Not care about	0	0
		Don't hope	0	0
4	The necessary need of the construction of the proposed project	Develop the economy	21	80.7
		Improve the quality of electricity generation	14	53.8
		Boost the tourism	9	34.6
5	The environment factors that may restrict the construction of the proposed project	The flood loss	14	53.8
		The immigrants allocation	12	46.2
		Destroy the ecology	0	0
6	Whether there are the sewage emissions from the industrial companies with serious water pollution around the project	Yes	10	38.5
		No	7	26.9
		Don't know	9	34.6
7	The acceptable ways of immigrants allocation in the local areas	Move	10	38.5
		Arrange the farmland nearly	6	23
		Compensate	23	88.5
8	When the construction of the proposed project will affect your farmland and you must move, whether you would like to move	Willing	26	100
		Decided by the conditions of the allocation sites	0	0
		Unwilling	0	0
9	Whether you accept the immigrant is allocated to your village	Accept	0	0
		Not care about	20	77
		Don't accept	6	23
10	The influence on the local wild animals and plants	No influence	22	84.6
		Small influence	4	15.4
		Big influence	0	0
11	The main influence of the	Environment	0	0

	proposed project on environment you think	Water environment	4	15.4
		Other aspects	22	84.6
12	The influence on the environment	Get better	26	100
		No change	0	0
		Get worse	0	0
13	The impact on the local economy	Boost	26	100
		No direct impact	0	0
		Negative impact	0	0
14	The most significant impact on the local residents	Develop local economy	24	92.3
		Increase income	13	50
		Ensure the power	5	19.2
15	The environmental and economical benefits that the proposed project bring about, which you prefer	Environmental benefits	4	15.4
		Environmental and economical benefits	7	27
		Economical benefits	16	61.5
16	The advantages and disadvantages of the project	Advantages bigger than disadvantages, the project is feasible	26	100
		Advantages equal to disadvantages	0	0
		Advantages smaller than disadvantages, the project is not feasible	0	0

The result of this investigation shows that 100% of the public people supported the start of the proposed project, 100%thought that the advantages of operation of the power plant was bigger than the disadvantages, and 100% thought the proposed project would improve the environment. Therefore, the local people supported the construction of the proposed project, and they figured out that the power plant had positive meaning for local economy development. They had a positive and optimistic attitude for the environmental impacts because of the construction of the proposed project. The public generally hope that the project will start as soon as possible in order to spur local economic development, increase incomes and social benefits.

In the Opinion Paper, the proposed project makes good use of the water resource to generate electricity and supply the electricity to the local areas, and the proposed project supplies several jobs for local people. The operation of the proposed project will reduce the GHG emissions from fossil fuels. The proposed project will not emit the waste water and waste gas. The local people support the construction and operation of the proposed project.

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

The project owner will pay much attention to the comments and suggestions of the stakeholders, especially the environmental impacts problems in the construction period and the land compensation for the related farmers. The proposed projects will invest RMB 1106[11] thousands yuan as land occupation compensation and RMB 886[12] thousands yuan as cost for soil & water conservation and environmental protection. During the construction period and operation period of the project, the project owner will do the work of ecological environmental protection and soil & water conservation, finish the design of environmental protection to make sure that all the measures and funds should be put into effect, and strengthen the environmental management during construction period, environmental monitoring and onsite supervision and law enforcement to make sure the environmental quality can reach the quality standard and the related requirement.

11 Refer to The technologic project approval of Taohua Hydro Power Project.
12 Refer to Environmental Impact Assessment of Taohua Hydro Power Project.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

No public funding is involved in this project activity.

Annex 3

BASELINE INFORMATION

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

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

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

Fuel	Low Calorific Value	Emission Factor (tC/TJ)	Oxidation Factor
Raw Coal	**20908 kJ/kg**	**25.8**	**100%**
Cleaned Coal	**26344 kJ/kg**	**25.8**	**100%**
Other Washed Coal	**8363 kJ/kg**	**25.8**	**100%**
Coke	**28435 kJ/kg**	**25.8**	**100%**
Crude Oil	**41816 kJ/kg**	**20.0**	**100%**
Gasoline	**43070 kJ/kg**	**18.9**	**100%**
Diesel Oil	**42652 kJ/kg**	**20.2**	**100%**
Fuel Oil	**41816 kJ/kg**	**21.1**	**100%**
Natural Gas	**38931 kJ/m^3**	**15.3**	**100%**
Coke Oven Gas	**16726 kJ/m^3**	**12.1**	**100%**
Other Gas	**5227 kJ/m^3**	**12.1**	**100%**
LPG	**50179 kJ/kg**	**17.2**	**100%**
Refinery Dry Gas	**46055 kJ/kg**	**18.2**	**100%**

Data Source:

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

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

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

Table A2 Simple OM Emission Factors Calculation of CSPG for Year 2003

Fuel	Unit	Guangdong	Guangxi	Guizhou	Yunnan	Total	EF	Oxidation	Average Low Calorific Value	CO_2 Emission (tCO_2e)
							(tC/TJ)	(%)	(MJ/t,km3)	K=G*H*I*J*44/12/10000 (for mass unit)
		A	B	C	D	G=A+B+C+D	H	I	J	K=G*H*I*J*44/12/1000 (for volumn unit)
Raw Coal	10^4 t	4491.79	831.84	2169.11	1405.27	8898.01	25.8	100	20908	175993455.05
Cleaned Coal	10^4 t	0.05				0.05	25.8	100	26344	1246.07
Other Washed Coal	10^4 t			36.38	20.37	56.75	25.8	100	8363	448971.84
Coke	10^4 t				0.5	0.5	25.8	100	28435	13449.76
Coke Oven Gas	10^8 m^3				0.04	0.04	12.1	100	16726	2968.31
Other Gas	10^8 m^3	3.21			11.27	14.48	12.1	100	5227	335797.81
Crude Oil	10^4 t	6.85				6.85	20	100	41816	210055.71
Gasoline	10^4 t	0.02				0.02	18.9	100	43070	596.95
Diesel Oil	10^4 t	31.9			0.76	32.66	20.2	100	42652	1031759.27
Fuel Oil	10^4 t	627.22	0.3			627.52	21.1	100	41816	20301304.48
LPG	10^4 t					0	17.2	100	50179	0.00
Refinery Gas	10^4 t	2.85				2.85	18.2	100	46055	87592.00
Natural Gas	10^8 m^3					0	15.3	100	38931	0.00
Other Petroleum Products	10^4 t	11.35				11.35	20	100	38369	319357.98
									Subtotal	**198746555.23**
Electricity imported from CCPG		Average emission factor of CCPG		CO_2 emission of imported electricity						
K		L		M=K*L					**Total=M+Subtotal**	**198755406.84**
11100 MWh		0.79744 tCO2e/MWh		8851.58 tCO_2e						

Data Source: *China Energy Statistical Yearbook 2004,* Chinese DNA's Guideline of emission factors of Chinese grids

Table A3 Fuel-fired Electricity Generation of CSPG for Year 2003

Item	Electricity Generation	Electricity Generation	Auxiliary Power Ratio	Supplied Electricity
	(10^8 kWh)	**(MWh)**	**(%)**	**(MWh)**
Guangdong	1433.51	143351000	5.50	135466695
Guangxi	170.79	17079000	8.43	15639240.3
Guizhou	432.95	43295000	7.40	40091170
Yunnan	190.55	19055000	8.01	17528694.5
Electricity imported from CCPG	/	11100	/	11100
Total				**208736899.8**

Data Source: *China Electric Power Yearbook 2004,* Chinese DNA's Guideline of emission factors of Chinese grids

According to Table A2, the total CO_2 emissions of CSPG is 198755406.84tCO_2e in year 2003. According to Table A3, the total supplied electricity of CSPG is 208736899.8 MWh. According to formula (2) in section B.6.1, the $EF_{OM, Simple, 2003}$ is 0.952181464tCO_2e/MWh.

Table A4 Simple OM Emission Factors Calculation of CSPG for Year 2004

Fuel	Unit	Guangdong	Guangxi	Guizhou	Yunnan	Total	EF	Oxidation	Average Low Calorific Value	CO_2 Emission (tCO_2e)
							(tC/TJ)	(%)	(MJ/t,km3)	K=G*H*I*J*44/12/10000 (for mass unit)
		A	B	C	D	G=A+B+C+D	H	I	J	K=G*H*I*J*44/12/1000 (for volumn unit)
Raw Coal	10^4 t	6017.7	1305	2643.9	1751.28	11717.88	25.8	100	20908	231767573.55
Cleaned Coal	10^4 t	0.21				0.21	25.8	100	26344	5233.50
Other Washed Coal	10^4 t					0	25.8	100	8363	0.00
Coke	10^4 t					0	25.8	100	28435	0.00
Coke Oven Gas	10^8 m^3					0	12.1	100	16726	0.00
Other Gas	10^8 m^3	2.58				2.58	12.1	100	5227	59831.38
Crude Oil	10^4 t	16.89				16.89	20	100	41816	517932.98
Gasoline	10^4 t					0	18.9	100	43070	0.00
Diesel Oil	10^4 t	48.88			1.83	50.71	20.2	100	42652	1601975.28
Fuel Oil	10^4 t	957.71				957.71	21.1	100	41816	30983494.25
LPG	10^4 t					0	17.2	100	50179	0.00
Refinery Gas	10^4 t	2.86				2.86	18.2	100	46055	87899.34
Natural Gas	10^8 m^3	0.48				0.48	15.3	100	38931	104833.40
Other Petroleum Products	10^4 t	1.66				1.66	20	100	38369	46707.86
									Subtotal	**265175481.54**
Electricity imported from CCPG		Average emission factor of CCPG		CO_2 emission of imported electricity						
K		L		M=K*L					**Total=M+Subtotal**	**274226116.64**
10951240 MWh		0.82644843tCO2e/MWh		9050634 tCO_2e						

Data Source: *China Energy Statistical Yearbook 2005,* Chinese DNA's Guideline of emission factors of Chinese grids

Table A5 Fuel-fired Electricity Generation of CSPG for Year 2004

Item	Electricity Generation	Electricity Generation	Auxiliary Power Ratio	Supplied Electricity
	(10^8 kWh)	**(MWh)**	**(%)**	**(MWh)**
Guangdong	1693.89	169389000	5.42	160208116.2
Guangxi	201.43	20143000	8.33	18465088.1
Guizhou	497.2	49720000	7.06	46209768
Yunnan	243.22	24322000	7.56	22483256.8
Electricity imported from CCPG	/	10951240	/	10951240
Total				**258317469.1**

Data Source: *China Electric Power Yearbook 2005*, Chinese DNA's Guideline of emission factors of Chinese grids

According to Table A4, the total CO_2 emissions of CSPG is 274226116.64 tCO2e in year 2004. According to Table A5, the total supplied electricity of CSPG is 258317469.1 MWh. According to formula (2) in section B.6.1, the $EF_{OM, Simple,2004}$ is 1.061585643tCO2e/MWh.

Table A6 Simple OM Emission Factors Calculation of CSPG for Year 2005

Fuel	Unit	Guangdong	Guangxi	Guizhou	Yunnan	Total	EF	Oxidation	Average Low Calorific Value	CO_2 Emission (tCO_2e)
							(tC/TJ)	(%)	(MJ/t,km3)	K=G*H*I*J*44/12/10000 (for mass unit)
		A	B	C	D	G=A+B+C+D	H	I	J	K=G*H*I*J*44/12/1000 (for volumn unit)
Raw Coal	10^4 t	6696.47	1435	3212.31	1975.55	13319.33	25.8	100	20908	263442601.85
Cleaned Coal	10^4 t				0.15	0.15	25.8	100	26344	3738.21
Other Washed Coal	10^4 t			10.39	33.88	44.27	25.8	100	8363	350237.59
Coke	10^4 t	4.79			8.05	12.84	25.8	100	28435	345389.71
Coke Oven Gas	10^8 m^3				0.79	0.79	12.1	100	16726	58624.07
Other Gas	10^8 m^3	1.87			15.96	17.83	12.1	100	5227	413485.84
Crude Oil	10^4 t	10.91				10.91	20	100	41816	334555.88
Gasoline	10^4 t	0.68				0.68	18.9	100	43070	20296.31
Diesel Oil	10^4 t	31.96	2.02		1.81	35.79	20.2	100	42652	1130638.84
Fuel Oil	10^4 t	887.21				887.21	21.1	100	41816	28702703.26
LPG	10^4 t					0	17.2	100	50179	0.00
Refinery Gas	10^4 t	4.92				4.92	18.2	100	46055	151211.46
Natural Gas	10^8 m^3	0.93				0.93	15.3	100	38931	203114.71
Other Petroleum Products	10^4 t	1.7				1.7	20	100	38369	47833.35
									Subtotal	**295204431.07**
Electricity imported from CCPG		Average emission factor of CCPG		CO_2 emission of imported electricity						
K		L		M=K*L					**Total=M+Subtotal**	**369521974.54**
96363000		0.771224884tCO2e/MWh		74317543 tCO_2e						

Data Source: *China Energy Statistical Yearbook 2006*, Chinese DNA’s Guideline of emission factors of Chinese grids

Table A7 Fuel-fired Electricity Generation of CSPG for Year 2005

Item	Electricity Generation	Electricity Generation	Auxiliary Power Ratio	Supplied Electricity
	(10^8 kWh)	**(MWh)**	**(%)**	**(MWh)**
Guangdong	1764.53	176453000	5.58	166606922.6
Guangxi	250.23	25023000	7.95	23033671.5
Guizhou	584.3	58430000	7.34	54141238
Yunnan	272.81	27281000	6.94	25387698.6
Electricity imported from CCPG	/	96363000	/	96363000
Total				**365532530.7**

Data Source: *China Electric Power Yearbook 2006,* Chinese DNA's Guideline of emission factors of Chinese grids

According to Table A6, the total CO2 emissions of CSPG is 369521974.54 tCO2e in year 2005. According to Table A7, the total supplied electricity of CSPG is 365532530.7MWh. According to formula (2) in section B.6.1, the $EF_{OM, Simple,2005}$, is 1.01091406 tCO2e/MWh.

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

$$EF_{OM} = 1.0119 tCO_2e/MWh$$

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

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

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

		Guangdong	Guangxi	Guizhou	Yunnan	Total	Average Low Calorific Value	Emission Factor	Oxidation	CO_2 Emission
								(tC/TJ)		(tCO_2e)
Fuel	**Unit**	**A**	**B**	**C**	**D**	**G=A+B+C+D**	**H**	**I**	**J**	**K=G*H*I*J*44/12/100**
Raw Coal	10^4 t	6696.47	1435	3212.31	1975.55	13319.33	20908 kJ/kg	25.8	100%	263442601.85
Cleaned Coal	10^4 t				0.15	0.15	26344 kJ/kg	25.8	100%	3738.21
Other Washed Coal	10^4 t			10.39	33.88	44.27	8363 kJ/kg	25.8	100%	350237.59
Coke	10^4 t	4.79			8.05	12.84	28435 kJ/kg	25.8	100%	345,390
Subtotal										**264,141,967**
Crude Oil	10^4 t	10.91				10.91	41816 kJ/kg	20	100%	334555.88
Gasoline	10^4 t	0.68				0.68	43070 kJ/kg	18.9	100%	20296.31
Diesel Oil	10^4 t	31.96	2.02		1.81	35.79	42652 kJ/kg	20.2	100%	1130638.84
Fuel Oil	10^4 t	887.21				887.21	41816 kJ/kg	21.1	100%	28702703.26
Other Petroleum Products	10^4 t	1.7				1.7	38369 kJ/kg	20	100%	47833.35
Subtotal										**30236023**
Natural Gas	10^7 m^3	9.3				9.3	38931 kJ/m^3	15.3	100%	203114.71
Coke Oven Gas	10^7 m^3				7.9	7.9	16726 kJ/m^3	12.1	100%	58624.07
Other Gas	10^7 m^3	18.7			159.6	178.3	5227 kJ/m^3	12.1	100%	413485.84
LPG	10^4 t					0	50179 kJ/kg	17.2	100%	0.00
Refinery Gas	10^4 t	4.92				4.92	46055 kJ/kg	18.2	100%	151211
Subtotal										**826,436**
Total										**295,204,431**

Data Source: *China Energy Statistical Yearbook 2006*

According to Table A8 and formula (6) in section B.6.1, the percentages of CO_2 emissions from the coal-fired, oil-fired and gas-fired power plants in total fuel-fired CO_2 emissions are calculated as:

$$\lambda_{Coal} = 89.48\%,\ \lambda_{Oil} = 10.24\%,\ \lambda_{Gas} = 0.28\%$$

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

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

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

Table A9 Parameters used for calculating fuel-fired emission factor

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

According to Table A9 and formula (7) in section B.6.1, the $EF_{Thermal}$ is 0.9117 tCO_2e/MWh

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

Table A10 Installed Capacities of CSPG

Installed Capacity	Unit	2002	2003	2004	2005
Fuel-fired	**MW**	**35969.2**	**40444.1**	**46659.7**	**54507**
Hydro	**MW**	**22921**	**25409.3**	**27580.1**	**30347.1**
Nuclear	**MW**	**2790**	**3780**	**3780**	**3780**
Wind & Others	**MW**	**76.8**	**83.4**	**83.4**	**83.4**
Total	**MW**	61757.0	69716.8	78103.2	88717.5

Data Source: <China Electric Power Yearbook 2003-2006>

Table A11 Newly Added Installed Capacity from Year 2000-2005

	2002	2003	2004	2005	Newly capacity additions from 2003-2005
Fuel-fired (MW)	**35969.2**	**40444.1**	**46659.7**	**54507**	**14062.9**
Hydro (MW)	**22921**	**25409.3**	**27580.1**	**30347.1**	**4937.8**
Nuclear (MW)	**2790**	**3780**	**3780**	**3780**	**0**
Wind & Others (MW)	**76.8**	**83.4**	**83.4**	**83.4**	**0**
Total（MW）	**61757**	**69716.8**	**78103.2**	**88717.5**	**1900.7**
Percentage of newly installed capacity to 2005	**30.39%**	**21.42%**	**11.96%**	**0.00%**	
Percentage of newly added fuel-fired plants		**74.01 %**			

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

According to Table A11 and formula (8) in section B.6.1, the EF_{BM} is calculated as:

$$EF_{BM} = 0.6748\ tCO_2e/MWh$$

Step 3: Calculating the baseline emission factor (EF_y)

According to formula (9) in section B.6.1, the baseline emission factor of CSPG is calculated as:

$$EF_y = 0.84335\ tCO_2e/MWh$$

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

Annex 4

MONITORING INFORMATION

The meter' type, parameter and recording frequency.

Meter	Type	Manage	Electronic Recording frequency	Record handed frequency	Gathering frequency	emending organization emending period	Precision	Save method	Remark
M1，M2 M3, M4	DSSD331	Owner	the computer monitors at the same time ,record every one hour	Every 24th hours	Every month	Duyun city grid company Every five years	0.5	Electronic recording and handed hold three years	Positive and reverse direction computation
M5	DSSD331-2	Owner	the computer monitors at the same time ,record every one hour	Every 24th hours	Every month	Duyun city grid company Every five years	0.5	Electronic recording and handed hold three years	Positive and reverse direction computation
M6	DXD3001	Grid company	the computer monitors at the same time ,record every one hour	Every 24th hours	Every month	Duyun city grid company Every five years	0.5S	Electronic recording and handed hold three years	Positive and reverse direction computation

Taohua' Layout Diagram