CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of the small-scale project activity

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

11.4 MW Bundled Small Hydropower Project in Shanjunyan and Liaoli, Guizhou Province, P. R. China.
Version number of the document: 04
Date: September 06, 2008

Revision history of the document:

Version of the Document	Date of the Document	Reason for Revision
Version 01	August 28, 2007	For Global Stakeholder Consultation
Version 02	April 14, 2008	Revise according to the Resolution of Corrective Action and Clarification Requests of JACO CDM
Version 03	August 18, 2008	Revise for Methodology Update
Version 04	September 06, 2008	Revise according to the Resolution of Corrective Action and Clarification Requests of JACO CDM

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

The 11.4 MW Bundled Small Hydropower Project in Shanjunyan and Liaoli (hereafter referred to as the Bundled Project) is located at Rongjiang County, Guizhou Province, P.R.China. It consists of Shanjunyan small hydropower plant (hereafter referred to as Shanjunyan Project), Liaoli small hydropower plant (hereafter referred to as Liaoli Project). The total installed capacity of the Bundled Project is 11.4 MW.

The Shanjunyan Project is located on Zhaisong River within Zhongcheng Town. It is designed to deliver discharge flow of 33 m^3/s with 22 m water head. The total installed capacity of the Shanjunyan Project is 6.4 MW. It is estimated that the feed-in electricity to the Guizhou Power Grid from the Shanjunyan Project is approximately 27,298 MWh per year.

The Liaoli Project is located in Guzhou Town. It is designed to deliver discharge flow of 35.24 m^3/s with 16.4 m water head. The total installed capacity of the Liaoli Project is 5 MW. It is estimated that the feed-in electricity to the Guizhou Power Grid from the Liaoli Project is approximately 17,824 MWh per year.

Guizhou Power Grid is an integral part of the China Southern Power Grid (hereafter referred to as CSPG). The electricity currently generated by the grid is relatively carbon intensive, with an operating margin emission factor of 1.0119 tCO2/MWh and a build margin emission factor of 0.6748 tCO2/MWh[1]. The project activity will achieve greenhouse gas (GHG) emission reductions by avoiding CO_2 emissions from the business-as usual scenario electricity generation of those fossil fuel-fired power plants connected into the China Southern Power Grid. It is estimated that annual electricity supplied to Guizhou Power Grid by the Bundled Project is 45,122 MWh and the annual emission reduction is 38,054 t CO_2e.

[1] Notification on Determining Baseline Emission Factors of China Power Grid issued by China's DNA on Aug. 9th, 2007 on http://cdm.ccchina.gov.cn.

The Bundled Project clearly fits into the development priority of China and the regional development strategy of West China Development. It will therefore help reduce GHG emissions resulting from the high-growth, coal-dominated business-as-usual scenario. Rongjiang County is one of the nation's extreme poverty areas[2] in China, populated by minorities and under the special assistance by the Central Government. After the operation of the Bundled Project, shortage of electricity supply in Rongjiang county will be mitigated, and electricity supply for township and village enterprises will be guaranteed and local economic development will be facilitated.

The Bundled Project has multiple positive impacts to local community in both environment and economic aspects and contributes to sustainable development of the host country.

GHG Mitigation and Air Quality Improvement
In addition to the reduction of greenhouse gas by alternating fossil-fuel power station in CSGS, a conversion from fossil fuel to hydro power station reduces air pollutants, for instance particles molecules which threat air quality and further mitigates air quality issues due to steep economic growth in China.

Prevention of Natural Disaster
The construction of dam facility envisages contributing river conservancy given steep terrain of the Guizhou province. Since the project's area is a highly vulnerable to natural disasters like flood or land-slide. The construction and management of these facilities contributes prevention of natural disasters. The hydro-power station will not only generate en electricity but manage environmental integrity to achieve multi-purpose project.

Stimulating Economic Growth
The project also expected to create positive economic impacts both in directly and indirectly. The generated power will provide to local household to improve life-status of one of the most economically segregated region in China. The project is in line with the Central Government's long-term development plan in the region and accelerates economic independence of the local tribes. The project also generates instant job-opportunities in construction. It is anticipated that 50+ jobs are generated for the operation and maintenance of the project and the employed labour could have an opportunity to learn hands-on knowledge for power-facilities.

These positive impacts of the Bundled Project promote sustainable development of the region.

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)
P.R.China (host)	Rongjiang County Lirong Hydropower Development Co.,Ltd. (project owner)	NO
JAPAN	Smart Energy Co., Ltd. (purchasing party)	NO

[2] http://www.cpad.gov.cn/data/2006/1119/article_331579.htm

Table A.3 Project Participants. Further contact information of project participants is provided in Annex 1.

Host Country: People's Republic of China, which has ratified the Kyoto Protocol to the United Nations Framework Convention on Climate Change in September 2002.

Project Proponent:

Rongjiang County Lirong Hydropower Development Co.,Ltd. and Smart Energy Co., Ltd. (Tokyo, JAPAN)

Rongjiang County Shanjunyan Small Hydropower Station and Rongjiang County Lirong Hydropower Development Co.,Ltd. are Chinese private companies aiming at hydropower development through construction and operation of hydropower plants. Rongjiang County Shanjunyan Small Hydropower Station authorized Rongjiang County Lirong Hydropower Development Co.,Ltd as their representative regarding the bundled CDM project. Project participants shall at registration provide a written statement along with the submission of the bundle indicating:

(a) That all project participants agreed that their individual project activities are part of the bundle;

(b) Smart Energy Co., Ltd. will represent all project participants in order to communicate with the Executive Board in accordance with approved Modalities and Procedures for Communication.

Smart Energy Co., Ltd. whose address is Toranomon Masters Bldg. 3rd Floor, 1-12-14 Toranomon, Minato-ku, Tokyo, Japan, 105-0001.

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 (the "Host Country")

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

Qiandongnan Autonomous Region, Guizhou Province

A.4.1.3. City/Town/Community etc:

Zhongchen Town and Guzhou Town, Rongjiang County

A.4.1.4. Detail of physical location, including information allowing the unique identification of this small-scale project activity(ies):

The Bundled Project is located at Rongjiang County, Qiandongnan Autonomous Region, Guizhou Province, P.R.China.

The Shanjunyan Project is located at Zhongcheng Town which has geographical coordinates with east longitude of 108º03'18" and north latitude of 26º07'20".
The Liaoli Project is located at Guzhou Town which has geographical coordinates with east longitude of 108º04' ~ 108º44' and north latitude of 25º36' ~ 26º27'.
Figure 1 shows the location of Rongjiang County, the location of the Shanjunyan and the Liaoli Project.

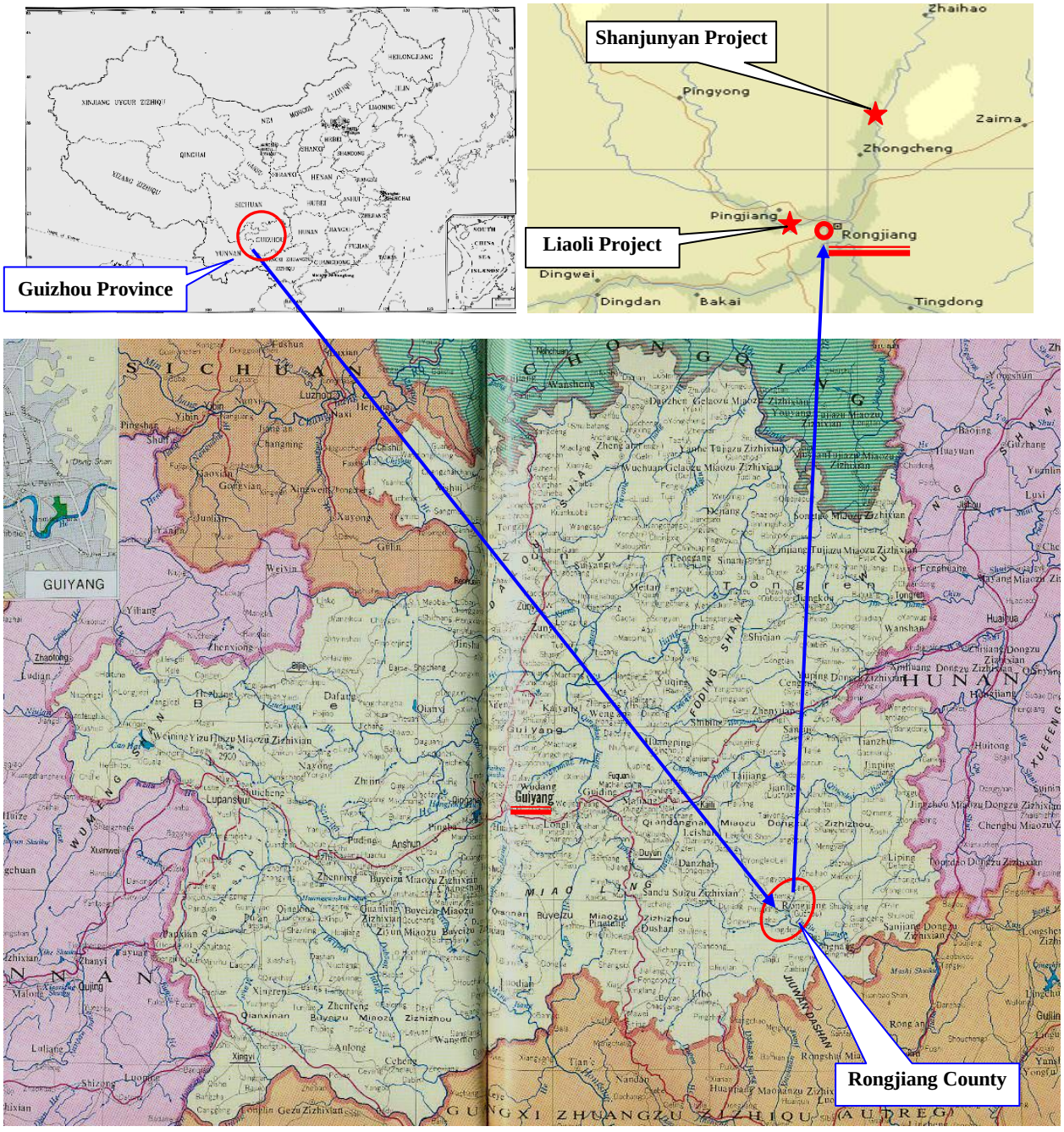

Figure 1. The location of Rongjiang County and the Shanjunyan , Liaoli Project.

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

According to the categorization of Appendix B of *the Simplified Modalities and Procedures for Small-scale CDM Project Activities*, the Bundled Project type and category are defined as follows:

Type I: Renewable energy projects

Category I.D.: Renewable Energy Generation for a Grid

The Bundled Project consists of the Shanjunyan Project and the Liaoli Project. 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 Bundled Project. Moreover, the size of the Bundled Project is 11.4 MW, which is within the limit of 15 MW stipulated for the chosen small-scale methodology.

The Shanjunyan Project is a new hydropower plant with two sets of 3.2 MW hydro turbines (ZD-JP502-LH-160) and associated generators (SF3200-28/2600) to produce clean electricity without GHG emissions for CSPG via 35 kV transmission line.

The Liaoli Project is a new hydropower plant at dam toe with two sets of 2.5 MW hydro turbines (ZD-JP502-LJ-175) and associated generators (SF2500-20/3250) to produce clean electricity without GHG emissions for CSPG via 35 kV transmission line.

The turbines and generators are made in China. The key specification of the hydro turbines and the generators of the Bundled Project are listed in Table A. 4. 2.1 and the major technical parameters of the hydropower plant of the Bundled Project are listed in Table A. 4. 2.2.

Table A. 4. 2.1. Key technical indicators of the Bundled Project

Project Name	Hydro Turbine		Generator	
Shanjunyan Project	Turbine Type	ZD-JP502-LH-160	Generator Type	SF3200-14/2600
	Water head	22 m	Rated Power	3200 kW
	Rated power	2632 kW	Power Factor	0.8
	Rated speed	750 r/min	Rated Voltage	6.3 kV
	Manufacture	Zhejiang Jinhua Hydro Power Equipment Co.	Manufacture	Zhejiang Jinhua Hydro Power Equipment Co.
Liaoli Project	Turbine Type	ZD-JP502-LJ-175	Generator Type	SF2500-20/3250
	Water head	16.4 m	Rated Power	2500 kW
	Rated power	2632 kW	Power Factor	0.8
	Rated speed	300 r/min	Rated Voltage	6.3 kV
	Manufacture	Jiangxi Ganzhou Power Equipment Co., Ltd.	Manufacture	Jiangxi Ganzhou Power Equipment Co., Ltd.

Table A. 4. 2.2. Main technical parameters of the hydropower plant

Name of Project	Shanjunyan Project	Liaoli Project
Installe capacity (MW)	6.4	5.0
Operating time yearly (hour)	5,015	3,950
Expected total annual power generation (MWh)	32,096	19,750
Expected effective supply to the grid (MWh)	27,298	17,824
Water head (m)	22.0	16.5
Design flow (m^3/s)	16.5	14.6

With all technologies and facilities provided domestically, the Bundled Project involves no technology transfer from abroad.

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

It is expected that the project activity will generate emission reductions for about 38,054 tCO_2e per year over the first 7-year crediting period from Oct 2008 to Sep 2015.

Years	Annual estimation of emission reductions in tonnes of CO_2e
2008(Otc. To Dec. 2008)	9,513
2009	38,054
2010	38,054
2011	38,054
2012	38,054
2013	38,054
2014	38,054
2015(Jan. to Sept. 2015)	28,541
Total estimated reductions (tonnes of CO_2e)	266,378
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	38,054

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

There is no public funding from Annex I Parties for the Project.

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

The project participants confirm that there is no registered small-scale CDM project activity or an application to register another small-scale CDM project activity with the same project participants and whose project boundary is within 1 km of the project boundary of the proposed small-scale activities at

the closest point.

According to Appendix C to the *Simplified Modalities and Procedures for Small-scale CDM Project Activities*, the Bundled 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 baseline and monitoring methodology applied for the Bundled Project is the approved methodology for small-scale CDM project- "AMS.I.D. Grid connected renewable electricity generation" (version13). For more information regarding the methodology, please refer to the link:
http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html

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

1. The Bundled Project is new hydropower project with total capacity of 11.4 MW ,which is less than the maximum qualifying capacity of 15MW established in the decision 17/CP. 7.paragraph 6(c)(i).
2. The Bundled Project is connected with CSPG, which is dominated by fossil fuel generation. The replacement of fossil fuel generation is in line with methodology.

Therefore, the methodology AMS.I.D. (version13) is applicable to the Bundled Project.

B.3. Description of the project boundary:

Based on the methodology AMS.I.D. (version13), the Bundled Project boundary encompasses the physical, geographical site of the renewable generation source. The electricity displaced by the Bundled Project rated by CSPG. Therefore, the boundary could be identified as CSPG and the Bundled Project with reservoir.
The project boundary for the baseline will include the emissions related to the electricity produced by the facilities and power plants to be replaced by the Bundled Project. This involves emissions from displaced fossil fuel use at power plants.
Conforming to the guidance and rules for small-scale project activities, the emissions related to production, transport and distribution of the fuel used for the power plants in the baseline are not included in the project boundary as these do not occur at the physical and geographical site of the project. For the same reason the emissions related to the transport are also excluded from the project boundary.

B.4. Description of baseline and its development:

The baseline scenario is the following:
Electricity delivered to the grid by the Bundled Project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations in B.6.1.

Table B.4.1: Key Information and Data Used to Determine the Baseline Scenario

Variable	Value / Unit	Source
Operating Margin Emissions factor	1.0119 tCO2/MWh	Notification on Determining Baseline Emission Factors of China Power Grid issued by China's DNA on Aug 9th, 2007 on http://cdm.ccchina.gov.cn
Build Margin Emissions Factor	0.6748 tCO2/MWh	Notification on Determining Baseline Emission Factors of China Power Grid issued by China's DNA on Aug 9th, 2007 on http://cdm.ccchina.gov.cn
Combined Margin Emissions	0.84335 tCO2/MWh	Calculated according to the Operating Margin Emissions factor and Build Margin Emissions Factor
Power supplied to the grid by the project in yearly	45,122 MWh	Calculated according to the Feasibility Study Report.

In the absence of the Bundled Project electricity will continue to be generated by the existing generation mix operating in the grid.

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

As a small hydropower project located in poor mountainous area, the Bundled Project faces many problems, which make the Bundled Project far from financial attractive. The investment barrier is the most prohibitive factor in implementing the Bundled Project. Detailed analysis is shown as follows:

Investment Barrier

The purpose of this part is to determine whether the Bundled Project is economically attractive or not through appropriate analysis method.

Determine appropriate analysis method

Three analysis methods are available: simple cost analysis, investment comparison analysis and benchmark analysis. Considering the Bundled Project has income from electricity sales, benchmark analysis is selected among these options. And also the internal return rate (FIRR) of total investment is identified as the financial indicator.

According to Eco*nomic Evaluation Code for Small Hydropower Projects* issued by the Ministry of Water Resources (Document No. SL16-95), the benchmark FIRR of small hydropower project is 10%. Accordingly, if the FIRR of total investment of the Bundled Project is lower than 10%, the Bundled Project is not financial attractive and fulfils the requirement of additionality.

Calculation and comp*arison*

The basic parameters for calculation of financial indicators of the Bundled Project are shown in Table 2.

Table 2. Basic parameters for calculation of financial indicators of the Shanjunyan Project and the Liaoli Project

Parameter	Shanjunyan Project	Liaoli Project	Source of Data
Installed capacity (MW)	6.4	5.0	Feasibility Study Report
Estimated annual output (MWh)	27,298	17,824	Feasibility Study Report
Project lifetime (years)	25	25	Feasibility Study Report
Total investment (million RMB)	32.38	27.98	Feasibility Study Report
Expected bus-bar tariff (excluding VAT, RMB/kWh)	0.1784	0.1784	Approval of FSB by Guizhou NDRC
Rate of VAT	6%	6%	"Announcement on the adjustment of certain VAT"issued by MOF and Tax Bureau (Caishuizi(94)[004])
Urban Construction Fee	0.3%	0.3%	Feasibility Study Report
Education aid Fee	0.06%	0.06%	Feasibility Study Report
Income tax (exempt for the first two years and 12.5% for the later three years)	25%	25%	Income Tax Law of People's Republic of China
Operation cost (million RMB/year)	0.69	0.57	Feasibility Study Report
Depreciation Rate	4%	4%	Feasibility Study Report
CER Expected Price (€/CO2e)	8	8	Purchase Agreement

Calculated based on these data, the FIRR of the total investment of the Shanjunyan Project is only 8.58%, and the FIRR of the total investment of the Liaoli Project is only 5.40%. It is lower than the benchmark FIRR for small hydropower projects (10%). Therefore, the Bundled Project is not financially feasible and fulfils the requirement of additionality.

Sensitivity Analysis

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

The following key parameters have been selected as sensitivity indicators to test the financial attractiveness for the proposed bundled project.

- Tariff (excluding VAT)
- Total investment
- Operation Cost

The results of sensitivity analysis are shown as follows.

Table 3. Sensitivity analysis data

Variation Scope / FIRR(%) / Parameter		-10%	-5%	0	5%	10%
Shanjunyan Project	Tariff	7.29%	7.94%	8.58%	9.20%	9.81%
	Total Investment	9.74%	9.13%	8.58%	8.06%	7.59%
	Operational Cost	8.76%	8.67%	8.58%	8.48%	8.38%
Liaoli Project	Tariff	4.30%	4.86%	5.40%	5.94%	6.45%
	Total Investment	6.35%	5.86%	5.40%	4.99%	4.60%
	Operational Cost	5.61%	5.51%	5.40%	5.30%	5.20%

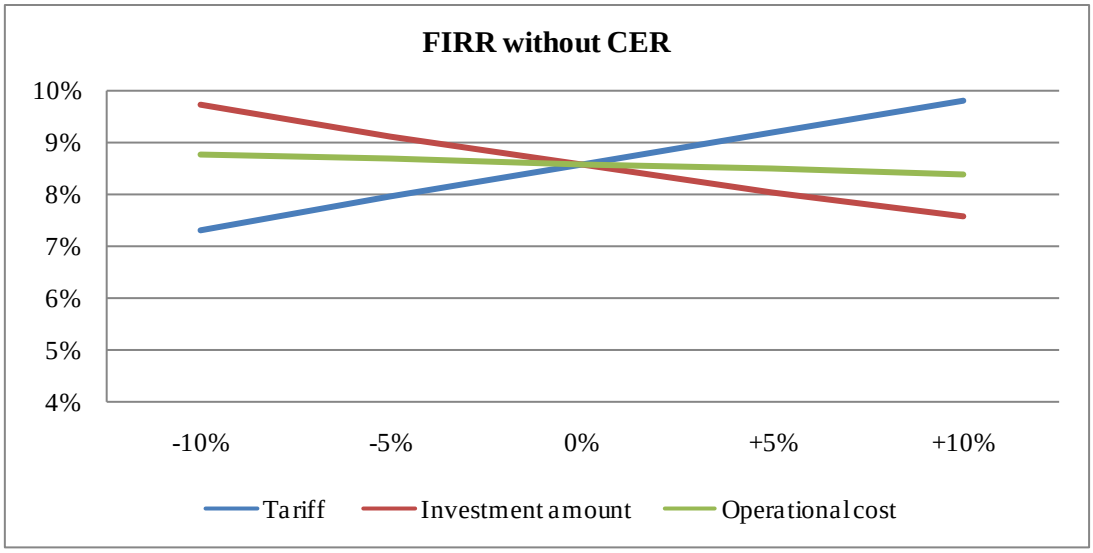

Figure 2 Sensitivity analysis of the Shanjunyan Project

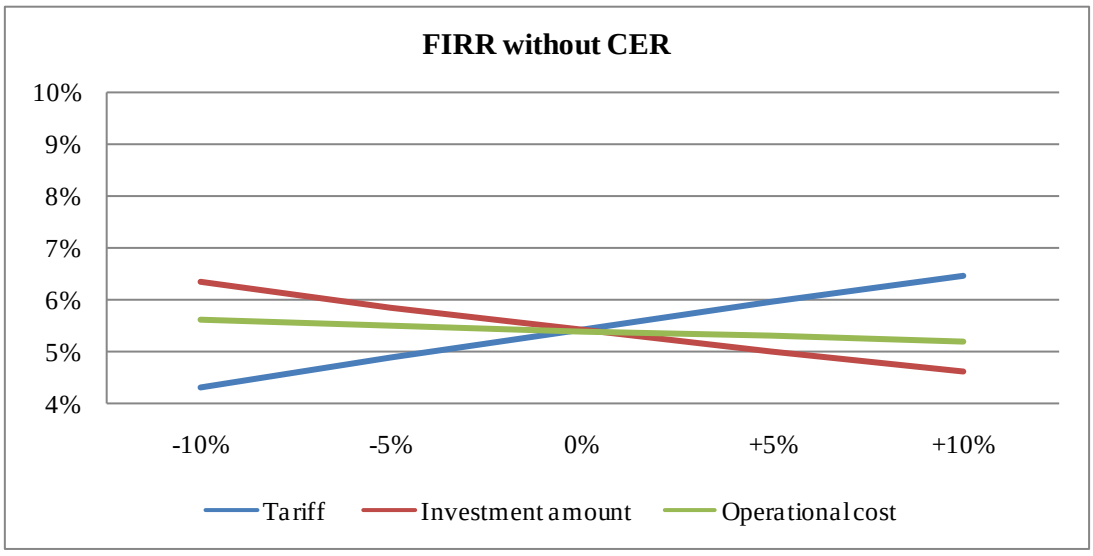

Figure 3 Sensitivity analysis of the Liaoli Project

The results of sensitivity analysis show that even the fluctuation range of those sensitivity indicators reach 10%, the FIRR of the total investment of the Projects could not reach the benchmark and the conclusion regarding that the Bundled Project is financially unattractive is still tenable.

Considering CDM before the construction of the project

Both of the proposed project encountered financial barrier towards its realization.

According to the analysis on the proposed project, the project owner realized that the project lacked financial attractiveness with low FIRR. To overcome financial weakness and unfavourable conditions that the Project encounters, the project owner of Shanjunyan Project decided to seek CDM assistance in August 2005. After taking CDM into consideration seriously, the project owner finally decided to start the construction of the project. The financial analysis shows that the additional support of the CDM makes a significant difference to the project financial status, increasing FIRR from 8.58% to 13.53%. If the project owner is able to sell CERs generated by the project activity, the additional carbon revenue will make the project financially viable.

The time table of the CDM consideration as follow:

Table 4.1. CDM consideration of Shanjunyan Project

Time	Event
23rd Aug 2005	CDM development contract signed
23rd Aug 2005	Investment decision was made by the chairman of the board and the incentive of CDM is acknowledged as a key element of the project's profitability
30th Sept 2005	Turbines/generators contract signed
20th Dec 2005	Construction contract signed
25th Sept 2007	ERPA contract signed
July 2008	Commercial production of Electricity

To overcome financial weakness and unfavourable conditions that the Project encounters, the project owner of Liaoli Project decided to seek CDM assistance in August 2005. After taking CDM into consideration seriously, the project owner finally decided to start the construction of the project. The financial analysis shows that the additional support of the CDM makes a significant difference to the project financial status, increasing FIRR from 5.40% to 9.51%. If the project owner is able to sell CERs generated by the project activity, the additional carbon revenue will make the project financially viable.

The time table of the CDM consideration as follow:

Table 4.2. CDM consideration of Liaoli Project

Time	Event
19th Aug2005	CDM development contract signed
31st Aug 2005	Investment decision was made by the chairman of the board and the incentive of CDM is acknowledged as a key element of the project's profitability
12th Sept 2005	Construction contract signed
23rd Mar 2006	Turbines/generators contract signed
25th Sept 2007	ERPA contract signed
July 2008	Commercial production of Electricity

In conclusion, the projects in this Bundled Project are not feasible without CDM financing. Compared to the benchmark, the projects face unusual financial barrier, CDM helps to overcome these barriers. Hence, the proposed projects activity are not a baseline scenario, but additional.

Impact of CDM Registration

If the Bundled Project could not be successfully registered as a CDM project, the Bundled Project is far from financial attractive and will fail to be implemented. Therefore, the goal of reducing anthropogenic greenhouse gas emission will fail to be achieved.

If the Bundled Project can be successfully registered as a CDM project, the CERs sales revenues will improve its financial performance greatly. Considering of the CERs sales revenues (calculated with €8/tCO2e during crediting period), the FIRR of the total investment of the Shanjunyan Project will be increased to 13.53%, the FIRR of the total investment of the Liaoli Project will be increased to 9.51%. The CDM revenue significantly promotes the financial feasibility of the Bundled Project and help the Bundled Project implemented successfully. Therefore, the goal of reducing anthropogenic greenhouse gas emission will be achieved.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The emission coefficient is calculated according to method (a) provided in the methodology AMS.I.D.(version 13) as: (a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the "Tool to calculate the emission factor for an electricity system"(version 01,EB35).

1. Calculation of $EF_{grid,cm,y}$ of China Southern Power Grid

The baseline emission factor will be calculated according to the procedures prescribed in the "Tool to calculate the emission factor for an electricity system" (EB35, version 01). According to "Tool to calculate the emission factor for an electricity system", there are six steps to calculate the emission factor of the power grid. The detailed processes are as follows:

Step 1 Identify the relevant electric power system

Because China DNA has published a delineation of the project electricity system and connected electricity systems on 9th August 2007, the electricity generated by the proposed bundled project will be transmitted to Yunnan Power Grid which is part of China Southern Power Grid. According to the latest guidelines issued on 9th August, 2007 by China's DNA, the geographical boundary of China Southern Power Grid covers Guangdong Province Power Grid, Guangxi Zhuang Autonomous Prefecture Power Grid, Yunnan Province Power Grid, Guizhou Province Power Grid. As for China Southern Power Grid, there is electricity transferring from connected electricity systems (Central China Power Gird) to the project electricity system, so it is referred to electricity imports. When determining the operating margin emission factor of China Southern Power Grid, the CO_2 emission factor(s) for net electricity imports from a connected electricity system (Central China Power Grid) should be considered. According to the

"Tool to calculate the emission factor for an electricity system", this PDD adopts the following option to determine the CO_2 emission factor(s) for net electricity imports from a connected electricity system (Central China Power Grid):

c) The simple operating margin emission rate of the exporting grid, determined as described in step 3 (a) simple OM, if the conditions for this method, as described in step 2 below, apply to the exporting grid;

Step 2. Select an operating margin (OM) method

According to the "Tool to calculate the emission factor for an electricity system", four methods could be used to calculate the OM and any of the four methods can be used:

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

For the proposed bundled project, from 2001 to 2005, the proportion of low-cost/must-run resources[3] in the total grid electricity of China Southern Power Grid was 32.33% in 2001, 31.62% in 2002, 33.53% in 2003 and 29.95% in 2004, 30.42% in 2005[4], far lower than 50%. As a result, the simple OM method may be used.

Furthermore, if simple OM method was chosen, according to the "Tool to calculate the emission factor for an electricity system", the emissions factor can be calculated using either of the two following data vintages:

- **Ex ante option**: A 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period, or
- **Ex post option**: The year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required to calculate the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year (y-1) may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year (y-2) may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

This PDD chooses "**Ex ante option**: A 3-year generation-weighted average".

Step 3. Calculate the operating margin emission factor according to the selected method

[3] Low-cost/must-run resources are defined as power plants with low marginal generation costs or power plants that are dispatched independently of the daily or seasonal load of the grid. They typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. If coal is obviously used as must-run, it should also be included in this list, i.e. excluded from the set of plants.

[4] China Electric Power Yearbooks (2002, 2003, 2004, 2005, and 2006)

This PDD adopts the (a) Simple OM. The simple OM emission factor is calculated as the generation weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units. It may be calculated:

- Based on data on fuel consumption and net electricity generation of each power plant / unit[5] (**Option A**), or
- Based on data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit (**Option B**), or
- Based on data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system (**option C**)

Option C was chosen based on the following three reasons:

- The necessary data for option A and option B is not available in China;
- Only nuclear and renewable power generation are considered as low-cost / must-run power sources and the quantity of electricity supplied to the grid by these sources is known.

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

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_y} \quad (1)$$

Where:

$EF_{grid,OM,simple,y}$ = Simple operating margin CO_2 emission factor in year y (tCO_2/MWh);

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

$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit);

$EF_{CO2,i,y}$ = CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ);

EG_y = Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year y (MWh);

i= All fossil fuel types combusted in power sources in the project electricity system in year y;

y= the three most recent years (2003, 2004 and 2005) for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option);

For this approach (simple OM) to calculate the operating margin, the subscript m refers to the power plants / units delivering electricity to the grid, not including low-cost/must-run power plants / units, and including electricity imports to the grid. Electricity imports should be treated as one power plant m. As for China Southern Power Grid, the electricity imported from Central China Power Grid should be treated as one power plant m.

[5] Power units should be considered if some of the power units at the site of the power plant are low-cost / must-run units and some are not. Power plants can be considered if all power units at the site of the power plant belong to the group of low-cost / must-run units or if all power units at the site of the power plant do not belong to the group of low-cost / must-run units.

Based on the formula (1), the calculation process for OM of China Southern Power Grid is shown in annex 3.

Step 4. Identify the cohort of power units to be included in the build margin

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

a) The set of five power units that have been built most recently, or

b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently;

In terms of vintage of data, project participants can choose between one of the following two options:

Option 1. For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2. For the first crediting period, the build margin emission factor shall be updated annually, ex-post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex-ante, as described in option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

This PDD chooses the **Option 1.**

Step 5. Calculate the build margin emission factor

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

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{BL,m,y}}{\sum_m EG_{m,y}} \quad (2)$$

Where:

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

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh);

$EF_{BL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2/MWh);

m = Power units included in the build margin;

y= Most recent historical year for which power generation data is available;

The CO_2 emission factor of each power unit m ($EF_{EL,m,y}$) should be determined as per the guidance in step 3 (a) for the simple OM, using options B1, B2 or B3, using for y the most recent historical year for which power generation data is available, and using for m the power units included in the build margin.

In China, because some data can't be available, the BM calculation in this PDD adopts the modifications methods agreed by the CDM EB[6]. First, calculate the newly added installed capacity and the various component technologies, then calculation of the weight of newly added installed capacity of each power generation technology. Finally the commercial and efficient level of each power generation technology is adopted to calculate BM emission factor.
Because the generating capacity of the coal-fired, oil-fired and gas-fired technology can not be separated from the existing statistical data, the BM calculation in this PDD adopts the following method: First, use the available data in the energy balance tables on the most recent year, then calculate the proportion of CO_2 emissions from solid, liquid and gaseous fuels corresponding to the total emissions of CO_2 emissions; Second, the proportion used as the weight, based on the emission factors of the optimal efficient and commercial technologies, calculate the emission factor of the thermal power in each grid. Finally, this thermal emission factor is multiplied by the proportion of thermal power added capacity in the additional 20% capacity. The result is BM emission factor.

Concrete steps and the formula for BM are as follows:

Sub-step1: Calculation of the proportion of CO_2 emissions from solid, liquid and gaseous fuels corresponding to the total emissions of CO_2 emissions.

$$\lambda_{Coal} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (3)$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (4)$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad (5)$$

Where:
$F_{i,m,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by plant *m* in year *y*;
$COEF_{i,m}$ is the CO_2 emission coefficient (tCO_2e / a mass or volume unit) of fuel *i*, taking into account the carbon content of the fuels used by plant *m* and the percent oxidation of the fuel in year *y*;
Coal, Oil and Gas is the feet for solid fuels, liquid fuels and gas fuels.

Sub-step2: Calculation the emission factor of thermal power.

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \quad (6)$$

$EF_{Coal,Adv}$, $EF_{Oil,Adv}$, $EF_{Gas,Adv}$ represent the emission factors of the optimal efficient and commercial coalfired, oil-fueled and gas-fueled technologies.

[6] the clarifications for some proposed projects in China adopting the approved methodology AM0005 and AMS-I.D to calculate the build margin emission factor.

Sub-step 3: Calculation of BM in the grid.

$$EF_{grid,BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Theraml} \quad (7)$$

Where:

CAP_{Total} is the total added installed capacity;

$CAP_{Thermal}$ is the total added installed capacity for thermal power.

Based on the above calculation principle for BM, basic data and parameter, the calculation process for BM is shown in annex 3.

Step 6. Calculate the combined margin emissions factor

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = w_{OM} \times EF_{grid,OM,y} + w_{BM} \times EF_{grid,BM,y} \quad (8)$$

Where:

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

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

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

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

In this PDD for the first crediting period, the weight w_{OM} and w_{BM} are 50%.

2. Baseline emissions

According to AMS.I.D. (version 13), based on the above calculated $EF_{grid,cm,y}$ of China Southern Power Grid, according to the procedures prescribed in the "Tool to calculate the emission factor for an electricity system" (EB35, version 01), the baseline is the MWh produced by the renewable generating unit multiplied by an emission coefficient (measured in Ton CO_2e/MWh) calculated in a transparent and conservative manner, calculated as follows:

$$BE_y = (EG_y - EG_{baseline}) \times EF_{grid,CM,y} = EG_y \times EF_{grid,CM,y} \quad (9)$$

Where:

BE_y = Baseline emissions in year y (tCO_2/yr).

EG_y = Electricity supplied by the project activity to the grid (MWh).

$EG_{baseline}$ = Baseline electricity supplied to the grid in the case of modified or retrofit facilities (MWh).

For new power plants this value is taken as zero. The proposed bundled project is new plants, so $EG_{baseline}$ is zero.

$EF_{grdi,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system".

So, the baseline emissions (BE_y in tCO_2e) are the product of the baseline emissions factor ($EF_{grid,CM,y}$ in

tCO_2e/MWh) calculated in the above procedures, times the result of the electricity supplied by the project activity to the grid (EG_y in MWh).

In case of equipment shutdown or overhaul, the project is likely to import the electricity from the grid during this period. Thus, the amount of imported electricity ($EG_{Grid\ to\ PJ,\ y}$) will be deducted from the amount supplied to the grid ($EG_{PJ\ to\ Grid,\ y}$) and the net quantity of electricity supplied ($EG_y = EG_{PJ\ to\ Grid,\ y} - EG_{Grid\ to\ PJ,\ y}$) will be as the base for emission reductions calculation. So the baseline emissions are calculated as:

$$BE_y = (EG_y - EG_{baseline}) \times EF_{grid,CM,y} = EG_y \times EF_{grid,CM,y} = (EG_{PJ\ to\ Grid} - EG_{Grid\ to\ PJ}) \times EF_{grid,CM,y} \quad (10)$$

Where:

$EG_{PJ\ to\ Grid,\ y}$ = the amount of the electricity supplied to the grid;

$EG_{Grid\ to\ PJ,\ y}$ = the amount of electricity imported from the grid;

3. Project emissions

According to AMS.I.D. (Version 13), as for run-of-river hydropower plants, the project emissions are zero,

$$PE_y = 0. \quad (11)$$

4. Leakage

According to AMS-I.D. (Version 13), there are none energy generating equipment transferred from another activity and there are none existing equipment transferred to another activity, so leakage is not to be considered. So, LE_y is zero.

$$LE_y = 0 \quad (12)$$

5. Emission reductions

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - L_y = BE_y = (EG_{PJ\ to\ Grid,y} - EG_{Grid\ to\ PJ,y}) \times EF_{grid,CM,y} \quad (13)$$

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

Data / Parameter	EGP_y
Data unit	*MWh*
Description	*The total power generation and power generated by low-cost/must run power plants within CSPG in year y.*
Source of data used	*China Electric Power Yearbook 2004, 2005 and 2006 Edition.*
Value applied	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied	*The data comes from reliable and open official data.*
Any comment	--

Data / Parameter	PR_y
Data unit	*%*
Description	*Percentage of self-consumed thermal power in year y.*
Source of data used	*China Electric Power Yearbook 2004, 2005 and 2006 Edition.*
Value applied	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied	*The data comes from reliable and open official data.*
Any comment	--

Data / Parameter	$FC_{i,y}$
Data unit	10^4*t or* $10^8 m^3$
Description	*Different fossil fuel consumptions for power generation within CSPG in year 2003, 2004 and 2005.*
Source of data used	*China Energy Statistical Yearbook 2004, 2005 and 2006 Edition.*
Value applied	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied	*The data comes from reliable and open official data.*
Any comment	--

Data / Parameter	$NCV_{i,y}$
Data unit	*MJ/t or MJ/*$10^3 m^3$ *(or convert toKJ/kg or KJ/*m^3*)*
Description	*Average low calorific values of different fuels for electricity generation.*
Source of data used	*China Energy Statistical Yearbook 2006 Edition.*
Value applied	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied	*The data comes from reliable and open official data.*
Any comment	*Official data*

Data / Parameter	$EF_{CO2,i,y}$
Data unit	*tC/TJ (or convert to kg/GJ)*
Description	*Emission factors of fuels for electricity generation.*
Source of data used	*Table1.3 and Table 1.4 of the Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook , Value 2 energy.*
Value applied	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied	*IPCC world-wide default values are adopted.*
Any comment	*Official data*

When calculating BM of CSPG, the following parameters are required:

Data / Parameter	$EF_{COAL,Adv}$
Data unit	*%*
Description	*The efficiency level of the best coal-based power generation technology commercially available in China.*
Source of data used	*Notification on Determining Baseline Emission Factors of China Power Grid issued by Chinese DNA on August 9th, 2007*
Value applied	*35.82%*
Justification of the choice of data or description of measurement methods and procedures actually applied	*The data comes from reliable and open official data.*
Any comment	--

Data / Parameter	$EF_{OIL/GAS,Adv}$
Data unit	*%*
Description	*The efficiency level of the best oil-based and gas-based power generation technology commercially available in China.*
Source of data used	*Notification on Determining Baseline Emission Factors of China Power Grid issued by Chinese DNA on August 9th, 2007*
Value applied	*47.67%*
Justification of the choice of data or description of measurement methods and procedures actually applied	*The data comes from reliable and open official data.*
Any comment	--

Data / Parameter	$CAP_{i,y}$
Data unit	*MW*
Description	*Power capacity of CSPG power resource i in y year.*
Source of data used	*China Electric Power Yearbook 2004, 2005 and 2006 Edition.*
Value applied	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied	*The data comes from reliable and open official data.*
Any comment	--

Data / Parameter	$EF_{import.y}$
Data unit	tCO_2/MWh
Description	*Emission Factor of CSPG in y year.*
Source of data used	*Notification on Determining Baseline Emission Factors of China Power Grid issued by Chinese DNA on August 9th, 2007*
Value applied	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied	*The data comes from reliable and open official data.*
Any comment	--

Data / Parameter	$GEN_{import.y}$
Data unit	*MWh*
Description	*Electricity adjusted from CCPG to CSPG in year y.*
Source of data used	*National Power Web* http://www.sp.com.cn/zgdl/spw/05_01y/05_01_dljh.htm
Value applied	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied	*The data comes from reliable and open official data.*
Any comment	--

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

Baseline emissions calculation

With reference to the *Notification on Determining Baseline Emission Factors of China Power Grid* issued by Chinese DNA on August 9th, 2007, the OM emission factor ($\boldsymbol{EF}_{OM,y}$) of CSPG is 1.0119 tCO2e/MWh, and the build margin emission factor ($\boldsymbol{EF}_{BM,y}$) of CSPG is 0.6748 tCO2e/MWh. The

detailed calculations and data are listed in Annex 3.

Based on formula (9) in section B.6.1, the baseline emissions factor (EF_y) of CSPG is calculated as 0.84335 tCO2e/MWh.

According to the *Feasibility Study Report* of the Bundled Project, the electricity output of the Bundled Project is estimated as 45,122 MWh per year, therefore the baseline emissions of the Bundled Project is estimated as 38,054 tCO2e per year.

Project activity emissions calculation

As described in section B.6.1, the Bundled Project activity emissions (PE_y) will be 0 tCO2e.

Leakage

As described in section B.6.1, the leakage of the Bundled Project (L_y) will be 0 tCO_2e.

Emission reductions calculation

Based on formula (13) in section B.6.1, the ex-ante annual emission reductions are estimated as 38,054 tCO2e.

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

It is expected that the Bundled Project activities will generate emission reductions for about 38,054 tCO2e per year over the first 7-year crediting period from Oct. 2008 to Sep. 2015.

Year	Estimation of project activity emissions (tonnes of CO2e)	Estimation of baseline emissions (tonnes of CO2e)	Estimation of leakage (tonnes of CO2e)	Estimation of overall emission reductions (tonnes of CO2e)
2008(Otc. to Dec.)	0	9,513	0	9,513
2009	0	38,054	0	38,054
2010	0	38,054	0	38,054
2011	0	38,054	0	38,054
2012	0	38,054	0	38,054
2013	0	38,054	0	38,054
2014	0	38,054	0	38,054
2015(Jan. to Sept.)	0	28,541	0	28,541
Total (tCO2e)	**0**	**266,378**	**0**	**266,378**

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

B.7.1 Data and parameters monitored:

Data / Parameter:	$EG_{PJ\ to\ Gird,y}$
Data unit:	*MWh*
Description:	*Electricity supplied to the grid by the Project in Year y.*
Source of data to be used:	*Measured by Electric Meter.*
Value of data	*45,122MWh*
Description of measurement methods and procedures to be applied:	Measured continuously and recorded on a monthly basis*; Double check by receipt of sales.*
QA/QC procedures to be applied:	*The data of the low degree of uncertainty. The two projects bale project of electricity power station Internet data separately through local county (city) level substation monitoring and recording. Each project owner regularly measuring and recording data, and the total monthly statistics released. Of the project to supply power plants online sale of electricity to double-check receipt. Calculations, the project owners from the formal record data.*
Any comment:	*Data will be archived at least for two years after the end of the crediting period, olr the last issuance of CERs, whichever occurs later.*

Data / Parameter:	$EG_{Gird\ to\ PJ,y}$
Data unit:	*MWh*
Description:	*Electricity drawn from the grid for the Project's consumption.*
Source of data to be used:	*Measured by Electric Meter.*
Value of data	*0 MWh*
Description of measurement methods and procedures to be applied:	Measured continuously and recorded on a monthly basis.
QA/QC procedures to be applied:	*The data of the low degree of uncertainty. The two projects bale project of electricity power station Internet data separately through local county (city) level substation monitoring and recording. Each project owner regularly measuring and recording data, and the total monthly statistics released. Calculations, the project owners from the formal record data.*
Any comment:	--

B.7.2 Description of the monitoring plan:

In this PDD, emission factor of the Bundled Project is determined ex-ante. Therefore the electricity supplied to and drawn from the grid by the Bundled Project is an integral data to determine emission reductions. The monitoring plan is designed to monitor these two electricity data of the Bundled Project. The amount of net electricity supply to the grid (EG_y) can be calculated by $EG_{PJ\ to\ Grid,\ y} - EG_{Grid\ to\ PJ,\ y}$.

1. The organizational structure of monitoring

Smart Energy Co., Ltd. is responsible for the management the emission reduction monitoring system of the Bundled Project. Companies involving the Bundled Project, Rongjiang County Shanjunyan Small Hydropower Station and Rongjiang County Lirong Hydropower Development Co.,Ltd. are responsible for the operation of the individual Project within the Bundled Project and execute the monitoring plan and data collecting.

Figure 4 describes for the detailed operation and management structure of the Bundled Project.

Smart Energy Co., Ltd.
In full charge of issues related to the CER calculation of the bundled project, in particular: (1) keep communication with project owners, the Executive Board, the UNFCCC Secretariat, DOE and related agencies; (2) in charge of activities related to CER issuance, ensure the completeness and accuracy of related data.

Individual project owners of the bundled project
In full charge of issues related to the project operation of the individual project of the bundled project, in particular: (1) supervise the project operation status related to data monitoring and the monitoring process as well, ensure a smooth and orderly monitoring process; (2) in charge of maintaining the ammeter, and checking, archiving and managing data; (3) in charge of collecting data required by the checking activity, including ammeter readings records, electricity sales records and copies of electricity sales receipts.

Figure 4 Monitoring Structure

Operation staff for each project will record the data periodically. One technician from the power plant and one financial staff will to crosscheck the data and administrate the monitoring work.

The Smart Energy Co.,Ltd and designated agency will be in charge of training monitoring operator. The monitoring data of the power plants will be delivered to the designated who is responsible to check and verify the data and develop the final monitoring report.

2. Installation and calibration of monitoring equipments

The owners of the bundled project will make contract with the local electric power grid company for electricity supply after go into operation. The power output to the grid and input from the grid will be monitored and regulated:

- Electric meters to measure the power supplied to the grid in the two projects will be installed and maintained according to the "Technical administrative code of electric energy metering (DL/T 448-2000)[7]". Examination and verification will be made by the project owners and the local electric power grid company before the meters come into operation.
- All the meters which have 0.5s level accuracy can measure the electricity both output to the grid and input from the grid.
- For the Shanjunyan project, the station have an electric meter installed in the Rongjiang Substation, and for the Liaoli project, the station have an electric meter installed in the Liu-Shu-Ping Substation, which belongs to the local electric power grid company.
- All the meters should be examined annually and calibrated at least every three years by the entities designated by local electric power grid company. The accuracy of active and reactive power should be level 0.5s and 1s. All the examination and calibration should be operated according to egulations of the national power industry[3]. Records of examination and calibration should be sealed after verified by both the project owner and the local electric power grid company, then the records should be submitted to DOE. Neither of the two parties should unseal or modify the meter unilaterally without the other party.
- In any cases stated as follows, the meters should be examined and calibrated by the local electric power grid company within 10 days.
  (a) Reading errors of the meters overpass the regulated range.
  (b) After repair or modification for the broken meters.
  (c) Any parties that require to modify, calibrate or replace the meters, should announce the other party in advance, a representative from the other party should be sent to inspect the process of modification, calibration or replacement.

3. Data collection, storage and management

Operators of project and the local electric power Grid Company should record the data from the substation electric meters monthly.

In case the error of last month data overpass the regulated range, or the meter malfunctions, the data of the power supplied to the grid should be determined as follows:

(a) A conservative value can be estimated only if the project owner and the electric power grid company provided enough evidence to the DOE to prove its conservatism and appropriateness.

(b) In case the project owner and electric power grid company cannot obtain an agreement on the estimated value, arbitration by the regulation entities should be requested to maintain the appropriateness of the estimated value.

[7] Technical administrative code of electric energy metering(DL/T 448-2000), issued by State Economic and Trade Commission of the People's Republic of China, 2000-10-03

All the monitoring records, both in paper based documents and in computer based documents, should be kept by the project owners monthly. Copies of the electricity purchase receipt should also be kept, with monitoring plan, other documents such as maps, environment evaluation reports will be used to verify the monitoring data. The project owner should provide index of all the project documents and monitoring data which are kept and archived by the project owner during the crediting period and two years beyond crediting period, to the DOE as the purpose of verification. The CDM project management group is in charge of all the paper based documents and data, which should have at least one copy.

In case of unexpected destruction of the equipments, new meters should be installed by the entities designated by the electric power grid company. A conservatively estimated value of the power supplied to the grid during the period which the meter were broken.

4. Monitoring report

The CDM project manager should finish the monitoring report for last year, copies should be delivered to each project owner and Smart Energy Co.,Ltd. Accepted by the project owners, the report will be submitted to the DOE with the monitoring data for verification.

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

Completion date: September 06, 2008

Entity 1: Beijing Karbon Energy Investment and Consulting Co., Ltd.
Address: Suite 422 Xihua Hotel, No. 69 Yuetan South Street, Xicheng District, Beijing 10045
Tel: +86-10-6858-2198
Fax: +86-10-6858-3019

Beijing Karbon Energy Investment and Consulting Co., Ltd. is not the project participants.

Entity 2: Smart Energy Co., Ltd.
Address: Toranomon Masters Bldg. 3rd Floor, 1-12-14 Toranomon, Minato-ku, Tokyo, Japan, 105-0001.
Tel: +81-3-3591-3012
Fax: +81-3-3591-3012

Smart Energy Co.,Ltd is the project participants.

SECTION C. Duration of the project activity / Crediting period:

C.1. Duration of the small-scale project activity:

C.1.1. Starting date of the small-scale project activity:

The starting date of Shanjunyan Project: September 30, 2005 (date of the main equipment purchase contract)
The starting date of Liaoli Project: September 12, 2005 (date of the construction contract)

The earlier date of the construction contracts or main equipment purchase contract is determined as the starting date of the project activity.

C.1.2. Expected operational lifetime of the small-scale project activity:

25 years, 0 month

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

C.2.1. Renewable crediting period:

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

Oct. 01, 2008 or registration date, whichever is the latest date.

C.2.1.2. Length of the first crediting period:

7 years, 0 month

C.2.2. Fixed crediting period:

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:

The *Environmental Impact Registration Form* of the Shanjunyan Project and the Liaoli Project are completed by the project owner, and approved by the Environment Protection Bureau.

According to the *Feasibility Study Report* and the *Environmental and Ecological Impact Report*, environmental impacts possibly caused by the Bundled Project and protective measures adopted by the project owner are analyzed as follows:

Compensation for submerged land

The Bundled Project involves no migrant and no people need to be relocated. The villagers whose land affected by the Bundled Project will be compensated by the Project owner according to the *Land Administration Law of the People's Republic of China (2004 Revision)*. According to the real land status, the Project owner will help those affected people to solve the land problem by means of making adjustment of the tillable field in the village and utilizing funds for reclaiming land, developing tamable barren hills and barren land in the same village or closest area.

Air pollution and noise

Noises from various construction machines, tail gas emitted by vehicles as well as dust during construction of the Bundled Project will have temporary impacts on the quality of local sound environment and air environment. Since the Bundled Project is located in mountainous area with few habitants, it will have little impact on local people and local environment. The project owner will reduce impacts of waste gas, noise and dust on the construction staff by means of sprinkling at irregular intervals, reducing spills, enhancing maintenance of machinery and equipment and adopting corresponding protective measures. These impacts will be eliminated with the achievement of the construction.

Waste water

Waste water will be generated by production and living activities during the construction and operation of the Bundled Project. As pollutants in the waste water resulting from production activities are primarily suspending particulates which are not toxic, the waste water will be discharged after collectively removing the suspending particulates by means of sedimentation tank. Waste water resulting from living activities, after being treated by septic tank, will be used to irrigate vegetable garden and forest land, and will not be discharged directly into the river.

Solid waste

Waste soil and residential waste will be generated during the construction and operation of the Bundled Project. Solid construction waste will be treated according to the requirements of the *Pollution Control Standard for Storage and Disposal Site for General Industrial Solid Wastes* (GB18599-2001), and vegetation recovery and planting should be accomplished for the landfill. Residential garbage will be treated according to the requirements of solid waste treatment.

Ecological impact

According to investigation, there is no valuable and rare terraneous and aquatic wildlife in the region of the Bundled Project. Construction of the Bundled Project will not have any impact on sources of drinking

water.

Because few wild animals live around project sites and the project activities are limited within small scope, the Bundled Project will have little impact on the wild animals; quantity of phytoplankton and zooplankton will be increased, providing abundant bait for the growth, development and reproduction of birds and amphibians living mainly in water area as the habitat whose quantity will thus be increased. To sum up, negative impacts on the environment caused by the Bundled Project mainly centered on the construction period which will disappear along with the completion of the Bundled Project construction. In conjunction with the implementation of a series of environment protection measures during the construction and operation, the Bundled Project will not have significant impacts on the environment.

In conclusion, environmental impacts arising from the Bundled Project are considered insignificant.

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 Bundled Project has not significant impacts on local environment and the EIAs of the Bundled Project have been approved by the local environmental protection authority.

SECTION E. Stakeholders' comments:

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

According to the requirement by the Measures for Operation and Management of Clean Development Mechanism Projects in China, a survey on the local villagers and residents was conducted. In September 2007, project owners of Shanjunyan Project and Liaoli Project carried out a survey of local residents and local authorities, including local environmental protection authority, local electricity authority, and local water authority respectively under the cooperation from Guizhou Hongfeng Forestry Clean Development Mechanism (CDM) Consultant and Service Co., Ltd. Project owners introduced the summary of the Projects, the staff from Guizhou Hongfeng Forestry Clean Development Mechanism (CDM) Consultant and Service Co., Ltd. explained the contents about CDM to local residents. It included the following contents.

- The main contents of Clean Development Mechanism.
- The importance of greenhouse gas (GHG) emission reduction.
- The definition of stakeholder under CDM project.
- The policy of Chinese Government and Annex I countries under the Kyoto Protocol.
- The negative impacts and the positive impacts of the construction and operation of the CDM project.

E.2. Summary of the comments received:

Totally 30 local residents and the correlative persons from local authorities attended the meeting. What local residents concern mostly was the affection and profit the Projects would bring. The following is a summary of the key desires and comments asked by the local residents.

- The correlative person from local authorities said they would support the construction and implementing the Projects positively.
- Some residents worried that the construction of the Projects would flood their infield.
- Some residents hoped that some job positions would be provided to them during the Projects construction.
- Some local residents wondered if they could work at the hydroelectric power station.

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

The Project owners promised that they would compensate local residents according to state regulation and they would sign a triple agreement with local authorities and residents to insure the legal rights of the residents then.
The Project owners showed that residents would get the priority in applying for the jobs during the Projects construction. Also, they will build a road among the mountains to transport the equipment to the hydroelectric power station which would benefit and satisfy the residents greatly.

The project owners expressed that as the professional knowledge was necessary for a station employee, not everyone could work there. The owners also explained that if the young people of the local residents graduated from an electric power specialized school, they could attend the interview of the company who would hire the young people preferentially and provide professional training to them.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Project participants:

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding from Annex I Parties for the Bundled Project.

Annex 3

BASELINE INFORMATION

Table Annex 3-1. Data of fuels consumed for electricity generation

Fuel type	Emission factor (tC/TJ)	Oxidation rate (%)	Low calorific value
Raw coal	25.8	100	20,908 kJ/kg
Clean coal	25.8	100	26,344 kJ/kg
Other washed coal	25.8	100	8,363 kJ/kg
Coke	29.2	100	28,435 kJ/kg
Other coke	29.2	100	28,435 kJ/kg
Crude oil	20	100	41,816 kJ/kg
Gasoline	18.9	100	43,070 kJ/kg
Diesel	20.2	100	42,652 kJ/kg
Fuel oil	21.1	100	41,816 kJ/kg
Other petroleum products	20	100	38,369 kJ/kg
LPG	17.2	100	50,179 kJ/m3
Refinery gas	15.7	100	46,055 kJ/m3
Natural gas	15.3	100	38,931 kJ/m3
Coke oven gas	12.1	100	16,726 kJ/m3
Other coal gas	12.1	100	5,227 kJ/m3

Data sources:

1) 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Workbook. Volume 2 Energy;
2) China Energy Statistical Yearbook 2006 edition

Table Annex 3-2. Thermal power generation data within CSPG in 2003

	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Guangdong	143,351,000	5.5	135,466,695
Guangxi	17,079,000	8.43	15,639,240
Guizhou	43,295,000	7.4	40,091,170
Yunnan	19,055,000	8.01	17,528,695
Total			208,725,800

Data source: China Electric Power Yearbook 2004 Edition.

Table Annex 3-3. Thermal power generation data within CSPG in 2004

	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Guangdong	169,389,000	5.42	160,208,116
Guangxi	20,143,000	8.33	18,465,088
Guizhou	49,720,000	7.06	46,209,768
Yunnan	24,322,000	7.56	22,483,257
Total			247,366,229

Data source: China Electric Power Yearbook 2005 Edition.

Table Annex 3-4. Thermal power generation data within CSPG in 2005

	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Guangdong	176,453,000	5.58	166,606,923
Guangxi	25,023,000	7.95	23,033,672
Guizhou	58,430,000	7.34	54,141,238
Yunnan	27,281,000	6.94	25,387,699
Total			269,169,531

Data source: China Electric Power Yearbook 2006 Edition.

Table Annex 3-5. Emission and Power Supply Data of CSPG in 2003

Energy	Unit	Guangdong A	Guangxi B	Guizhou C	Yunnan D	Total Fuel E=A+B+C+D	Emission factor (tc/TJ) F	Oxidation rate (%) G	NCV (MJ/t or 1000m3/) H	Emission (tCO2e) I
Raw Coal	10^4 t	4491.79	831.84	2169.11	1405.27	8898.01	25.8	100	20,908	175,993,455.05
Clean Coal	10^4 t	0.05	0	0	0	0.05	25.8	100	26,344	1,246.07
Other washed coal	10^4 t	0	0	36.38	20.37	56.75	25.8	100	8,363	448,971.84
Coke	10^4 t	0	0	0	0.50	0.50	29.2	100	28,435	15,222.20
Coke oven gas	10^8 m^3	0	0	0	0.04	0.04	12.1	100	16,726	2,968.31
Other coal gas	10^8 m^3	3.21	0	0	11.27	14.48	12.1	100	5,227	335,797.81
Crude oil	10^4 t	6.85	0	0	0	6.85	20	100	41,816	210,055.71
Gasoline	10^4 t	0.02	0	0	0	0.02	18.9	100	43,070	596.95
Diesel	10^4 t	31.90	0	0	0.76	32.66	20.2	100	42,652	1,031,759.27
Fuel oil	10^4 t	627.22	0.3	0	0	627.52	21.1	100	41,816	20,301,304.48
LPG	10^4 t	0	0	0	0	0	17.2	100	50,179	0.00
Refinery gas	10^4 t	2.85	0	0	0	2.85	15.7	100	46,055	75,560.14
Natural gas	10^8 m^3	0	0	0	0	0	15.3	100	38,931	0.00
Other petroleum products	10^4 t	11.35	0	0	0	11.35	20	100	38,369	319,357.98
Other coke	10^4 t	0	0	0	0	0	29.2	100	28,435	0.00
Other energy	10^4 tce	93.21	0	0	22.35	115.56	0	100	0	0.00
Total										198,736,295.81

Data sources: China Energy Statistical Yearbook 2004 Edition

If the unit of the fuel is 10^4 t, then $I=G*H*F*E*44/12/10^4$, if the unit of the fuel is 10^8 m^3, then $I=G*H*F*E*44/12/10^3$.
The same about the calculation of I in Table Annex 3-6 and Table Annex 3-7.

Table Annex 3-6. Emission and Power Supply Data of CSPG in 2004

Energy	Unit	Guangdong A	Guangxi B	Guizhou C	Yunnan D	Total Fuel E=A+B+C+D	Emission factor (tc/TJ) F	Oxidation rate (%) G	NCV (MJ/t or H	Emission (tCO2e) I
Raw Coal	10^4 t	6,017.70	1,305	2,643.90	1,751.28	11,717.88	25.8	100	20,908	231,767,573.55
Clean Coal	10^4 t	0.21	0	0	0	0.21	25.8	100	26,344	5,233.50
Other washed coal	10^4 t	0	0	0	0	0	25.8	100	8,363	0.00
Coke	10^4 t	0	0	0	0	0	29.2	100	28,435	0.00
Coke oven gas	10^8 m^3	0	0	0	0	0	12.1	100	16,726	0.00
Other coal gas	10^8 m^3	2.58	0	0	0	2.58	12.1	100	5,227	59,831.38
Crude oil	10^4 t	16.89	0	0	0	16.89	20	100	41,816	517,932.98
Gasoline	10^4 t	0	0	0	0	0	18.9	100	43,070	0.00
Diesel	10^4 t	48.88	0	0	1.83	50.71	20.2	100	42,652	1,601,975.28
Fuel oil	10^4 t	957.71	0	0	0	957.71	21.1	100	41,816	30,983,494.25
LPG	10^4 t	0	0	0	0	0	17.2	100	50,179	0.00
Refinery gas	10^4 t	2.86	0	0	0	2.86	15.7	100	46,055	75,825.26
Natural gas	10^8 m^3	0.48	0	0	0	0.48	15.3	100	38,931	104,833.40
Other petroleum products	10^4 t	1.66	0	0	0	1.66	20	100	38,369	46,707.86
Other coke	10^4 t	0	0	0	0	0	29.2	100	28,435	0.00
Other energy	10^4 tce	79.42	0	0	0	79.42	0	100	0	0.00
Total										265,163,407.45

Data sources: China Energy Statistical Yearbook 2005 Edition

Table Annex 3-7. Emission and Power Supply Data of CSPG in 2005

Energy	Unit	Guangdong A	Guangxi B	Guizhou C	Yunnan D	Total Fuel E=A+B+C+D	Emission factor (tc/TJ) F	Oxidation rate (%) G	NCV (MJ/t or H	Emission (tCO2e) I
Raw Coal	10^4 t	6,696.47	1,435	3,212.31	1,975.55	13,319.33	25.8	100	20,908	263,442,601.85
Clean Coal	10^4 t	0	0	0	0.15	0.15	25.8	100	26,344	3,738.21
Other washed coal	10^4 t	0	0	10.39	33.88	44.27	25.8	100	8,363	350,237.59
Coke	10^4 t	4.79	0	0	8.05	12.84	29.2	100	28,435	390,906.18
Coke oven gas	10^8 m^3	0	0	0	0.79	0.79	12.1	100	16,726	58,624.07
Other coal gas	10^8 m^3	1.87	0	0	15.96	17.83	12.1	100	5,227	413,485.84
Crude oil	10^4 t	10.91	0	0	0	10.91	20	100	41,816	334,555.88
Gasoline	10^4 t	0.68	0	0	0	0.68	18.9	100	43,070	20,296.31
Diesel	10^4 t	31.96	2.02	0	1.81	35.79	20.2	100	42,652	1,130,638.84
Fuel oil	10^4 t	887.21	0	0	0	887.21	21.1	100	41,816	28,702,703.26
LPG	10^4 t	0	0	0	0	0	17.2	100	50,179	0.00
Refinery gas	10^4 t	4.92	0	0	0	4.92	15.7	100	46,055	130,440.66
Natural gas	10^8 m^3	0.93	0	0	0	0.93	15.3	100	38,931	203,114.71
Other petroleum products	10^4 t	1.7	0	0	0	1.7	20	100	38,369	47,833.35
Other coke	10^4 t	0	0	0	0	0	29.2	100	28,435	0.00
Other energy	10^4 tce	104.66	133.15	0	59.72	297.53	0	100	0	0.00
Total										295,229,176.74

Data sources: China Energy Statistical Yearbook 2006 Edition

Table Annex 3-8. OM emission factors of CSPG

	2003	2004	2005
Net electricity import from the Central China Grid (MWh)	11,100	10,951,240	96,363,000
Average emission factor of the Central China Grid (tCO2e/MWh)	0.79744	0.82645	0.77123
Emission of Central China Grid (tCO2e)	8,852	9,050,630	74,317,555
Total emission of CSPG (tCO2e)	198,755,407	274,226,112	369,521,986
Thermal power generation within CSPG (MWh)	208,725,800	247,366,229	269,169,531
Fossil power supply of CSPG (MWh)	208,736,900	258,317,469	365,532,531
OM emission factors of CSPG in average	**1.01191**		

Data sources: China Energy Statistical Yearbook 2004 Edition, 2005 Edition, 2006 Edition

Table Annex 3-9. The data of efficiency level of the best electricity generation technologies commercially available in China and the corresponding emission factors.

	Parameter	Efficiency level	Emission factor (tc/TJ)	Oxidation rate	Emission factor (tCO2e/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%	0.95075
Oil-fired power plant	$EF_{Oil,Adv}$	47.67%	21.1	100%	0.58427
Gas-fired power plant	$EF_{Gas,Adv}$	47.67%	15.3	100%	0.42366

Data sources:

1) 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy; Workbook.
2) China Energy Statistical Yearbook 2006 edition
3) Notification on Determining Baseline Emission Factors of China Power Grid issued by Chinese DNA

Table Annex 3-10. The data of the electricity generation emissions related to solid, liquid and gas fuel.

Energy	Unit	Guangdong A	Guangxi B	Guizhou C	Yunnan D	Total Fuel E=A+B+C+D	NCV (MJ/t or 1000m3) H	Emission factor F	Oxidation rate G	Emission (tCO2e) I
Raw Coal	10^4 t	6,696.47	1,435	3,212.31	1,975.55	13,319.33	20,908	25.8	100	263,442,601.85
Clean Coal	10^4 t	0	0	0	0.15	0.15	26,344	25.8	100	3,738.21
Other washed coal	10^4 t	0	0	10.39	33.88	44.27	8,363	25.8	100	350,237.59
Coke	10^4 t	4.79	0	0	8.05	12.84	28,435	29.2	100	390,906.18
										264,187,483.84
Crude oil	10^4 t	10.91	0	0	0	10.91	41,816	20	100	334,555.88
Gasoline	10^4 t	0.68	0	0	0	0.68	43,070	18.9	100	20,296.31
Diesel	10^4 t	31.96	2.02	0	1.81	35.79	42,652	20.2	100	1,130,638.84
Fuel oil	10^4 t	887.21	0	0	0	887.21	41,816	21.1	100	28,702,703.26
Other petroleum products	10^4 t	1.7	0	0	0	1.7	38,369	20	100	47,833.35
										30,236,027.63
Natural gas	10^8 m^3	0.93	0	0	0	0.93	38,931	15.3	100	203,114.71
Coke oven gas	10^8 m^3	0	0	0	0.79	0.79	16,726	12.1	100	58,624.07
Other coal gas	10^8 m^3	1.87	0	0	15.96	17.83	5,227	12.1	100	413,485.84
LPG	10^4 t	0	0	0	0	0	50,179	17.2	100	0.00
Refinery gas	10^4 t	4.92	0	0	0	4.92	46,055	15.7	100	130,440.66
										805,665.28
Total										**295,229,176.74**

Data sources: China Energy Statistical Yearbook 2006 Edition

Used Table Annex 3-9, Table Annex 3-10, and the formula that established by ACM0002, the factors are calculated as follow:

$$\lambda_{Coal} = \frac{\sum_{i \in COAL, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} = 89.49\%$$

$$\lambda_{Oil} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} = 10.24\%$$

$$\lambda_{Gas} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} = 0.27\%$$

$$EF_{Thermal} = \lambda_{Coal} \cdot EF_{Coal,Adv} + \lambda_{Oil} \cdot EF_{Oil,Adv} + \lambda_{Gas} \cdot EF_{Gas,Adv} = 0.9117$$

Table Annex 3-11. Capacity increase data of CSPG from 2003 to 2005

	Installed capacity in 2003 (MW) A	Installed capacity in 2004 (MW) B	Installed capacity in 2005 (MW) C	Capacity additions from 2003 to 2005 (MW) D=C-A	Share in total capacity additions
Thermal power	40,444.10	46,659.70	54,507.00	14,062.90	74.01%
Hydro power	25,409.30	27,580.10	30,347.10	4,937.80	25.99%
Nuclear power	3,780.00	3,780.00	3,780.00	0.00	0.00%
Wind power and Other	83.40	83.40	83.40	0.00	0.00%
Total	69,716.80	78,103.20	88,717.50	19,000.70	
Share in total installed capacity of 2005	78.58%	88.04%	100.00%		

Data source:

1) China Electric Power Yearbook 2004, 2005 and 2006 Edition.
2) Notification on Determining Baseline Emission Factors of China Power Grid issued by Chinese DNA

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} EF_{Thermal} = 74.01\% * 0.9117 = \mathbf{0.6748\ tCO2/MWh}$$

$EFy=(EF_{OM,y}+EF_{BM,y})/2=(1.0119+0.6748)/2=0.84335$ tCO2/MWh

Annex 4

MONITORING INFORMATION

Please refer to section B.7. No need to complement more information here.