

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

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**Revision history of this document**

<b>Version Number</b>	<b>Date</b>	<b>Description and reason of revision</b>
01	21 January 2003	Initial adoption
02	8 July 2005	<ul style="list-style-type: none"> <li>● The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document.</li> <li>● As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <a href="http://cdm.unfccc.int/Reference/Documents">http://cdm.unfccc.int/Reference/Documents</a>.</li> </ul>
03	22 December 2006	<ul style="list-style-type: none"> <li>● 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.</li> </ul>

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

Title: 12.82 MW Bundled Small Hydropower Project in Qiandongnan Autonomous Region, Guizhou Province, P. R. China.

Version number of the document: Version 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 12.82 MW Bundled Small Hydropower Project (hereafter referred to as the Bundled Project) is located at Qiandongnan Autonomous Region, Guizhou Province, P. R. China. It consists of Jinping Sandengkan small hydropower plant (hereafter referred to as Jinping Sandengkan Project), Majingao small hydropower plant (hereafter referred to as Majingao Project), Sancengdong small hydropower plant (hereafter referred to as Sancengdong Project), and Wawadong (I) small hydropower plant (hereafter referred to as Wawadong (I) Project). The total installed capacity of the Bundled Project is 12.82 MW.

The Jinping Sandengkan Project is located at Liangjiang River within Tonggu Town, Jinping County. It is designed to deliver discharge flow of 36.60 m<sup>3</sup>/s with 15.77 m water head. The total installed capacity of the Jinping Sandengkan Project is 4.8 MW with 0.762 MW of guarantee output. It is estimated that the feed-in electricity to the Guizhou Power Grid from the Jinping Sandengkan Project is approximately 17,791 MWh per year.

The Majingao Project is located at Liangwang River within Taiyong Town, Jianhe County. It is designed to deliver discharge flow of 13.11 m<sup>3</sup>/s with 14.5 m water head. The total installed capacity of the Majingao Project is 1.5 MW with 0.219 MW of guarantee output. It is estimated that the feed-in electricity to the Guizhou Power Grid from the Majingao Project is approximately 4,520 MWh per year.

The Sancengdong Project is located at Liangxi River within Cengong County. It is designed to deliver discharge flow of 3.80 m<sup>3</sup>/s with 82 m water head. The total installed capacity of the Sancengdong Project is 2.52 MW with 0.54 MW of guarantee output. It is estimated that the feed-in electricity to the Guizhou Power Grid from the Sancengdong Project is approximately 10,016 MWh per year.

The Wawadong (I) Project is located at Guimian River within Panxi Town, Jianhe County. It is designed to deliver discharge flow of 3.52 m<sup>3</sup>/s with 135.5 m water head. The total installed capacity of the

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Wawadong (I) Project is 4 MW with 0.389 MW of guarantee output. It is estimated that the feed-in electricity to the Guizhou Power Grid from the Wawadong (I) Project is approximately 10,659 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 tCO<sub>2</sub>/MWh and a build margin emission factor of 0.6748 tCO<sub>2</sub>/MWh<sup>1</sup>. The project activity will achieve greenhouse gas (GHG) emission reductions by avoiding CO<sub>2</sub> 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 42,986 MWh and the annual emission reduction is 36,252 tCO<sub>2</sub>e.

The Bundled Project fits into the development priority of China and the regional development strategy of West China Development. It helps reduction of GHG emissions resulting from the high-growth, coal-dominated business-as-usual scenario. Jinping County, Jianhe County, and Cengong County are areas where suffering with extreme poverty<sup>2</sup> in China, populated by minorities and supported by the Central Government. After the commission of the Bundled Project, shortage of electricity supply in Jinping County, Jianhe County, and Cengong County will be mitigated, and electricity supply for township and village enterprises improved and result in promotion of local economic development.

The Bundled Project will not only supply renewable electricity to grid, but also contribute to sustainable development of the local community, the host country and the world by means of:

- Reducing GHG emissions compared to a business-as-usual scenario;
- Stimulating economy development of poverty area in China;
- Reducing the emission of other pollutants resulting from the power generation industry in China, compared to a business-as-usual scenario;
- Creating more than 58 permanent jobs and lots of short-term employment opportunities for local people during the project construction and operation period.

<b>A.3. <u>Project participants:</u></b>
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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)
China (host)	Jinping County Kaiyuan Hydropower Development Co.,Ltd. (project owner)	NO
Japan	Smart Energy Co., Ltd (purchasing party)	NO

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.

<sup>1</sup> 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>

<sup>2</sup> [http://www.cpad.gov.cn/data/2006/1119/article\\_331579.htm](http://www.cpad.gov.cn/data/2006/1119/article_331579.htm)

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**Project Proponent:**

Jinping County Kaiyuan Hydropower Development Co., Ltd., Smart Energy Co., Ltd. (Tokyo, JAPAN)

Jianhe County Qianlian Hydropower Development Co., Ltd., Cengong County Sancengdong Electric Power Co., Ltd., and Jianhe County Jingjian Hydropower Development Co., Ltd have authorized Jinping County Kaiyuan 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 of Guizhou Province

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

Jinping County, Jianhe County, and Cengong County

**A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :**

The Bundled Project is sited within Qiandongnan Autonomous Region, Guizhou Province, China.

Jinping Sandengkan Project is located within Zhongchen Country which has geographical coordinates with east longitude of 108°48'37" ~ 109°24'35" and north latitude of 26°23'39" ~ 26°46'49".

Majingao Project is located within Taiyong Town, Jianhe County which has geographical coordinates with east longitude of 108°25' and north latitude of 26°24'~26°30'.

Sancengdong Project is located within Kelou Town, Cengong Country which has geographical coordinates with east longitude of 108°21'33" ~ 108°24'56" and north latitude of 27°20'50" ~ 27°20'13".

Wawadong (I) Project is located within Jianhe Country, dam has geographical coordinates with east longitude of 108°54'04" and north latitude of 26°42'43", power plant has geographical coordinates with east longitude of 108°53'54" and north latitude of 26°42'35".



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Figure 1 shows the location of the bundled Project.

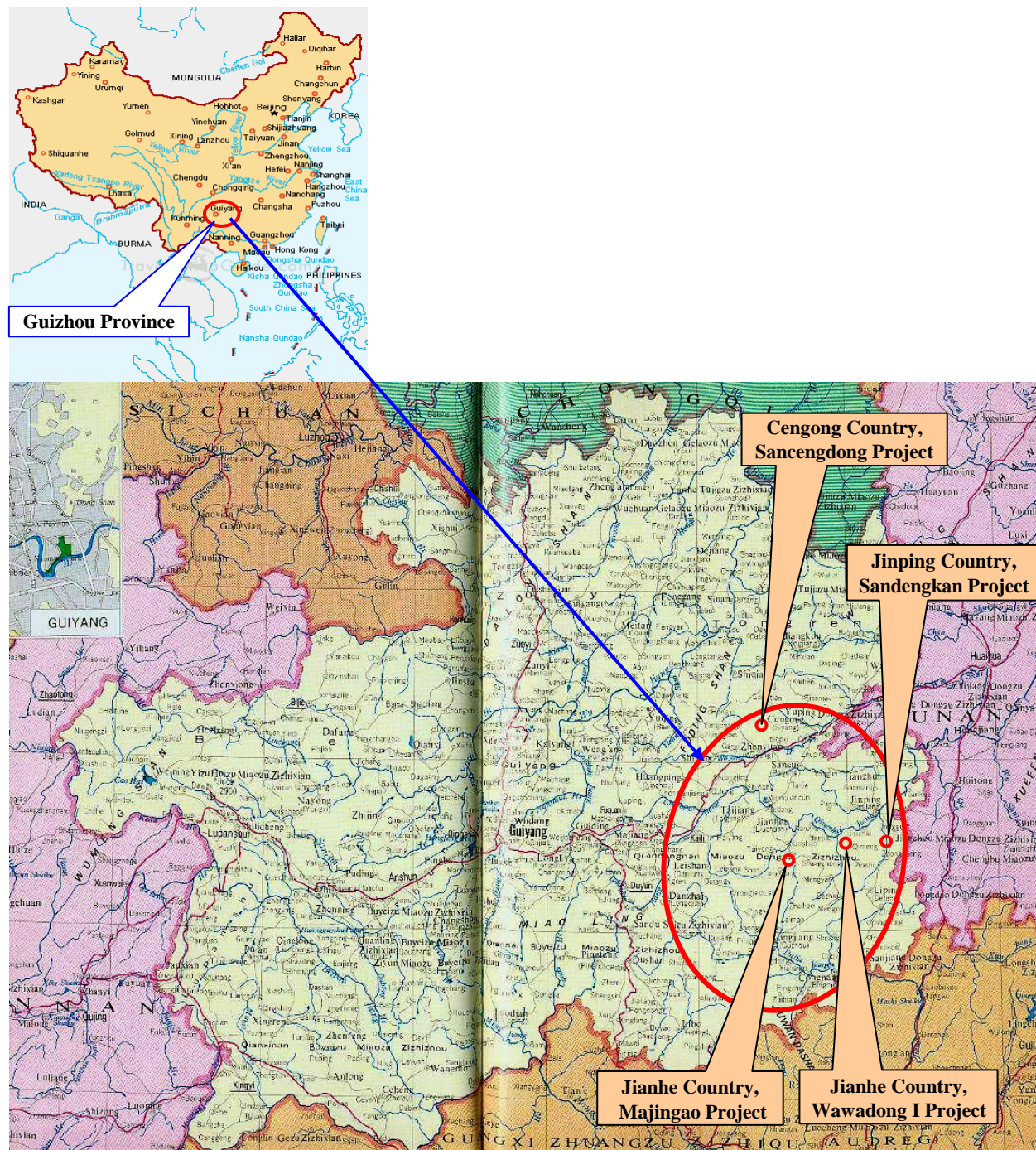


Figure 1: The location of the Bundled Project.

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

Using the categorization of Appendix B to 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 Jinping Sandengkan Project, Majingao Project, Sancengdong Project and Wawadong (I) 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 12.82 MW, which is within the limit of 15 MW stipulated for the chosen small-scale methodology.

The Jinping Sandengkan Project is a new hydropower plant with three sets of 1.6 MW hydro turbines (ZDJP502-LH-140) and associated generators (SF1600-16/2150) to produce clean electricity without GHG emissions for CSPG via 35 kV transmission line.

The Majingao Project is a new hydropower plant at dam toe with three sets of 0.5 MW hydro turbines (ZD560-LH-80) and associated generators (SF500-10/1180\*50) to produce clean electricity without GHG emissions for CSPG via 35 kV transmission line.

The Sancengdong Project is a new hydropower plant at dam toe with four sets of 0.63 MW hydro turbines (HL110-WJ-56) and associated generators (SFW-K630-6/990) to produce clean electricity without GHG emissions for CSPG via 35 kV transmission line.

The Wawadong (I) Project is a new hydropower plant at dam toe with two sets of 2 MW hydro turbines (HL130-WJ-71) and associated generators (SFW2000-6/1430) 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	Jinping Sandengkan Project	Majingao Project	Sancengdong Project	Wawadong (I) Project
Hydro Turbine	Turbine Type	ZDJP502-LH-40	ZD560-LH-80	HL110-WJ-56	HL130-WJ-71
	Water head	15.77m	14.5 m	82 m	135.5 m
	Rated power	1733 kW	500 kW	670.9 kW	2192.7 kW
	Rated speed	375 r/min	600 r/min	1000 r/min	1000 r/min
	Manufacture	Jiangxi Ganzhou Power Co., Ltd	Hunan Xinling Hydro Power Co., Ltd	Guangdong Chaozhou Huineng Co., Ltd	Zhejiang Jinhua Hydro Power Co., Ltd.

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	Project Name	Jinping Sandengkan Project	Majingao Project	Sancengdong Project	Wawadong (I) Project
<b>Generator</b>	Generator Type	SF1600-16/2150	SF500-10/1180*50	SFW-K630-6/990	SFW2000-6/1430
	Rated Power	1600 kW	500 kW	630 kW	2000 kW
	Power Factor	0.8	0.8	0.8	0.8
	Rated Voltage	6.3 kV	0.4kV	0.4 kV	6.3 kV
	Manufacture	Jiangxi Ganzhou Power Co., Ltd	Hunan Xinling Hydro Power Co., Ltd	Guangdong Chaozhou Huineng Co., Ltd	Zhejiang Jinhua Hydro Power Co., Ltd.

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

Name of Project	Jinping Sandengkan Project	Majingao Project	Sancengdong Project	Wawadong (I) Project
<b>Installe capacity (MW)</b>	4.8	1.5	2.52	4
<b>Operating time yearly (hour)</b>	4,335	3,720	4,790	3,000
<b>Expected total annual power generation (MWh)</b>	20,808	5,000	12,071	12,000
<b>Expected effective supply to the grid (MWh)</b>	17,791	4,520	10,016	10,659
<b>Water head (m)</b>	15.77	14.5	82	135.5
<b>Design flow (m3/s)</b>	12.2	4.37	0.95	1.76

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:**

The project activity contributes emission reductions for about 36,252 tCO<sub>2</sub>e per year during the first 7-year crediting period from Oct 2008 to Sep 2015.

Years	Annual estimation of emission reductions in tonnes of CO <sub>2</sub> e
2008(Oct. To Dec. 2008)	9,063
2009	36,252
2010	36,252
2011	36,252
2012	36,252
2013	36,252
2014	36,252



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Years	Annual estimation of emission reductions in tonnes of CO <sub>2</sub> e
2015(Jan. to Sep. 2015)	27,189
<b>Total estimated reductions (tonnes of CO<sub>2</sub>e)</b>	<b>253,764</b>
<b>Total number of crediting years</b>	<b>7</b>
<b>Annual average over the crediting period of estimated reductions (tonnes of CO<sub>2</sub>e)</b>	<b>36,252</b>

**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 large scale project activity:**

Based on the information provided in Appendix C of the simplified modalities and procedures for small scale CDM activities, the Jinping Sandengkan Project, the Majingao Project, the Sancengdong Project and the Wawadong (I) Project are not a part of any larger scale project or program and are not debundled component of any larger project activity. The project participants have not registered or operated (and are not therefore engaged in any way) in any other small-scale hydro CDM project activities or by using any other technologies within the project boundary, and in the area surrounding the project boundary.

**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:**

AMS I.D. version 13 is applicable since:

1. The Bundled Project is new hydropower project with total capacity of 12.82 MW, which is less than the maximum 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.

**B.3. Description of the project boundary:**

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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>B.4. Description of baseline and its development:</b>
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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 tCO <sub>2</sub> /MWh	Notification on Determining Baseline Emission Factors of China Power Grid issued by China's DNA on Aug 9th, 2007 on <a href="http://cdm.ccchina.gov.cn">http://cdm.ccchina.gov.cn</a>
Build Margin Emissions Factor	0.6748 tCO <sub>2</sub> /MWh	Notification on Determining Baseline Emission Factors of China Power Grid issued by China's DNA on Aug 9th, 2007 on <a href="http://cdm.ccchina.gov.cn">http://cdm.ccchina.gov.cn</a>
Combined Margin Emissions	0.84335 tCO <sub>2</sub> /MWh	Calculated according to the Operating Margin Emissions factor and Build Margin Emissions Factor
Power supplied to the grid by the project in yearly	42,986 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 problems. 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 *Economic 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 comparison**

The basic parameters for calculation of financial indicators of the Bundled Project are shown in Table B.4.2.

**Table B.4.2. Basic parameters for calculation of financial indicators of the Bundled Project**

Parameter	Jinping Sandengkan Project	Majingao Project	Sancengdong Project	Wawadong (I) Project	Source of Data
Installed capacity (MW)	4.8	1.5	2.52	4.0	Feasibility Study Report
Estimated annual output (MWh)	17,791	4,520	10,016	10,659	Feasibility Study Report
Project lifetime (years)	25	25	25	25	Feasibility Study Report
Total investment (million RMB)	29.58	6.67	17.02	20.90	Feasibility Study Report
Expected bus-bar tariff (excluding VAT, RMB/kWh)	0.1784	0.1784	0.215	0.1784	Approval of FSB by Guizhou NDRC
Rate of VAT	6%	6%	6%	6%	“Announcement on the adjustment of

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Parameter	Jinping Sandengkan Project	Majingao Project	Sancengdong Project	Wawadong (I) Project	Source of Data
					certain VAT” issued by MOF and Tax Bureau (Caishuizi(94)[004])
<b>Urban Construction Fee</b>	0.3%	0.3%	0.3%	0.3%	Feasibility Study Report
<b>Education aid Fee</b>	0.06%	0.06%	0.06%	0.06%	Feasibility Study Report
<b>Income tax (exempt for the first two years and 12.5% for the later three years)</b>	25%	25%	25%	25%	Income Tax Law of People’s Republic of China
<b>Operation cost (million RMB)</b>	0.44	0.17	0.18	0.21	Feasibility Study Report
<b>Depreciation Rate</b>	4%	4%	4%	4%	Feasibility Study Report
<b>CER Expected Price (€/CO<sub>2</sub>e)</b>	8	8	8	8	Purchase Agreement

Calculated based on these data, the FIRR of the total investment of the Jinping Sandengkan Project is 5.53%, the Majingao Project is 5.79%, the Sancengdong Project is 7.78%, and the Wawadong (I) Project is 4.28%. It is lower than the benchmark FIRR for small hydropower projects (10%). Therefore, the Bundled Project is not feasible and satisfies the requirement of additionality.

**Sensitivity Analysis**

The objective of sensitivity analysis is to examine 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 B.4.3. Sensitivity analysis data**

Variation Scope FIRR(%)		-10%	-5%	0	5%	10%
Parameter						
Jinping Sandengkan Project	Tariff	4.45%	5.00%	5.53%	6.06%	6.57%
	Total Investment	6.52%	6.00%	5.53%	5.10%	4.70%
	Operational Cost	5.69%	5.61%	5.53%	5.46%	5.38%
Majingao Project	Tariff	4.59%	5.20%	5.79%	6.38%	6.95%
	Total Investment	6.80%	6.27%	5.79%	5.35%	4.95%
	Operational Cost	6.05%	5.92%	5.79%	5.66%	5.53%

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Variation Scope		-10%	-5%	0	5%	10%
FIRR(%)						
Parameter						
Sancengdong Project	Tariff	6.61%	7.20%	7.78%	8.35%	8.91%
	Total Investment	8.92%	8.33%	7.78%	7.28%	6.81%
	Operational Cost	7.88%	7.83%	7.78%	7.73%	7.68%
Wawadong (I) Project	Tariff	3.34%	3.82%	4.28%	4.73%	5.17%
	Total Investment	5.15%	4.70%	4.28%	3.89%	3.53%
	Operational Cost	4.39%	4.33%	4.28%	4.22%	4.17%

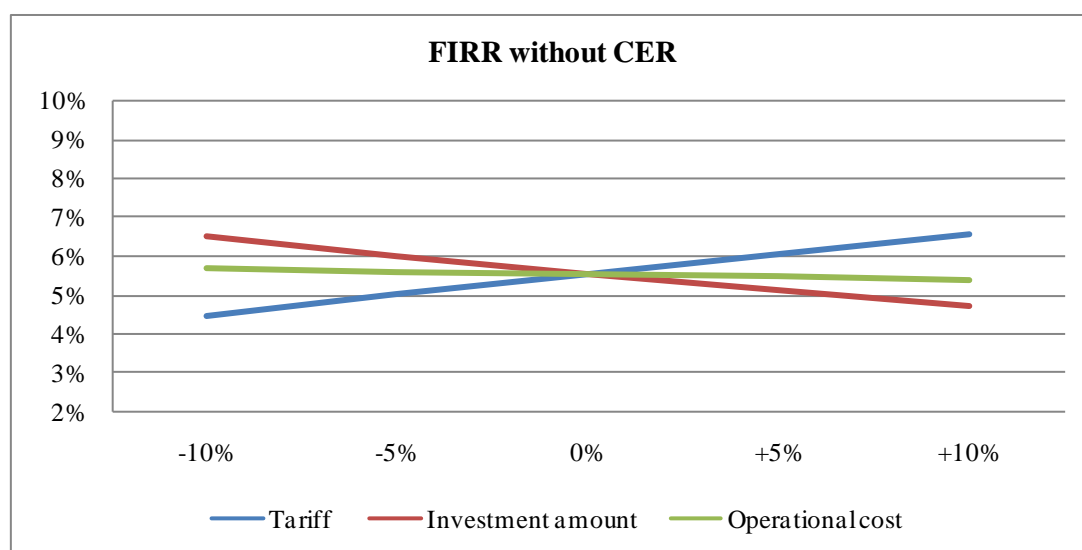


Figure 2 Sensitivity analysis of the Jinping Sandengkan Project

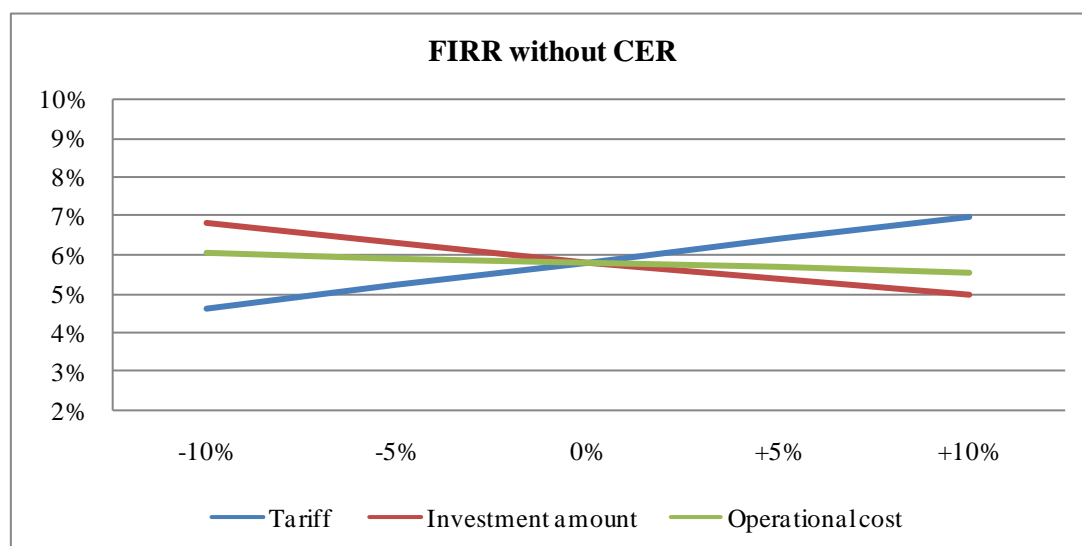
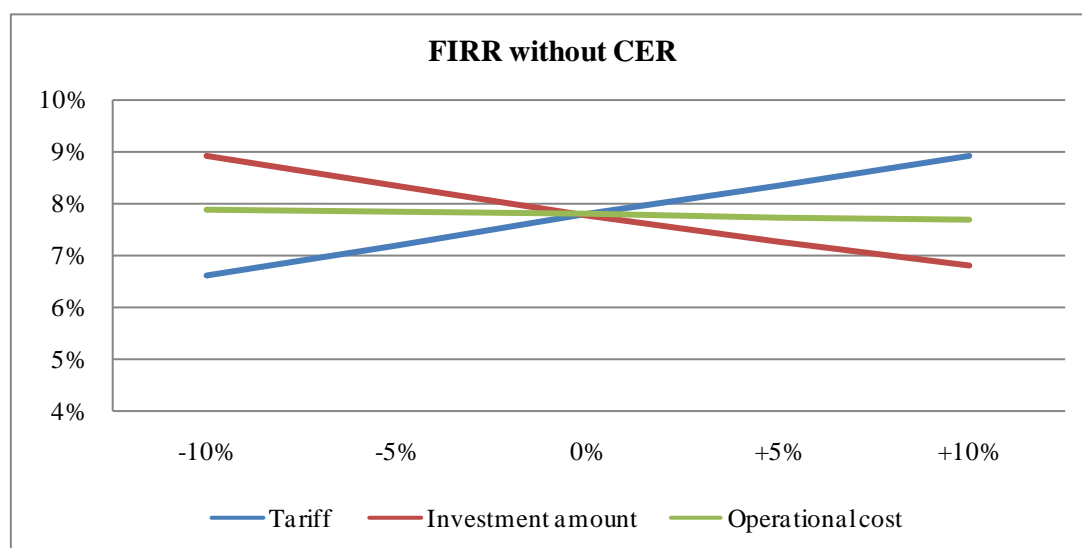
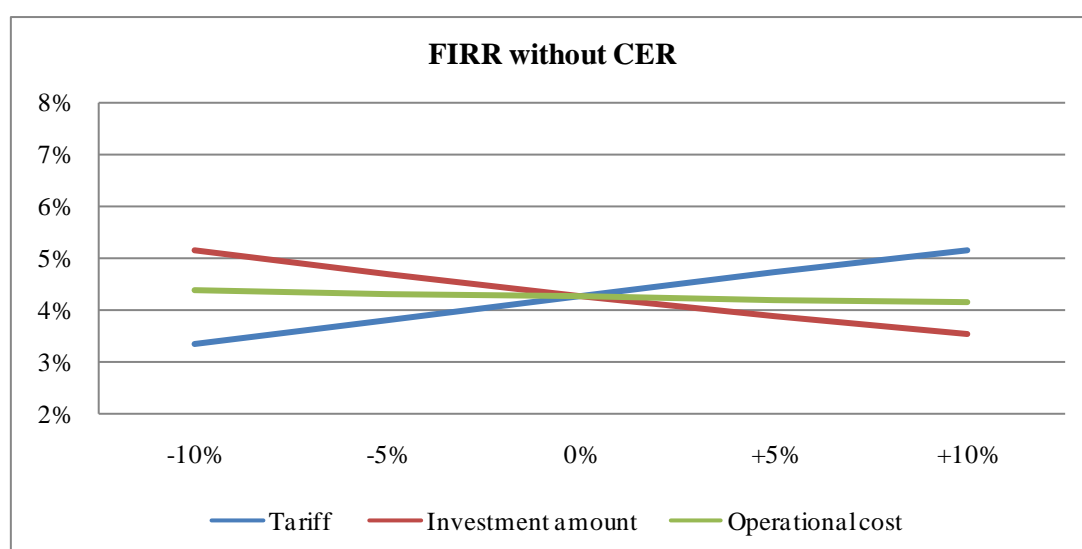


Figure 3 Sensitivity analysis of the Majingao Project



**Figure 4 Sensitivity analysis of the Sancengdong Project**



**Figure 5 Sensitivity analysis of the Wawadong (I) Project**

The results of sensitivity analysis indicates show that even the fluctuation range of the sensitivity indicators reach 10%, the benchmark FIRR of the total investment of the Projects and that the conclusion of the Bundled Project's financial attractiveness is still tenable.

#### ***Considering CDM before the construction of the project***

Those four 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 Jinping Sandengkan Project decided to seek CDM



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assistance and signed the CDM development contract in September 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 5.53% to 9.61%. 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 detailed time table of the CDM consideration as follow:

**Table 4.1. CDM consideration of Jinping Sandengkan Project**

Time	Event
9 <sup>th</sup> Sep 2005	CDM development contract signed
15 <sup>th</sup> Sep 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
5 <sup>th</sup> Nov 2005	Construction contract signed
17 <sup>th</sup> Mar 2006	Turbines/generators contract signed
25 <sup>th</sup> Sep 2007	ERPA contract signed
July 2008	Commercial production of Electricity

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 Majingao Project decided to seek CDM assistance and signed the CDM development contract in February 2006. After taking CDM into consideration seriously, the project owner finally decided to start the construction. The financial analysis shows that the additional support of the CDM makes a significant difference to the project financial status, increasing FIRR from 5.79% to 10.34%. 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 detailed time table of the CDM consideration as follow:

**Table 4.2. CDM consideration of Majingao Project**

Time	Event
19 <sup>th</sup> Feb 2006	CDM development contract signed
1 <sup>st</sup> Mar 2006	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
28 <sup>th</sup> Mar 2006	Turbines/generators contract signed
20 <sup>th</sup> Apr 2006	Construction contract signed
25 <sup>th</sup> Sep 2007	ERPA contract signed
July 2008	Commercial production of Electricity

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 Sancengdong Project decided to seek CDM assistance in March 2006. After taking CDM into consideration seriously, the project owner finally decided to start the construction of the project in April 2006. The financial analysis shows that the additional support of the CDM makes a significant difference to the project financial status, increasing FIRR from 7.78% to 11.58%. If the project owner is able to sell CERs generated by the project activity, the additional carbon revenue will make the project financially viable.

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The detailed time table of the CDM consideration as follow:

**Table 4.3. CDM consideration of Sancengdong Project**

Time	Event
20 <sup>th</sup> Feb 2006	CDM development contract signed
6 <sup>th</sup> Mar 2006	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
17 <sup>th</sup> Mar 2006	Turbines/generators contract signed
14 <sup>th</sup> May 2006	Construction contract signed
25 <sup>th</sup> Sep 2007	ERPA contract signed
July 2008	Commercial production of Electricity

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 Wawadong (I) Project decided to seek CDM assistance and signed the CDM development contract in June 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 4.28% to 7.72%. 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 detailed time table of the CDM consideration as follow:

**Table 4.4. CDM consideration of Wawadong (I) Project**

Time	Event
18 <sup>th</sup> Jun 2005	CDM development contract signed
24 <sup>th</sup> Jun 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
30 <sup>th</sup> Jun 2005	Construction contract signed
15 <sup>th</sup> Nov 2006	Turbines/generators contract signed
25 <sup>th</sup> Sep 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

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€8/tCO<sub>2</sub>e during crediting period), the FIRR of the total investment of the Jinping Sandengkan Project is will be increased to 9.61%, the Majingao Project will be increased to 10.34%, the Sancengdong Project will be increased to 11.58%, and the Wawadong(I) Project will be increased to 7.72%. 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>B.6. Emission reductions:</b>
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<b>B.6.1. Explanation of methodological choices:</b>
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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<sub>grid,cm,y</sub> 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 9<sup>th</sup> 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 9<sup>th</sup> 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 Grid) 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<sub>2</sub> 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<sub>2</sub> 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:

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- 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<sup>3</sup> 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<sup>4</sup>, 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***

This PDD adopts the (a) Simple OM. The simple OM emission factor is calculated as the generation weighted average CO<sub>2</sub> emissions per unit net electricity generation (tCO<sub>2</sub>/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<sup>5</sup> (**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**)

<sup>3</sup> 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.

<sup>4</sup> China Electric Power Yearbooks (2002, 2003, 2004, 2005, and 2006)

<sup>5</sup> 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

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**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<sub>2</sub> emission factor in year y (tCO<sub>2</sub>/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<sub>2</sub> emission factor of fossil fuel type i in year y (tCO<sub>2</sub>/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.

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:

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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.

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**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<sub>2</sub>/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:

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

$m$  = Power units included in the build margin;

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

The CO<sub>2</sub> 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<sup>6</sup>. 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

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



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CO<sub>2</sub> emissions from solid, liquid and gaseous fuels corresponding to the total emissions of CO<sub>2</sub> 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<sub>2</sub> emissions from solid, liquid and gaseous fuels corresponding to the total emissions of CO<sub>2</sub> 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<sub>2</sub> emission coefficient (tCO<sub>2</sub>e / 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.

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

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

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<sub>2</sub> emission factor in year y (tCO<sub>2</sub>/MWh);

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

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

$w_{BM}$  = 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<sub>2</sub>e/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<sub>2</sub>/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.

$EF_{grid,CM,y}$  = Combined margin CO<sub>2</sub> emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system”.

So, the baseline emissions ( $BE_y$  in tCO<sub>2</sub>e) are the product of the baseline emissions factor ( $EF_{grid,CM,y}$  in tCO<sub>2</sub>e/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;

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$EG_{Grid\ to\ PJ,y}$  = 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	--

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<b>Data / Parameter</b>	$FC_{i,y}$
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	--

<b>Data / Parameter</b>	$NCV_{i,y}$
Data unit	$MJ/t$ or $MJ/10^3 m^3$ (or convert to $KJ/kg$ 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

<b>Data / Parameter</b>	$EF_{CO_2,i,y}$
Data unit	$tC/TJ$ (or convert to $kg/GJ$ )
Description	Emission factors of fuels for electricity generation.
Source of data used	Table 1.3 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:

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

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

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

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<b>Data / Parameter</b>	$EF_{import,y}$
Data unit	tCO <sub>2</sub> /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	--

<b>Data / Parameter</b>	$GEN_{import,y}$
Data unit	MWh
Description	Electricity adjusted from CCPG to CSPG in year y.
Source of data used	National Power Web <a href="http://www.sp.com.cn/zgdl/spw/05_01y/05_01_dljh.htm">http://www.sp.com.cn/zgdl/spw/05_01y/05_01_dljh.htm</a>
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 ( $EF_{OM,y}$ ) of CSPG is 1.0119 tCO<sub>2</sub>e/MWh, and the build margin emission factor ( $EF_{BM,y}$ ) of CSPG is 0.6748 tCO<sub>2</sub>e/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 tCO<sub>2</sub>e/MWh.

According to the *Feasibility Study Report* of the Bundled Project, the electricity output of the Bundled Project is estimated as 42,986 MWh per year, therefore the baseline emissions of the Bundled Project is estimated as 36,252 tCO<sub>2</sub>e per year.

**Project activity emissions calculation**

As described in section B.6.1, the Bundled Project activity emissions ( $PE_y$ ) will be 0 tCO<sub>2</sub>e.

**Leakage**

As described in section B.6.1, the leakage of the Bundled Project ( $L_y$ ) will be 0 tCO<sub>2</sub>e.



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**Emission reductions calculation**

Based on formula (11) in section B.6.1, the ex-ante annual emission reductions are estimated as 36,252 tCO<sub>2</sub>e.

**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 36,252 tCO<sub>2</sub>e per year over the first 7-year crediting period from Oct. 2008 to Sept. 2015.

Year	Estimation of project activity emissions (tonnes of CO <sub>2</sub> e)	Estimation of baseline emissions (tonnes of CO <sub>2</sub> e)	Estimation of leakage (tonnes of CO <sub>2</sub> e)	Estimation of overall emission reductions (tonnes of CO <sub>2</sub> e)
2008(Oct. to Dec.)	0	9,063	0	9,063
2009	0	36,252	0	36,252
2010	0	36,252	0	36,252
2011	0	36,252	0	36,252
2012	0	36,252	0	36,252
2013	0	36,252	0	36,252
2014	0	36,252	0	36,252
2015(Jan. to Sept.)	0	27,189	0	27,189
<b>Total (tCO<sub>2</sub>e)</b>	<b>0</b>	<b>253,764</b>	<b>0</b>	<b>253,764</b>

**B.7 Application of a monitoring methodology and description of the monitoring plan:****B.7.1 Data and parameters monitored:**

<b>Data / Parameter:</b>	<i>EGPJ to Grid, y</i>
Data unit:	<i>MWh</i>
Description:	<i>Electricity supplied to the grid by the Project in Year y.</i>
Source of data to be used:	<i>Measured by Electric Meter.</i>
Value of data	<i>42,986MWh</i>
Description of measurement methods and procedures to be applied:	<i>Measured continuously and recorded on a monthly basis; Double check by receipt of sales.</i>
QA/QC procedures to be applied:	<i>The data of the low degree of uncertainty. The four 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.</i>
Any comment:	<i>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.</i>

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<b>Data / Parameter:</b>	$EG_{Grid\ to\ PJ, y}$
Data unit:	MWh
Description:	<i>Electricity drawn from the grid for the Project's consumption.</i>
Source of data to be used:	<i>Measured by Electric Meter.</i>
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:	<i>The data of the low degree of uncertainty. The four 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.</i>
Any comment:	--

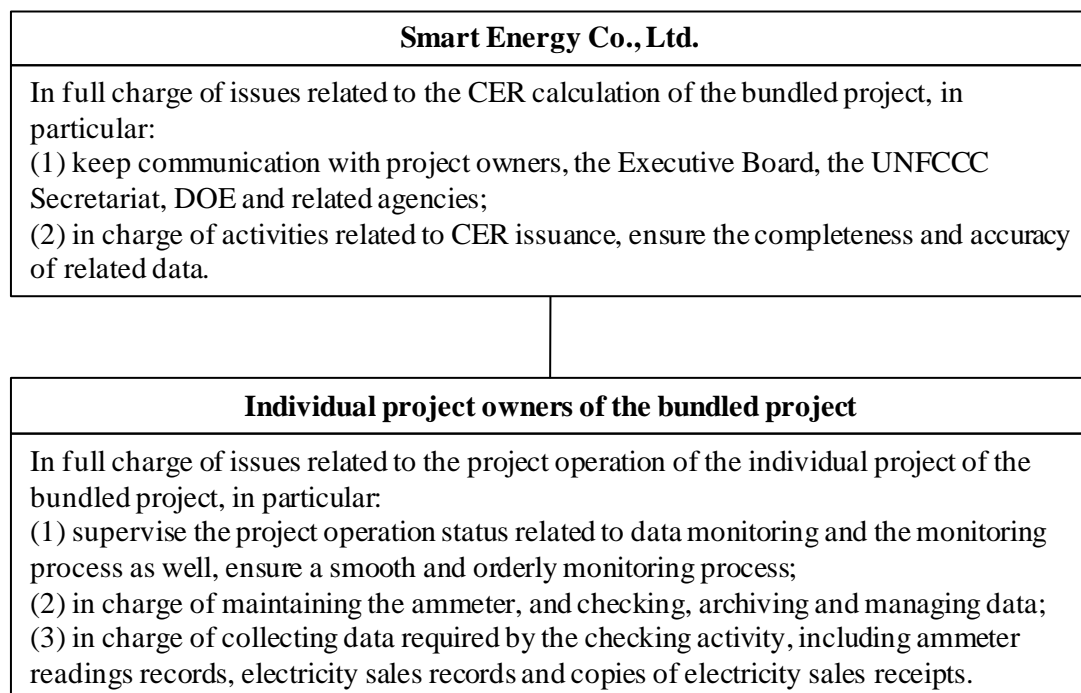
### B.7.2 Description of the monitoring plan:

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 calculation of emission reductions of the Bundled Project. Companies involving the Bundled Project, Jinping County Kaiyuan Hydropower Development Co.,Ltd., Jianhe County Qianlian Hydropower Development Co.,Ltd., Cengong County Sancengdong Electric Power Co.,Ltd., and Jianhe County Jingjian Hydropower Development Co.,Ltd. are responsible for the operation of the individual Project within the Bundled Project.

Figure 6 describes for the detailed operation and management structure of the Bundled Project.

**Figure 6 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 projects will be installed and maintained according to the “Technical administrative code of electric energy metering (DL/T 448-2000)<sup>7</sup>”. 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 Jinpin Sandengkan project, an electric meter is installed in the Tonggu Substation, which belongs to the local electric power grid company.

<sup>7</sup> 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

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- For the Jianhe Majinao project, an electric meter is installed in the Taiyong Substation, which belongs to the local electric power grid company.
- For the Cengong Sancengdong project, an electric meter is installed in the Longtian Substation, which belongs to the local electric power grid company.
- For the Jianhe Wawadong I project, two electric meters will be installed. One backup meter installed in the plant belongs to the project owner, the other one which will be used to measure the power supply is installed in the Panxi substation and belongs to the local 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 regulations of the national power industry<sup>3</sup>. 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.

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.

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

The starting date of Jinping Sandengkan Project: November 5, 2005 (date of the construction contract)

The starting date of Majingao Project: March 28, 2006 (date of the main equipment purchase contract)

The starting date of Cengong Sancengdong Project: March 17, 2006 (date of the main equipment purchase contract)

The starting date of Wawadong (I) Project: June 30, 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

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**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:**

October 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:**

According to the clauses 13 and 19 of the Environmental Protection Law of the People's Republic of China, the project entity must analyze the environmental impacts of project activities in China. The Bundled Project developer therefore commissioned a third party to conduct the required environmental impact assessment (EIA), and the EIA report was approved by the local Environmental Protection Bureau.

The project results in more positive environmental benefits than adverse impacts. The EIA highlights the following with regards to the Bundled Project:

**Compensation for submerged land**

The Bundled Project involves no migration and people need not 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 life and air environment. Since the Bundled Project is located in mountainous area with few residents, the project has 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 protection measures. These impacts will mitigated upon completion 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 mountainous 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. In summary, negative impacts on the environment caused by the Bundled Project occurs mostly during the construction period which will diminished upon the commission of the Bundled Project. In conjunction with the implementation of a series of environment protection measures during the construction and operation, the Bundled Project will minimize impacts on the environment.

In conclusion, environmental impacts arising from the Bundled Project are 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 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 Jinping Sandengkan Project, Majingao Project, Sancengdong Project and Wawadong(I) 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 50 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

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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.

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

Project participants:

Organization:	Jinping County Kaiyuan Hydropower Development Co.,Ltd.
Street/P.O.Box:	Kaiyuan Building 3 F, Sanjiang Town
Building:	-
City:	Jinping Country
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Postfix/ZIP:	556700
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E-Mail:	-
URL:	-
Represented by:	-
Title:	President
Salutation:	-
Last Name:	Ou
Middle Name:	-
First Name:	Rulin
Department:	-
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Direct FAX:	+86-855-7226466
Direct tel:	+86-855-7223897
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URL:	<a href="http://www.smart-energy.jp/index.html">http://www.smart-energy.jp/index.html</a>
Represented by:	-
Title:	CEO
Salutation:	-
Last Name:	Ogushi
Middle Name:	-
First Name:	Takuya
Department:	-
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Direct FAX:	+81-20-4623-7236
Direct tel:	+81-3-3591-3012
Personal E-Mail:	<a href="mailto:ogushi@smart-energy.jp">ogushi@smart-energy.jp</a>

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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/m <sup>3</sup>
Refinery gas	15.7	100	46,055 kJ/m <sup>3</sup>
Natural gas	15.3	100	38,931 kJ/m <sup>3</sup>
Coke oven gas	12.1	100	16,726 kJ/m <sup>3</sup>
Other coal gas	12.1	100	5,227 kJ/m <sup>3</sup>

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

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

Data source: China Electric Power Yearbook 2004 Edition.

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

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

Data source: China Electric Power Yearbook 2005 Edition.

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

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

Data source: China Electric Power Yearbook 2006 Edition.



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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 (tCO <sub>2</sub> e) I
Raw Coal	10 <sup>4</sup> t	4491.79	831.84	2169.11	1405.27	8898.01	25.8	100	20,908	175,993,455.05
Clean Coal	10 <sup>4</sup> t	0.05	0	0	0	0.05	25.8	100	26,344	1,246.07
Other washed coal	10 <sup>4</sup> t	0	0	36.38	20.37	56.75	25.8	100	8,363	448,971.84
Coke	10 <sup>4</sup> t	0	0	0	0.50	0.50	29.2	100	28,435	15,222.20
Coke oven gas	10 <sup>8</sup> m <sup>3</sup>	0	0	0	0.04	0.04	12.1	100	16,726	2,968.31
Other coal gas	10 <sup>8</sup> m <sup>3</sup>	3.21	0	0	11.27	14.48	12.1	100	5,227	335,797.81
Crude oil	10 <sup>4</sup> t	6.85	0	0	0	6.85	20	100	41,816	210,055.71
Gasoline	10 <sup>4</sup> t	0.02	0	0	0	0.02	18.9	100	43,070	596.95
Diesel	10 <sup>4</sup> t	31.90	0	0	0.76	32.66	20.2	100	42,652	1,031,759.27
Fuel oil	10 <sup>4</sup> t	627.22	0.3	0	0	627.52	21.1	100	41,816	20,301,304.48
LPG	10 <sup>4</sup> t	0	0	0	0	0	17.2	100	50,179	0.00
Refinery gas	10 <sup>4</sup> t	2.85	0	0	0	2.85	15.7	100	46,055	75,560.14
Natural gas	10 <sup>8</sup> m <sup>3</sup>	0	0	0	0	0	15.3	100	38,931	0.00
Other petroleum products	10 <sup>4</sup> t	11.35	0	0	0	11.35	20	100	38,369	319,357.98
Other coke	10 <sup>4</sup> t	0	0	0	0	0	29.2	100	28,435	0.00
Other energy	10 <sup>4</sup> 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<sup>4</sup> t, then  $I = G \cdot H \cdot F \cdot E \cdot 44 / 12 / 10^4$ , if the unit of the fuel is 10<sup>8</sup> m<sup>3</sup>, then  $I = G \cdot H \cdot F \cdot E \cdot 44 / 12 / 10^3$ .

The same about the calculation of I in Table Annex 3-6 and Table Annex 3-7.

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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 (tCO <sub>2</sub> e) I
Raw Coal	10 <sup>4</sup> 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 <sup>4</sup> t	0.21	0	0	0	0.21	25.8	100	26,344	5,233.50
Other washed coal	10 <sup>4</sup> t	0	0	0	0	0	25.8	100	8,363	0.00
Coke	10 <sup>4</sup> t	0	0	0	0	0	29.2	100	28,435	0.00
Coke oven gas	10 <sup>8</sup> m <sup>3</sup>	0	0	0	0	0	12.1	100	16,726	0.00
Other coal gas	10 <sup>8</sup> m <sup>3</sup>	2.58	0	0	0	2.58	12.1	100	5,227	59,831.38
Crude oil	10 <sup>4</sup> t	16.89	0	0	0	16.89	20	100	41,816	517,932.98
Gasoline	10 <sup>4</sup> t	0	0	0	0	0	18.9	100	43,070	0.00
Diesel	10 <sup>4</sup> t	48.88	0	0	1.83	50.71	20.2	100	42,652	1,601,975.28
Fuel oil	10 <sup>4</sup> t	957.71	0	0	0	957.71	21.1	100	41,816	30,983,494.25
LPG	10 <sup>4</sup> t	0	0	0	0	0	17.2	100	50,179	0.00
Refinery gas	10 <sup>4</sup> t	2.86	0	0	0	2.86	15.7	100	46,055	75,825.26
Natural gas	10 <sup>8</sup> m <sup>3</sup>	0.48	0	0	0	0.48	15.3	100	38,931	104,833.40
Other petroleum products	10 <sup>4</sup> t	1.66	0	0	0	1.66	20	100	38,369	46,707.86
Other coke	10 <sup>4</sup> t	0	0	0	0	0	29.2	100	28,435	0.00
Other energy	10 <sup>4</sup> 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

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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 (tCO <sub>2</sub> e) I
Raw Coal	10 <sup>4</sup> 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 <sup>4</sup> t	0	0	0	0.15	0.15	25.8	100	26,344	3,738.21
Other washed coal	10 <sup>4</sup> t	0	0	10.39	33.88	44.27	25.8	100	8,363	350,237.59
Coke	10 <sup>4</sup> t	4.79	0	0	8.05	12.84	29.2	100	28,435	390,906.18
Coke oven gas	10 <sup>8</sup> m <sup>3</sup>	0	0	0	0.79	0.79	12.1	100	16,726	58,624.07
Other coal gas	10 <sup>8</sup> m <sup>3</sup>	1.87	0	0	15.96	17.83	12.1	100	5,227	413,485.84
Crude oil	10 <sup>4</sup> t	10.91	0	0	0	10.91	20	100	41,816	334,555.88
Gasoline	10 <sup>4</sup> t	0.68	0	0	0	0.68	18.9	100	43,070	20,296.31
Diesel	10 <sup>4</sup> t	31.96	2.02	0	1.81	35.79	20.2	100	42,652	1,130,638.84
Fuel oil	10 <sup>4</sup> t	887.21	0	0	0	887.21	21.1	100	41,816	28,702,703.26
LPG	10 <sup>4</sup> t	0	0	0	0	0	17.2	100	50,179	0.00
Refinery gas	10 <sup>4</sup> t	4.92	0	0	0	4.92	15.7	100	46,055	130,440.66
Natural gas	10 <sup>8</sup> m <sup>3</sup>	0.93	0	0	0	0.93	15.3	100	38,931	203,114.71
Other petroleum products	10 <sup>4</sup> t	1.7	0	0	0	1.7	20	100	38,369	47,833.35
Other coke	10 <sup>4</sup> t	0	0	0	0	0	29.2	100	28,435	0.00
Other energy	10 <sup>4</sup> 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
<b>Net electricity import from the Central China Grid (MWh)</b>	11,100	10,951,240	96,363,000
<b>Average emission factor of the Central China Grid (tCO<sub>2</sub>e/MWh)</b>	0.79744	0.82645	0.77123
<b>Emission of Central China Grid (tCO<sub>2</sub>e)</b>	8,852	9,050,630	74,317,555
<b>Total emission of CSPG (tCO<sub>2</sub>e)</b>	198,755,407	274,226,112	369,521,986
<b>Thermal power generation within CSPG (MWh)</b>	208,725,800	247,366,229	269,169,531
<b>Fossil power supply of CSPG (MWh)</b>	208,736,900	258,317,469	365,532,531
<b>OM emission factors of CSPG in average</b>	<b>1.01191</b>		

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 (tCO <sub>2</sub> e/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

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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 (tCO <sub>2</sub> e) I
Raw Coal	10 <sup>4</sup> 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 <sup>4</sup> t	0	0	0	0.15	0.15	26,344	25.8	100	3,738.21
Other washed coal	10 <sup>4</sup> t	0	0	10.39	33.88	44.27	8,363	25.8	100	350,237.59
Coke	10 <sup>4</sup> t	4.79	0	0	8.05	12.84	28,435	29.2	100	390,906.18
<b>264,187,483.84</b>										
Crude oil	10 <sup>4</sup> t	10.91	0	0	0	10.91	41,816	20	100	334,555.88
Gasoline	10 <sup>4</sup> t	0.68	0	0	0	0.68	43,070	18.9	100	20,296.31
Diesel	10 <sup>4</sup> t	31.96	2.02	0	1.81	35.79	42,652	20.2	100	1,130,638.84
Fuel oil	10 <sup>4</sup> t	887.21	0	0	0	887.21	41,816	21.1	100	28,702,703.26
Other petroleum products	10 <sup>4</sup> t	1.7	0	0	0	1.7	38,369	20	100	47,833.35
<b>30,236,027.63</b>										
Natural gas	10 <sup>8</sup> m <sup>3</sup>	0.93	0	0	0	0.93	38,931	15.3	100	203,114.71
Coke oven gas	10 <sup>8</sup> m <sup>3</sup>	0	0	0	0.79	0.79	16,726	12.1	100	58,624.07
Other coal gas	10 <sup>8</sup> m <sup>3</sup>	1.87	0	0	15.96	17.83	5,227	12.1	100	413,485.84
LPG	10 <sup>4</sup> t	0	0	0	0	0	50,179	17.2	100	0.00
Refinery gas	10 <sup>4</sup> t	4.92	0	0	0	4.92	46,055	15.7	100	130,440.66
<b>805,665.28</b>										
<b>Total</b>										<b>295,229,176.74</b>

Data sources: China Energy Statistical Yearbook 2006 Edition

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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)	Installed capacity in 2004 (MW)	Installed capacity in 2005 (MW)	Capacity additions from 2003 to 2005 (MW) D=C-A	Share in total capacity additions
	A	B	C		
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

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} EF_{Thermal} = 74.01\% \times 0.9117 = \mathbf{0.6748 \text{ tCO}_2/\text{MWh}}$$

$$EF_y = (EF_{OM,y} + EF_{BM,y}) / 2 = (1.0119 + 0.6748) / 2 = \mathbf{0.84335 \text{ tCO}_2/\text{MWh}}$$

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**Annex 4**

**MONITORING INFORMATION**

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