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

CONTENTS

Annexes

Revision history of this document

Version Number	Date	Description and reason of revision
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 small-scale project activity

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

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Gutanhe 10 MW Hydropower Project in Yunnan Province

Version number of the document: 06

Date: 15/09/2010

Version history	Date	Remarks
01	12/12/2007	For GSP
02	20/05/2008	Revised as DOE's Requirements
03	10/10/2008	Revised as DOE's Requirements
04	18/11/2008	Revised as DOE's Requirements
05	17/02/2009	Revised as DOE's Requirements
05.1	13/08/2009	Minor revision
06	15/09/2010	Revised as EB's correction request

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

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Gutanhe 10 MW Hydropower Project in Yunnan Province (hereafter simplified as the Project) is a run-of-river hydropower project, which is developed by Lushui Shengtenggu Electric Development Co., Ltd.. It is located on Denggeng River in Denggeng Village, Lushui County, Nujiang Lisu Autonomous Prefecture, Yunnan Province, China. The purpose of the Project is to generate clean electricity using water power without CO_2 emission and deliver it into Nujiang Power Grid, part of Yunnan Power Grid which is an integral part of China Southern Power Grid (CSPG).

The Project is a run-of-river hydropower project with installed capacity of 10MW. The theoretical electricity generation will be 52.20 GWh per year and electricity supplied to the grid is expected to be 41.34 GWh annually after implementation of the Project. The project activity will achieve greenhouse gas (GHG) emission reductions by displacing equivalent electricity supplied by CSPG, which is predominated by fossil fuel-fired power plants[1]. The estimated annual emission reductions are 34,864 tCO_2e.

As a renewable energy project, the Project will produce positive environmental and socio-economic benefits and contribute to the local sustainable development through following aspects:

- Contributing to local economy development by providing electricity to meet local increasing energy demands;
- Reducing GHG emissions and mitigating the emissions of other pollutants caused from local coal-fired power plants compared with a business-as-usual scenario by displacing part of electricity from fossil fuel-fired power plants;

[1] In 2005, the total electricity generation of the China Southern Power Grid was 420.956 TWh, of which 294.341 TWh came from thermal power plants, about 70% of the total. Please refer to *China Electric Power Yearbook 2006*.page 583.

- Complying with the development priority of China energy industry, and helping to improve the power composing of CSPG by increasing the share of renewable energy;
- Creating plenty of short-term employment opportunities during the project construction period and 26 permanent jobs during the operation time for the local people.

A.3. Project participants:

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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)
The People's Republic of China (host)	Lushui Shengtenggu Electric Development Co., Ltd. (Project Owner)	No
the Netherlands	Essent Energy Trading B.V. (Buyer)	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party (ies) involved is required.		

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

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

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A.4.1.1. Host Party(ies):

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The People's Republic of China

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

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Yunnan Province

A.4.1.3. City/Town/Community etc:

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Lushui County, Nujiang Lisu Autonomous Prefecture

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

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The Project locates on the Denggeng River, in Denggeng Village of Lushui County, Nujiang Lisu Autonomous Prefecture, Yunnan Province, China. The power house of the Project has geographical coordinates with east longitude of 98°49′28″ and north latitude of 25°55′45″ and the dam with east longitude of 98°47′41″ and north latitude of 25°55′47″. Figure A-1 shows the location of Nujiang Prefecture in Yunnan Province in China and Figure A-2 shows the location of the Project in Lushui

County in Nujiang Prefecture.

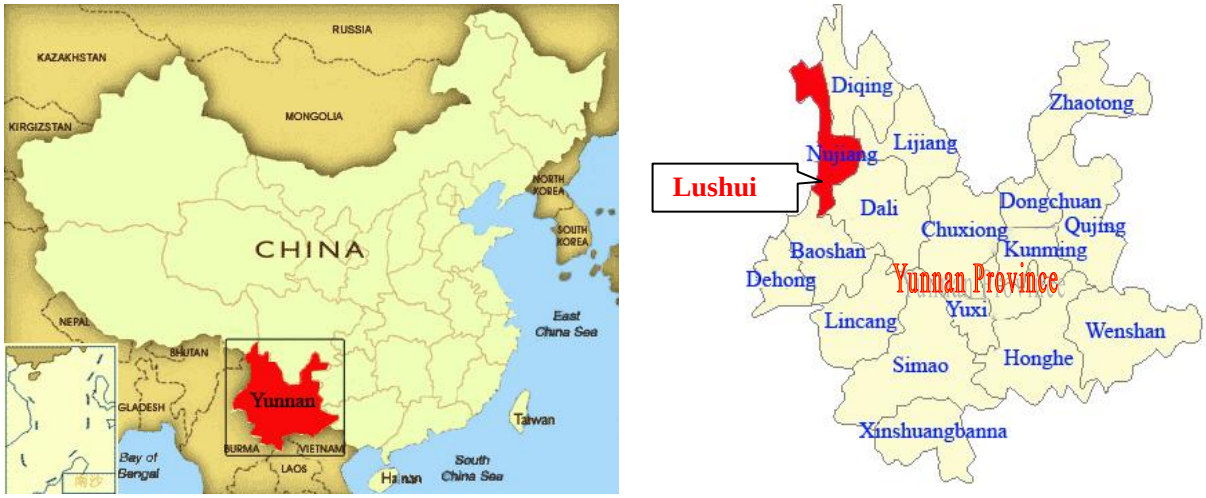

Figure A-1.The location of Nujiang Prefecture in Yunnan Province in China

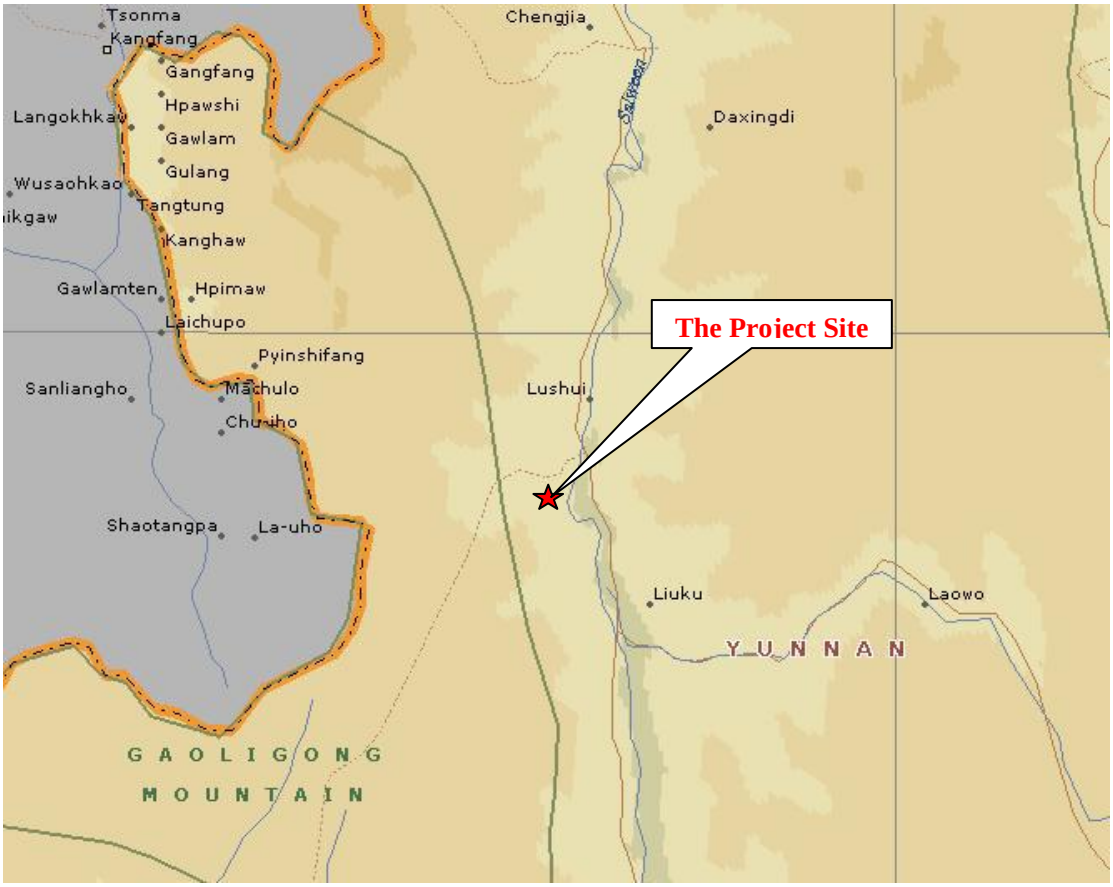

Figure A-2. The location of the Project

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

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

Type I: Renewable energy project

Category I.D.: Grid connected renewable electricity generation

Sub-category: Hydro

The project is a run-of-river hydropower station and will install two sets of 5 MW hydro turbines (CJA237-W-135/2×14.5) and associated generators (SFW5000-12/2150) to produce clean electricity without GHG emissions for CSPG via the 110 kV transmission line. The plant load factor (PLF) is 59.6%[2]. The electricity generated by the project and imported from the grid will be monitored by the double-way revenue meter, which is installed in the project site (please refer to the electric wiring diagram in Annex 4). The timetable of the Project lists in Table A-1.

table A-1.Time Schedule of the project activity

Item	Time
Feasibility Study Report and its approval letter	2005.07/2005.12.08
EIA Report and its approval letter	2005.10/2005.11.15
The Expansion Feasibility Study Report and its approval letter	2006.03/2006.04.17
Construction starting date	2006.06.06
The main facilities purchasing contract	2006.06.30
Commissioning date	2008.03.05

The project uses state of the art technology with all the equipment produced domestically. The main equipments' lifetime, such as hydro turbine and generation, are all more than 20 years. The technology of hydro plant of China is mature and advanced and there is no technology transfer from abroad. The key technical indicators of the hydro turbines and the generators of the Project are listed in table A-2.

Table A-2. Key technical indicators of the hydro turbine and the generator of the Project[3]

Hydro Turbine		**Generator**	
Turbine Type	CJA237-W-135/2×14.5	**Generator Type**	SFW5000-12/2150
Rated head	265 m	**Rated Power**	5000 kW
Rated power	5263.6 kW	**Rated Voltage**	6.3 kV
Rated flow	2.275 m^3/s	**Rated Current**	572.8A
Rated speed	500 r/min	**Rated speed**	500 r/min
Supplier	Fujian Nanping Nandian Hydropower Equipment Manufacturing Co., Ltd.	**Supplier**	Fujian Nanping Nandian Hydropower Equipment Manufacturing Co., Ltd.

[2] The theoretical annual electricity generation is 52.20 GWh, so the PLF is 52.20GWh/10MW/8760h=59.6%. This is sourced from *the Expansion Feasibility Study Report* (EFSR)，which was finished by Chenzhou Hydropower Survey and Design Institute in Hunan Province, a third independent party authorized the Chinese government. The EFSR was provided to the government while applying the Project for implementation approval and this approval was issued by Nujiang Lisu Prefecture Development and Reform Committee on 17 Apr 2006.

[3] The indicators are from EFSR of the Project

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

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It is expected that the project activity will generate emission reductions for about 34,864 tCO_2e per year over the first 7-year crediting period from Jan. 1st, 2010 to Dec. 31st, 2016.

Years	Annual estimation of emission reductions in tonnes of CO_2e
2010	34,864
2011	34,864
2012	34,864
2013	34,864
2014	34,864
2015	34,864
2016	34,864
Total estimated reductions (tonnes of CO_2e)	244,048
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	34,864

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

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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:

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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 activity at the closest point.

According to Appendix C to the *Simplified Modalities and Procedures for Small-scale CDM Project Activities*, the Project is not a debundled component of a larger 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:

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AMS-I.D. version 13- "Grid connected renewable electricity generation". For more information regarding the methodology, please refer to the link:

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

"Tool to calculate the emission factor for an electricity system", version 01.1. For more information, please refer to the link: http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html.

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

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The Project is a newly-built hydropower project with a total designed capacity of 10 MW which is less than 15 MW. The electricity produced by the Project will be supplied to CSPG, which is predominated by fossil fuel-fired[4] power plants.

Therefore, the Project is applicable for the use of the approved methodology for small-scale CDM project- AMS-I.D.

B.3. Description of the project boundary:

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Based on the methodology AMS-I.D., the project boundary encompasses the physical, geographical site of the renewable generation source. The electricity displaced by the Project should be the electricity generated by CSPG. Therefore, the project boundary could be identified as CSPG and the Project (refer to figure B-1). The spatial extent of the project boundary includes the project power plant and all power plants physically connected into CSPG.

[4] In 2005, the total electricity generation of the China Southern Power Grid was 420.956 TWh, of which 294.341 TWh came from thermal power plants, about 70% of the total. Please refer to *China Electric Power Yearbook 2006*.page 583.

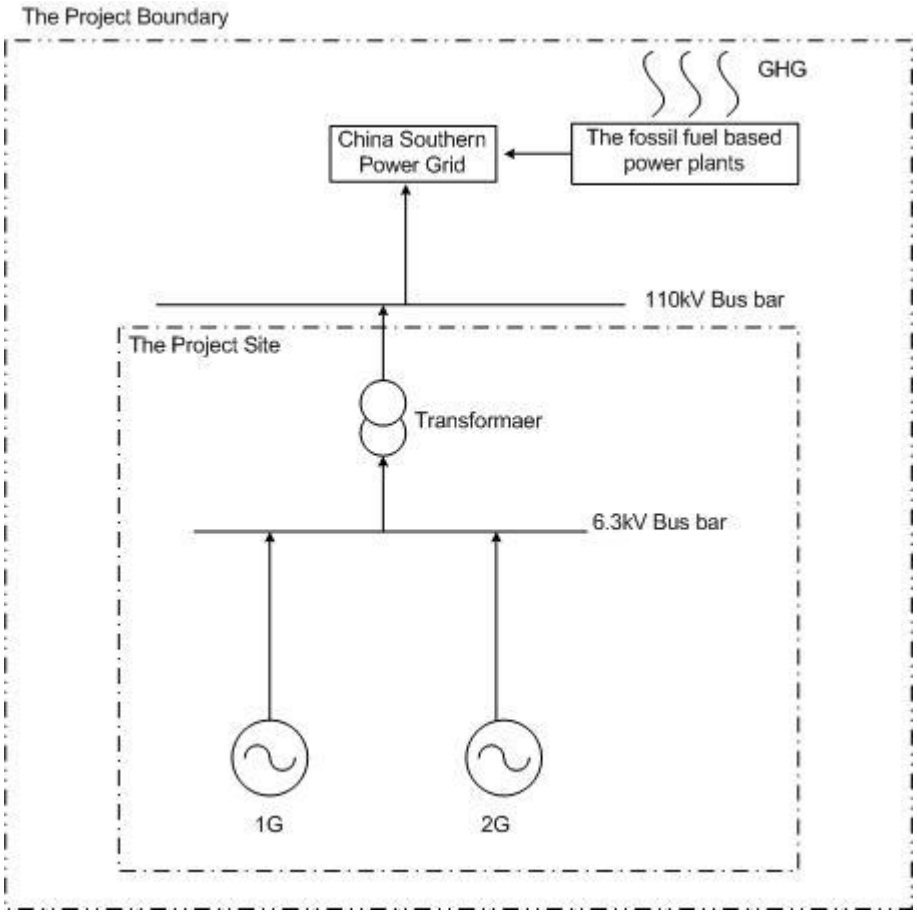

Figure B-1. Flow diagram of the project boundary

According to *Notification on Determining Baseline Emission Factors of China Power Grid* [5] issued by China Designated National Authority for CDM (China DNA) on August 9th , 2007, CSPG is composed of Guangdong Power Grid, Guangxi Power Grid, Yunnan Power Grid and Guizhou Power Grid.

B.4. Description of baseline and its development:

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The baseline of the Project is determined based on the methodology AMS-I.D.

The Project is a run-of-river hydropower plant connected with CSPG, so the baseline scenario of the Project is electricity delivered to CSPG by the Project that would otherwise be generated by the existing power plants and addition of new generation sources within CSPG.

According to methodology AMS-I.D., the baseline is the electricity produced by the renewable generating unit multiplied by an emission coefficient. Therefore, the baseline of the Project is the electricity delivered to CSPG by the Project multiplied by the baseline emission coefficient of CSPG.

[5] China DNA(http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=1889), August 9th, 2007

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:

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UNFCCC simplified modalities seek to establish additionality of the project activity as per Attachment A to Appendix B, which listed various barriers, out of which, at least one barrier shall be identified due to which the project would not have occurred any way. The main barrier identified by the project participants for the project activity is investment barrier. Detailed analysis is shown as follows:

Investment Barrier

The purpose of this part is to determine whether the 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 Project has income from electricity sales, benchmark analysis is selected among these options. And also the internal return rate (IRR) 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 IRR of small hydropower project is 10%. Accordingly, if the total investment's IRR of the Project is lower than 10%, the project is not an economically attractive course of action and fulfils the requirement of additionality.

Although the *Economic Evaluation Code for Small Hydropower Projects* (Document No. SL16-95) was issued by the Ministry of Water Resources in 1995, it is valid nowadays. Its validity has been acknowledged by the *Bulletin from Ministry of Water Resources* about the valid water resources technology standard in June 2002[6] and in Sep 2006[7]. It has not been replaced by any other standard from its issuance. Therefore, the application of the *Economic Evaluation Code for Small Hydropower Projects* (Document No. SL16-95) in the *Expansion Feasibility Study Report* (EFSR) of the Project and in this PDD is considered reasonable.

Calculation and comparison

The basic parameters for calculation of IRR of the Project are shown in Table B-1.

Table B-1. Basic parameters for calculation of financial indicators of the Project[8]

Parameter	Unit	Amount
Estimated annual output	GWh	41.34
PLF	%	59.6
Project lifetime (including 2 years of construction	Years	22

[6] http://www.cws.net.cn/guifan/bzdt/bzgg.asp.

[7] http://www.mwr.gov.cn/tzgg/qt/20060926000000479251.aspx.

[8] The Data are from the EFSR of the Project, which was developed by the Chenzhou Hydropower Survey and Design Institute in Hunan Province, a qualified third party, in Mar. 2006 and has been approved by Nujiang Lisu Prefecture Development and Reform Committee in Yunnan Province on Apr. 17th, 2006. All the input values used in the investment analysis are the same as in the EFSR and PDD. Besides, all the costs and the tariff make utilization of fixed value based on current price level, which is regulated by the document of SL16-95.

period)		
Total investment	Million RMB	47.7841
Expected tariff（without VAT）	RMB/kWh	0.17
VAT	%	6
Income tax	%	33
Tax of expense for city maintenance and construction	%	3
Tax of education fee addition	%	1
Period of depreciation	Years	20
Rate of scrap value	%	0
Reserve rate	%	15
Operational and maintenance cost	Million RMB	1.5145

Further detail about the input values

O&M costs

The O&M cost used in the calculation of project IRR are fully consistent with EFSR, which was designed by Chenzhou Hydropower Survey and Design Institute in Hunan Province in Mar 2006 and approved by Nujiang Lisu Prefecture Development and Reform Committee in Yunnan Province in Apr 2006. In addition, a survey of O&M costs of registered CDM hydropower projects with similar scale (5MW-15MW) in Yunnan Province is as below.

Table B-2 Detailed information for similar hydropower projects

NO.	Ref.	Title	Installed Capacity (MW)	Unit Investment (RMB/kW)	Unit O&M Cost (RMB/kW)	Approved Tariff (incl. VAT) (RMB/kWh)	Commissioning Starting Date
1	2905	Lushui Bajiaohe Small Hydropower Project	15	5661	96	0.16 in high flow season; 0.20 in dry season	05/2007
2	1496	Pihe 9.6MW Small Hydropower Project in Yunnan Province	9.6	4430	148	0.16 in high flow season; 0.20 in dry season	08/2007
3	1485	Lishiluo Erji 6.4MW Small Hydropower Project in Yunnan Province	6.4	5627	166	0.16 in high flow season; 0.20 in dry season	08/2007
4	1504	Mujiajia Erji 10MW Small Hydropower Project in Yunnan Province	10	4816	176	0.16 in high flow season; 0.20 in dry season	04/2008
5	1430	Pushihe Erji 10 MW Small Hydropower Project in Yunnan Province	10	5127	102	0.16 in high flow season; 0.20 in dry season	07/2007
6	2146	Lushui Zijihe Small Hydropower Project	12.6	5758	125	0.16 in high flow season; 0.20 in dry season	05/2008
7	1439	Aluhe 12.6 MW Small Hydropower Project in Yunnan	12.6	5071	124	0.16 in high flow season; 0.20 in dry season	04/2007

		Province					
8	2045	Mujiajia Yiji 18.9MW Hydropower Project in Yunnan Province	18.9	4567	155	0.16 in high flow season; 0.20 in dry season	Not yet
9	2804	Fugong Latudi River Hydropower Station	18.9	4443	114	0.16 in high flow season; 0.20 in dry season	03/2008
10	1510	Yunnan Mopo River 12.5 MW Hydropower Project	12.5	4687	166	0.16 in high flow season; 0.20 in dry season	11/2008
11	1978	Laowuhe Erji 10 MW Hydropower Project in Yunnan Province	10	4031	141	0.16 in high flow season; 0.20 in dry season	01/2009
12	2688	Fugong Labuluo Hydropower Project	24	4921	129	0.16 in high flow season; 0.20 in dry season	03/2007
13	2030	Fugong Mukeji Hydropower Project	31.5	6186	87	0.16 in high flow season; 0.20 in dry season	06/2007
14	2874	Sidehe 24.8MW Hydropower Project in Yunnan Province	24.8	4960	141	0.16 in high flow season; 0.20 in dry season	09/2008
15	3113	**Gutanhe 10 MW Hydropower Project in Yunnan Province**	10	4778	151	0.16 in high flow season; 0.20 in dry season	02/2008

Source: All the relevant information was sourced from the website of UNFCCC, detailed as below:
2905, http://cdm.unfccc.int/UserManagement/FileStorage/J8Y0OW5TB1UZNXC2M3PSVHLERK69AQ
1496, http://cdm.unfccc.int/UserManagement/FileStorage/908P4CM1ZPQ1SEOSTRIAR13MJ3ZAAY
1485, http://cdm.unfccc.int/UserManagement/FileStorage/E08JNT2PI8NAUKQA7WS3B44L45W90J
1504, http://cdm.unfccc.int/UserManagement/FileStorage/C93JDP5R6LV9NF5QTPZVVRRCQKBMTG
1430, http://cdm.unfccc.int/UserManagement/FileStorage/YYXD8OB4PQ0F8BTFGCQGIEYTJYUX8Y
2146, http://cdm.unfccc.int/UserManagement/FileStorage/DLC97Y28EO0WS3RXFKUI1BQTZHMGJ4
1439, http://cdm.unfccc.int/UserManagement/FileStorage/RI8MTHCHY20TJAYASCP7T36WPR2G61
2045, http://cdm.unfccc.int/UserManagement/FileStorage/5CYWH3JMTIF12EP06AZLN8VX4UDKQG
2804, http://cdm.unfccc.int/UserManagement/FileStorage/ZMXTCFI3WY58619ALKBS024EPVQH7R
1510, http://cdm.unfccc.int/UserManagement/FileStorage/66L0VZCHYKPAF0DRX6DEF1ATM6G6M7
1978, http://cdm.unfccc.int/UserManagement/FileStorage/R036KJ5B82DPCUFYTHOI7ZMAGVWX1Q
2688, http://cdm.unfccc.int/UserManagement/FileStorage/HS9MKCLG4IT03EBXJ5VNAZ6O81DWFR
2630, http://cdm.unfccc.int/UserManagement/FileStorage/AY4K6FO08T5MNQ3RZLIEPBWJH19GS2
2874, http://cdm.unfccc.int/UserManagement/FileStorage/07IKJGYVMAW2HBPONXF41UDTC5LS68

It can be concluded from the above table that the O&M cost of these projects is from 87RMB/KW to 176RMB/KW. As for the Project, 151.45RMB/KW of O&M cost for the Project is reasonable and creditable. Furthermore, the actual O&M cost of the Project in year of 2009 is 1.61 million RMB, which is higher than the estimation of 1.5145 million RMB of O&M cost sourced from EFSR. Thus, it can be concluded that the O&M cost of 1.5145 million RMB for the Project is reasonable and conservative.

PLF

As for the Project, the theoretical annual electricity generation is 52.20GWh, so the PLF is 52.20GWh/10MW/8760h=59.6%. The theoretical annual electricity generation is sourced from the Expansion Feasibility Study Report (EFSR)，which was finished by Chenzhou Hydropower Survey and Design Institute in Hunan Province, a third independent party authorized the Chinese government. The EFSR was provided to the government while applying the Project for implementation approval and this approval was issued by Nujiang Lisu Prefecture Development and Reform Committee on 17 Apr 2006. In addition, a survey of PLF of similar registered CDM hydropower projects was submitted to the DOE for crosscheck.

During the validation, DOE has raised concerns about the estimated power supply of the Project, and the project owner has provided a statistics of the actual power supply since the start of operation in Mar 2008 till Jul 2009 to calculate the actual PLF for DOE' reference. At the stage of request for review, the project owner has updated it by including the most recent data from Mar 2008 to Feb 2010[9]. It can be clearly observed that the actual PLF of the Project during the last 2 years is only 39.15%, which is absolutely conservative compared with the one applied in the investment analysis in this report.

Grid Tariff

As stated in Table B-4[10], Section B.5 of this report, the project owner made the decision of investment based on the FSR finished in Jul 2005 and EFSR (with the expansion of capacity) completed in Mar 2006. Both in the FSR and EFSR, the gird tariff of 0.17 RMB/kWh (excl. VAT) was applied for financial assessment. This tariff was sourced from tariff policy of Nujiang Lisu Autonomous Profecture (Nujijiage[2004]444)[11] issued by Yunnan Nujiang Lisu Autonomous Prefecture Development and Reform Committee, which was the only tariff instruction for feasibility study of projects at that time. The document of "Nujijiage[2004]444" states that for power plants connected into Nujiang Power sub-grid, the electricity tariff should be 0.16 RMB/kWh (incl. VAT) in flood season (from May to Oct) and 0.20 RMB/kWh (incl. VAT) in dry season (from Nov to Apr of next year). So the arithmetical average tariff is 0.18 RMB/kWh (incl. VAT). Therefore, given the VAT rate of 6%, the application of 0.17 RMB/kWh (excl. VAT) in the FSR (EFSR) and the investment analysis can be considered reasonable and not underestimating the profitability of the project since it is known that the electricity generation in flood season is much more than that in dry season. In addition, this tariff policy can be evidenced by the PPA of the Project[12]. The PPA indicated that the actual tariff of the Project is 0.16 RMB/kWh (incl. VAT) in flood season (from May to Oct) and 0.20 (incl. VAT) in dry season (from Nov to Apr of next year).

In other hand, the project owner noticed that "*Information note on the highest tariffs applied by the EB in its decisions on registration of projects in the People's Republic of China*"[13] has been issued by EB, and the highest tariff of 0.215 RMB/kWh (incl. VAT, for registered CDM project 2015) was indicated as for small scale projects with Run-of-River type in Yunnan Province. However, the project owner would like to point out that the highest tariff of 0.215 RMB/kWh (incl. VAT) applied in project 2015 is not suitable

[9] The calculation spreadsheet and related evidences has been submitted to DOE.

[10] Please refer to Page 22 of this report.

[11] Tariff policy of Nujiang Prefecture (Nujijiage[2004]444) has been submitted to DOE.

[12] PPA of Gutanhe Project has been submitted to DOE.

[13] http://cdm.unfccc.int/Reference/Notes/reg_note07.pdf

for the Project and further clarification is detailed as below:

1) Different background between Yunnan Province and Nujiang Lisu Autonomous Prefecture

Yunnan Province with an area[14] of 39.4 ten thousand km^2, it has the highest number of ethnic minorities among all provinces in China, and some 38% of the province's population are members of minorities[15]. Nujiang Lisu Autonomous Prefecture is situated in high mountains areas and 92% of its population is members of minorities[16]. It is one of the least development regions in China, which is identified by central government of China in as early as 1994 and is still in the most updated list to date[17]. The disposable income per capita in Nujiang Lisu Autonomous Prefecture and Yunnan Province from year 2003 to 2009 is detailed as follow:

Year	Personal Disposable Income (PDI) (RMB/person)		
	Nujiang	Yunnan	Rate
	A1	A2	A=A1/A2
2003	3900	7643.57	51.02%
2004	4300	8870.88	48.47%
2005	5100	9265.9	55.04%
2006	5500	10069.89	54.62%
2007	5900	11496.11	51.32%
2008	8042	13250.22	60.69%
2009	8836	14424	61.26%

Source:

Nujiang
http://www.mep.gov.cn/zhxx/gzdt/200411/t20041116_62596.htm
http://www.yfao.gov.cn/show.aspx?id=211
http://www.ynf.gov.cn/canton_model45/newsview.aspx?id=334214
http://www.ynf.gov.cn/canton_model25/newsview.aspx?id=58970
http://njzzx.org/Article/Content.aspx?ID=615
http://nj.xxgk.yn.gov.cn/canton_model3/newsview.aspx?id=924429
http://nj.xxgk.yn.gov.cn/canton_model3/newsview.aspx?id=958305

Yunnan
Page 185,*Yunnan Statistical Yearbook 2009*, which is compiled by *Statistical Bureau of Yunnan Province* and *Survey Office of the National Bureau of Statistics in Yunnan*
http://www.yn.xinhuanet.com/newscenter/2010-02/01/content_18922300.htm

Based on the survey from year 2003 to 2009, it can be found that the annual disposable income per capita in Nujiang is much lower than the one in Yunnan Province. Furthermore, Nujiang Lisu Autonomous Prefecture is one of the 30 Minority Autonomous Prefectures identified by Chinese Government[18]. In

[14] http://www.yn.gov.cn/yunnan,china/74590868828323840/index.html

[15] http://www.oklx.com/cn/yunnan/intro.htm

[16] http://baike.baidu.com/view/34525.htm

[17] http://zh.wikipedia.org/zh/%E5%9B%BD%E5%AE%B6%E7%BA%A7%E8%B4%AB%E5%9B%B0%E5%8E%BF

[18] http://www.seac.gov.cn/gjmw/zzdf/M1002index_1.htm

accordance with Law of the People's Republic of China on Regional National Autonomy and Article 3 and 4 of Autonomous Ordinance of Nujiang Lisu Autonomous Prefecture in Yunnan Province[19], the Government of Lujiang Lisu Autonomous Prefecture is entitled to adopt special policies and flexible measures according to the local realities. So the socio-economic and policy context in Nujiang is essentially different from the one in Yunnan Province.

2) The history of tariff policies in Nujiang and Yunnan

As Nujiang Lisu Autonomous Prefecture is one of the least development regions in China, there are few hydropower stations have been implemented and there had not an integrated power grid before 2003. The developments of local power grid and hydropower were initiated in 2003, an evidence of this is the document issued on Sep. 18th, 2003 by the government of Nujiang, namely, "Suggestion on boosting the development of small and medium-sized hydropower stations in Nujiang"[20]. Completion of local power grid started thereafter with the first tariff policy enacted on 13/12/2004, and "Yunnan Nujiang Power Grid Co., Company" was lately formed on Feb. 1st, 2005[21] as another milestone. The development of tariff policy in Nujiang and Yunnan after 2003 is detailed as follow:

Time	Nujiang Lisu Autonomous Prefecture	Yunnan Province
13/12/ 2004	Official tariff document of Nujiang Lisu Autonomous Prefecture (Nujijiage [2004] 444) issued by Yunnan Nujiang Lisu Prefecture Development and Reform Committee. The document of "Nujijiage [2004] 444" states that for hydropower stations connected into Nujiang Power sub-grid, the electricity tariff should be 0.16 RMB/kWh (including VAT) in flood season (from May to October) and 0.20 RMB/kWh (including VAT) in dry season (from November to April of next year).	
30/08/ 2005		The official tariff document Yunfagaijiage[2005] NO. 792 issued by Yunnan provincial Development and Reform Commission on August 30. 2005. The document regulates the tariff of hydropower stations non-unified dispatched by the Yunnan Grid (i.e. Electricity generation of this kind of hydropower stations are controlled by the Yunnan Grid Company and the local grid company together, and both Yunnan Grid Company and the local grid company can send dispatch command to this kind of hydropower stations). That is, if the electricity generated by the hydropower stations is transmitted to the Yunnan Grid through the local grid, and the generation is controlled by both the Yunnan Grid

[19] http://www.seac.gov.cn/gjmw/zcfg/2004-07-10/1168742761851078.htm
http://www.seac.gov.cn/gjmw/zcfg/2005-05-10/1170217311841755.htm

[20] http://www.nujiang.gov.cn/nj/72340168526266368/20070124/102939.html

[21] http://www.ynnjdw.cn/webpages/gsgk.html

		Company and the local grid company, the document is applicable and the tariff of these hydropower stations is as following: 0.13 RMB/kWh including VAT in flood seasons (from June to October) 0.18 RMB/kWh including VAT in normal seasons (May and November) 0.23 RMB/kWh including VAT in dry seasons (from December to next April)
06/01/ 2006		Official tariff document (Yunfagaijiage[2006] NO. 28) issued by Yunnan Provincial Development and Reform Commission. This document regulates the tariff of hydropower stations unified dispatched by the Yunnan Grid (i.e. Electricity generation of this kind of hydropower stations are controlled by Yunnan Grid Company directly, and the Yunnan Grid Company sends dispatch command to this kind of hydropower stations). Namely, if the hydropower stations deliver electricity to the Yunnan Grid directly, then the following tariff is applicable: 0.19 RMB/kWh including VAT in flood seasons (from June to October) 0.215 RMB/kWh including VAT in normal seasons (May and November) 0.24 RMB/kWh including VAT in dry seasons (from December to next April)
03/12/ 2009		Official tariff document (Yunfagaiwujia[2009] NO. 2483) issued by Yunnan Provincial Development and Reform Commission. As a result, for hydropower stations with the unit capacity less than 50MW under the control of Yunnan Grid Company, the following tariff is applicable: 0.197 RMB/kWh including VAT in flood seasons (from June to October) 0.222 RMB/kWh including VAT in normal seasons (May and November) 0.247 RMB/kWh including VAT in dry seasons (from December to next April)
07/06/ 2010	Official tariff document of Nujiang Lisu Autonomous Prefecture (Nufagaijiage [2010] 182) issued by Yunnan Nujiang Lisu Prefecture Development and Reform Committee. The document of "Nujijiage [2010] 182" states that for hydropower stations connected into Nujiang Power sub-grid, the electricity tariff should be 0.139 RMB/kWh (including VAT) in flood season (from May to October) and 0.242 RMB/kWh (including VAT) in dry season (from November to April of next year).	

It can be found from the above table that the tariff of hydropower projects applied in Yunnan and Nujiang is in accordance with its own regional tariff policies respectively, and no decrease in tariff is found in Yunnan and Nujiang. So the tariffs have been increasing respectively for hydropower either directly connected with Yunnan Power Grid or its sub-layer Nujiang Power grid, as the Project is located at Lushui County, Nujiang Lisu Autonomous Prefecture, the tariff policy of "Nujijiage[2004] 444" was applicable at the investment decision time for the Project.

3) In accordance with Annex 32 EB 53, "*Clarifications on the Implementation of E+/E- Clarifications in the Context of Projects on the Agenda of EB 53"*, the analysis is as follow:

a) The policy after 11 Nov 2001 did not impact the tariff applicable to the Project.

According to paragraph 6(b) of Annex 3 EB 22, "National and/or sectoral policies or regulations that give comparative advantages to less emissions-intensive technologies over more emissions-intensive technologies (e.g. public subsidies to promote the diffusion of renewable energy or to finance energy efficiency programs)" is called E- Policies.

There are no comparable emission-intensive power plants in Nujiang, for instance, there are no new coal-fired power plants constructed since 2001. Neither any uniform tariff regulation system nor any trend in tariff setting for coal-fired power plants could be found in Nujiang. Meanwhile, as stated above, an increase in tariff for hydropower projects, other than a decrease in tariff, was found in Nujiang from 2004 to 2010. Thus, there were E- policies have been implemented after Nov. 11th, 2001.

b) As the policies after 11 Nov 2001 did not impact the tariff applicable to the Project, step (b) of Annex 32 EB 53 is not applicable.

c) As clarified above under point 1) and point 2), the socio-economic and policy context in Nujiang is essentially different from the one in Yunnan Province, and the applicable policy change was not leading to a lower tariff over time, so the para 4(c) of Annex 32, EB53 is not applicable to this proposed project. Nevertheless, taking into consideration of the EB requirement about "reference tariff", we would like to demonstrate additionally that the IRR of Gutanhe project is still below the benchmark even if the "reference tariff" is applied the IRR calculation.

The evidences of calculation of "reference tariff" have been submitted to DOE for check. According to the result of calculation of "reference tariff", if the reference tariff of 0.205RMB/KWh (incl. VAT) is adopted, the IRR of the Project is 9.35%, still less than the benchmark. Thus, the project is confirmed as robust in terms of additionality based on investment analysis.

4) The tariff applied for the Project

The Project is located at Lushui County, Nujiang Lisu Autonomous Prefecture, and deliveries electricity to Nujiang Power Grid. Nujiang Power Grid is a sub-grid of Yunnan Power Grid, the plants in Nujiang Power Gird are physically connected to Yunnan Power Grid. The electricity tariff of the Project should be determined by the local government – Yunnan Nujiang Lisu Development and Reform Committee.

As stated above, the tariff 0.17RMB/kWh (excl. VAT) of the Project sourced from EFSR is consistent

with the document "Nujijiage [2004] 444", this tariff was suitable for the Project at investment decision period, and was evidenced by the PPA signed by the project owner and Nujiang Power Grid Company. In addition, based on the survey from Table B-2, there are 14 registered CDM projects which are similar to the Project, and the tariff applied for these projects are all "0.16 RMB/kWh (incl. VAT) in flood season (from May to October) and 0.20 RMB/kWh (incl. VAT) in dry season (from November to April of next year)", which is in accordance with the tariff policy applied for the Project. Thus, 0.17RMB/kWh (excl. VAT) used for the Project is reasonable and creditable. Further, the project owner noticed that a new policy document "Nufagaijiage [2010] 182" was issued by the local government in Jun 2010, and the arithmetical average tariff is increased to 0.1905RMB/kWh (incl. VAT) for hydropower projects. However, the project IRR is only 8.29%, less than the benchmark of 10%, even the latest tariff policy was applied for the Project.

It is noted that the so called highest tariff for CDM hydropower project in Yunnan province is 0.215RMB/kWh (inc.VAT) which was sourced from the PDD of PA2015, however, PDD of PA2015 also agrees that 0.215RMB/kWh (inc.VAT) is overestimation in terms of revenue and conservative in terms of additionality test as it is not "considering dramatically different electricity generation in dry and flood seasons"(footnote 15, page 18, http://cdm.unfccc.int/UserManagement/FileStorage/GBLDQW8IFZVX73CRUKEJA2NO19S0T4): according to the PPA of PA2015 – the electricity tariff in dry seasons (Jan to Apr, Dec) is 0.240 RMB/kWh with VAT, the electricity tariff in normal seasons (May and Nov) is 0.215RMB/kWh with VAT, and the electricity tariff in flood seasons (Jun to Oct) is 0.190RMB/kWh with VAT[22]. Based on the data available in the published monitoring report of PA2015[23], the weighted averaged tariff (the actual tariff during Apr 2009 ~ Mar 2010) of PA2015 is 0.200RMB/kWh[24] (incl. AVT). If this tariff is used for the IRR calculation of the proposed project, the project IRR would be 8.99% which is still less than the benchmark of 10%. Further, as the real electricity generation data from Mar 2008 to Feb 2010 (total 2 years, 24 months) of the proposed project now are available (evidences have been submitted to DOE for check), even if the tariff scheme of PA2015 is applied with the real seasonal generation data of the proposed project, the hypothetical weighted average tariff (from Mar 2008 to Feb 2010) for this project would be 0.2077RMB/kWh (incl. AVT), and the hypothetical IRR is 9.54%, still lower than the benchmark of 10%.

Calculated based on the data indicated in table B-1, the IRR of the total investment of the Project is 7.53%. It is significantly lower than the benchmark IRR for common hydro power projects (10%). Therefore, the Project is not financially feasible and fulfils the requirement of additionality.

Taking into account the income from selling CERs (calculated with an assumed price of 8€/tCO_2e), the total investment's IRR of the Project will be increased to 11.86%, which is greater than the benchmark IRR of 10%. Therefore, the Project is economically attractive.

Sensitivity Analysis

The objective of sensitivity analysis is to show whether the conclusion regarding the financial

[22] Page 18, the registered PDD of project 2015

[23] http://cdm.unfccc.int/Projects/DB/TUEV-SUED1218122893.83/view

[24] The weighted average tariff calculation spreadsheet for project 2015 and 3113 has been submitted to DOE.

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 project.

- Power Output
- Total Static investment
- O&M cost
- Grid Tariff

A variation of ±10% has been considered in the sensitivity analysis and the results of sensitivity analysis are shown as the following Table B-3 and Figure B-1.

Table B-3. the results of the sensitivity analysis

Range Scope / IRR (%) / Para-meters	-10%	-5%	0	5%	10%
Power Output	6.17%	6.85%	7.53%	8.20%	8.86%
Total Static Investment	8.81%	8.14%	7.53%	6.97%	6.46%
O&M cost	7.82%	7.68%	7.53%	7.39%	7.24%
Grid Tariff	6.17%	6.85%	7.53%	8.20%	8.86%

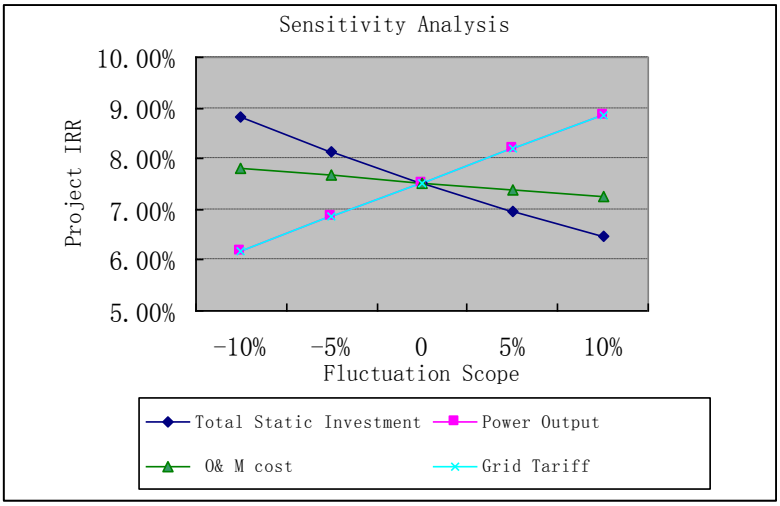

Figure B-1. the results of the sensitivity analysis

Power output

Since the expected power output of the Project described in the EFSR were calculated based on multi-yearly historical hydrological data, electricity demand of the Grid and technical performance of installed capacity, assuming a variation range large than 10% is not realistic.

As stated above, it can be clearly observed that the actual PLF of the Project during the last 2 years is only 39.15%, less than the designed PLF of 59.6%, which means that the actual annual power supply of the Project is lower than the designed one sourced from EFSR, so a variation range for power output large than 10% is not realistic.

Total Static Investment

Since the construction materials and fuels prices are constantly increasing in P.R. China[25], the total investment cost is unlikely to be reduced by 10%. In fact, according to the *General Contract for Construction and Equipments*[26] signed between the project owner and the primary contractor, the value of contract price was 48.0 Million RMB, minor greater than the total investment in the *Expansion Feasibility Study Report*. Thus, a decrease in total investment is unlikely to happen.

O&M cost

The O&M cost used in the calculation of project IRR are fully consistent with EFSR, which was designed by Chenzhou Hydropower Survey and Design Institute in Hunan Province in Mar 2006 and approved by Nujiang Lisu Prefecture Development and Reform Committee in Yunnan Province in Apr 2006. Since the construction materials and fuels prices are constantly increasing in P.R. China[27], the total O&M cost is unlikely to be reduced by 10%.

Furthermore, the actual O&M cost of the Project in year of 2009 is 1.61 million RMB, which is higher than the estimation of 1.5145 million RMB of O&M cost sourced from EFSR. Thus, it can be concluded that the total O&M cost is unlikely to be reduced by 10%.

Grid Tariff

As stated in Table B-4, Section B.5 of this report, the project owner made the decision of investment based on the FSR finished in Jul 2005 and EFSR (with the expansion of capacity) completed in Mar 2006. Both in the FSR and EFSR, the gird tariff of 0.17 RMB/kWh (excl. VAT) was applied for financial assessment. This tariff was sourced from tariff policy of Nujiang Lisu Autonomous Profecture (Nujijiage[2004]444)[28] issued by Yunnan Nujiang Lisu Autonomous Prefecture Development and Reform Committee, which was the only tariff instruction for feasibility study of projects at that time. The document of "Nujijiage[2004]444" states that for power plants connected into Nujiang Power sub-grid, the electricity tariff should be 0.16 RMB/kWh (inc. VAT) in flood season (from May to Oct) and 0.20 RMB/kWh (inc. VAT) in dry season (from Nov to Apr of next year). So the arithmetical average tariff is 0.18 RMB/kWh (inc. VAT). Therefore, given the VAT rate of 6%, the application of 0.17 RMB/kWh (excl. VAT) in the FSR (EFSR) and the investment analysis of this report can be considered reasonable and conservative since it is known that the electricity generation in flood season is much more than that of dry season. In addition, this tariff policy can be evidenced by the PPA of the Project[29]. The PPA indicated that the actual tariff of the Project is 0.16 RMB/kWh (inc. VAT) in flood season (from May to Oct) and 0.20 (inc. VAT) in dry season (from Nov to Apr of next year). Since the pricing right usually is controlled by the grid company, it is impossible for the project owner without negotiation power to expect the tariff to

[25] See Statistical Communiqué of the People's Republic of China. National Bureau of Statistics of China:

(http://www.stats.gov.cn/english/StatisticalCommuniques/)

[26] *General Contract for Construction and Equipments*, dated on Dec. 28th, 2006.

[27] See Statistical Communiqué of the People's Republic of China. National Bureau of Statistics of China:

(http://www.stats.gov.cn/english/StatisticalCommuniques/)

[28] Tariff policy of Nujiang Prefecture (Nujijiage[2004]444) has been submitted to DOE.

[29] PPA of Gutanhe Project has been submitted to DOE.

be increased by 10%.

The sensitivity analysis shows that even the fluctuation range of the sensitivity indicators reach 10%, the IRR of the Project could not reach the benchmark and the conclusion regarding that the Project is financially unattractive is still tenable.

To sum up, the Project has obvious investment barrier and fulfils the requirement of additionality.

The incentive by the CDM was seriously considered in the decision to proceed with the project activity as follows:

The *Feasibility Study Report* (FSR), designed by Chenzhou Hydropower Survey and Design Institute in Hunan Province, was finished in July, 2005. It indicated that with installed capacity of 7.5MW(3×2.5MW), the project IRR is only 6.92% , which is significant lower than the benchmark IRR of 10% and the suggestion of applying for CDM revenue was given in the FSR to make the project feasible.

For ensuring whether CDM is reliable, the project owner consulted the Water Resource Bureau of Lushui County and the positive response was given as a formal document, which was issued on Aug. 22th, 2005. Since the reliability of CDM was confirmed and the potential CERs revenue could make the project to be financially attractive, the Board Meeting was held on Sep. 3rd, 2005 to discuss the project and CDM-related issues. All shareholders supported to continue promoting the project under considering CDM and agreed that the Water Resource Bureau of Lushui County should assist to find a CDM development consultant. It took more than three months for the project owner to sign the *CDM Development Agreement* with Yunnan Xieli Engineering Development Co., Ltd. (YXED) at the Water Resource Bureau of Lushui County on Dec. 26th, 2005. During the period, the approval letter of the EIA and FSR were received on Nov. 15th, 2005 and Dec. 8th, 2005 respectively.

In the beginning of 2006, when preparing for the design of construction, it was found that the water resources can be utilized more effectively if the scale of installed capacity can be expanded. For optimizing the engineering design of the project, the project owner authorized the Chenzhou Hydropower Survey and Design Institute in Hunan Province to compile the *Expansion Feasibility Study Report* (EFSR). In March 2006, the EFSR was finished and the conclusion was that the total installed capacity could be revised to 10MW (2×5MW) from formal 7.5MW (3×2.5MW), meanwhile the project IRR can be increased by 0.61%, i.e. 7.53%. Although the IRR was still lower than the benchmark IRR, the EFSR indicated that with the revenues from CDM the expansion plan should be more attractive than the formal design. Therefore, the expansion plan with CDM was accepted by the project owner. The approval letter of the EFSR was issued by Nujiang Lisu Prefecture Development and Reform Committee in Yunnan Province on Apr. 17th, 2006. During this period, the project's CDM-related work was provisionally ceased because of waiting for the revision of engineering design and corresponding approval letter.

The project acquired the *Construction permission* issued by local authorities on Jun. 5th, 2006 and started construction on Jun. 6th, 2006. The *Main Facilities Purchasing Contract*, including turbine and generator, was signed between the project owner and Fujian Nanping Nandian Hydropower Equipment Manufacturing Co., Ltd. on Jun. 30th, 2006. On Dec. 28th , 2006, in order to accelerate the process of the

Project, the project owner signed the *General Contract for Construction and Equipments* with Mr. Guo Junwei, the principal manager of the initial-stage engineering of the Project, to commission Mr. Guo Junwei as the primary contractor to conduct overall affairs related to the construction of the Project. Therefore, the project was started on 06/06/2006.

After the starting of construction, the CDM work went forward. On Aug. 2006, a potential carbon buyer accompanied by YXED went to the project site to make investigation. However, the agreement for carbon business wasn't signed finally because the cooperation between the carbon buyer and YXED wasn't achieved. Since then, YXED hasn't made headway regarding the project's CDM work. Worrying about this situation, on Feb. 2007, the project owner issued a letter to YXED, stating that YXED must provide substantial progress to the project owner in three months, otherwise the *CDM Development Agreement* would be terminated. In this letter, the project owner also notified YXED that they would look for other CDM consultants because the exclusivity of the *CDM Development Agreement* has lost its effectiveness. Waiting for YXED's reply, the project owner began to contact Cleanergy Investment Service (Beijing) Co., Ltd (CIS, the complier of the PDD). On Apr. 5th, 2007, the shareholders held a Board Meeting, deciding to withdraw from the cooperation with YXED immediately, and to start the negotiation with CIS about the project's CDM development. On May 25th, 2007, YXED finally fed back a written notice to the project owner, to agree with the termination of the CDM cooperation. The project owner then signed the new *CDM Development Agreement* on Jun. 15th, 2007 with CIS. The *CER PURCHASE AGREEMENT* between the project owner and Essent Energy Trading B.V. was signed on Jan. 11th, 2008. The project started validation on Jan. 18th, 2008.

The timeline of the project is shown in table B-4 below.

table B-4.The milestones of the project activity in the CDM context[30]

Date(dd/mm/yy)	Events	Documents/evidences
07/2005	*Feasibility Study Report* was finished.	FSR
22/08/2005	The letter of supporting the project to apply for CDM revenue was issued by the Water Resource Bureau of Lushui County.	*Notice on promoting the hydropower project to apply for CDM by Water Resource Bureau of Lushui County. (Lu-Shui_Wu_Fa[2005]108)*
03/09/2005	The board decided to promote the Project with applying for CDM revenue.	*Board Meeting Minute*.
10/2005	EIA Report was finished.	EIA
15/11/2005	The approval letter of the EIA was received.	*Approval letter for EIA report of Gutanhe Hydropower project by Nujiang Lisu Prefecture Environment Protection Bureau. (Nu_Huan_Fa[2005]125)*
08/12/2005	The approval letter of the FSR was received.	*Approval letter for FSR of Gutanhe Hydropower project by Nujiang Lisu Prefecture Development and Reform Committee. (Nu_Fa_Gai_Neng_Yuan[2005]414)*
26/12/2005	Contracted with a CDM development consultant, Yunnan Xieli Engineering	*CDM Development Agreement* between the project owner and YXED.

[30] All the relevant documents/evidences mentioned in the table had been submitted to DOE.

	Development Co., Ltd (YXED).	
03/2006	The *Expansion Feasibility Study Report* was finished.	EFSR
17/04/2006	The approval letter of the EFSR was received.	*Approval letter for EFSR of Gutanhe Hydropower project by Nujiang Lisu Prefecture Development and Reform Committee. (Nu_Fa_Gai_Neng_Yuan[2006]122)*
05/06/2006	Official approval of starting construction was received.	*Construction permission* approved by Nujiang Lisu Prefecture Development and Reform Committee.
06/06/2006	The project started construction.	*Order of starting construction* issued by the supervision company, Yuannan Engineering Consultation and Supervision Co. Ltd.
30/06/2006	Contracted with the manufacturer of turbines and generators.	*Main Facilities Purchasing Contract* between the project owner and Fujian Nanping Nandian Hydropower Equipment Manufacturing Co., Ltd.
08/2006	YXED arranged an onsite investigation with a carbon buyer.	*Notification on terminating CDM cooperation* issued by YXED and confirmed by the project owner.
28/12/2006	Commissioned Mr. Guo junwei as the primary contractor of the Project.	*General Contract for Construction and Equipments* between the project owner and Mr. Guo junwei.
27/02/2007	The project owner issued a letter to YXED, stating a deadline for the cooperation with YXED.	*Notification on the deadline for CDM cooperation* issued by the project owner to YXED.
05/04/2007	The board decided to withdraw from the cooperation with YXED and start negotiation with CIS was done.	*Board Meeting Minute*
25/05/2007	The *CDM Development Agreement* was terminated by the project owner and YXED.	*Notification on terminating CDM cooperation* issued by YXED and confirmed by the project owner.
15/06/2007	Contracted with Cleanergy Investment Service (Beijing) Co., Ltd (CIS).	*CDM Development Agreement* between the project owner and CIS.
11/01/2008	Signed the contract of carbon business.	*CER PURCHASE AGREEMENT* between the project owner and Essent Energy Trading B.V.
18/01/2008	The project started GSP.	http://cdm.unfccc.int/Projects/Validation/index.html.
05/03/2008	The Project was in commissioning.	Interview with the project owner.

In conclusion, the incentive by the CDM was seriously considered by the project owner in the decision to proceed with the project activity.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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The methodology AMS-I.D. is applicable to the Project.

Step 1. Baseline emissions calculation

The Project is a newly built Hydro power plant, therefore, according to AMS-I.D, the baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity, calculated as follows:

$$BE_y = EG_y \times EF_{grid,CM,y} \quad (1)$$

Where:

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

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

$EF_{grid,CM,y}$ = 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*.

The *Tool to calculate the emission factor for an electricity system* provides for a step-wise approach to calculate the $EF_{grid,CM,y}$. These steps include:

Substep 1.1. Identify the relevant electric power system

Based on the Expansion Feasibility Study Report of the project, the electricity generation of the project will be transmitted to Nujiang Power Grid, which is a sub-grid of Yunnan Power Grid, and the plants in Nujiang Power grid are physically connected to Yunnan Power Grid. According to *Notification on Determining Baseline Emission Factors of China Power Grid*[31] issued by the National Development and Reform Commission of the Government of China (China DNA) on August 9th ,2007, Yunnan Power Grid is an integral part of CSPG which is composed of Guangdong Power Grid, Guangxi Power Grid, Yunnan Power Grid and Guizhou Power Grid. Therefore, the project electricity system is defined as CSPG.

SubStep 1.2 Select an operating margin (OM) method

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

(a) Simple OM, or

(b) Simple adjusted OM, or

(c) Dispatch data analysis OM, or

(d) Average OM.

The application of method (c) requires availability of dispatch data. However, the detailed data of

[31] http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=1889， August 9th ,2007

dispatch are taken as confidential business information by the grid company and not publicly available. Thus, method (c) cannot be adopted for the Project. Similarly, the data of annual load duration curve required by method (b) also can not be obtained publicly. Therefore, method (b) is also not applicable here.

Among the total electricity generations of the CSPG, the amount of low-cost/must run resources accounts for about 34% in 2001, 33% in 2002, 31% in 2003, 30% in 2004 and 29% in 2005[32], all less than 50%. It can't fulfil the requirement of method (d), but fulfils the requirement of method (a). Thus, the method (a) can be used to calculate the operating margin emission factor.

For the Project, ex-ante option is adopted for calculation of the OM emission factor ($EF_{grid,OM,y}$) of CSPG.

SubStep 1.3. Calculate the operating margin emission factor according to the selected method

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:

Option A: Based on data on fuel consumption and net electricity generation of each power plant / unit, or

Option B: Based on data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit, or

Option C: Based on data on total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

As per *Tool to calculate the emission factor for an electricity system*, Option A should be preferred. However, the data on fuel consumption and net electricity generation of each power plant / unit is not publicly available. Thus, Option A cannot be adopted for the Project. Similarly, the data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit are not available too. Thus, Option B cannot be adopted for the Project.

According to the *Notification on Determining Baseline Emission Factors of China Power Grid* issued *on August 9th ,2007*, only nuclear and renewable power generations are considered as low-cost / must-run power sources. And the quantity of electricity supplied to the grid by low-cost / must-run power sources is known. Therefore, Option C is adopted to calculate the simple OM emission factor of CSPG.

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:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{co_2,i,y}}{EG_y} \quad (2)$$

32 *China Electric Power Yearbook, 2002~2006 Edition.*

Where:

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

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

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

$EF_{co_2,i,y}$ = CO_2 emission factor of fossil fuel type i in year y (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.

CSPG has electricity import from Central China Power Grid (thereafter as CCPG). According to *Tool to calculate the emission factor for an electricity system,* electricity imported from a connected electricity system will be treated as one power plant. The data used to calculation the emission factor is from China Electric Power Yearbook 2004~2006.

The data on electricity generation and auxiliary electricity consumption are obtained from the *China Electric Power Yearbook* from 2002 to 2006 (published annually). The data on different fuel consumptions for power generation and the net caloric values of the fuels are obtained from the *China Energy Statistical Yearbook* from 2004 to 2006 (published annually after 2003). The emission factors and oxidation factors of the fuels adopted are obtained from *Table 1.3* and *Table 1.4* of the *"2006 IPCC Guidelines for National Greenhouse Gas Inventories"*, Volume 2, Chap 1, Page 1.21-1.24.

SubStep 1.4. 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.

Since the set of power units described as (b) in CSPG comprises the larger annual generation than that of (a), the sample group (b) should be used for calculating the build margin of CSPG. The power plant projects that have been registered as CDM project activities should be excluded from the sample group m.

In terms of vintage of data, project participants chooses Option 1 to calculate the BM emission factor ($EF_{grid,BM,y}$) of CSPG. Option 1as follow:

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.

SubStep 1.5. 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:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \cdot EF_{EL,m,y}}{\sum_m EG_{m,y}} \qquad (3)$$

Where:

$EF_{grid,BM,y}$ = 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).

$EF_{EL,m,y}$ = 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.

Currently in China, the capacity margin data of sampling plants group m are publicly unavailable. Taking notice of this situation, CDM EB accepts the following deviation in application of methodology AMS-I.D in China[33]:

- ✧ Use of capacity additions exceeds 20% of total generation for estimating the build margin emission factor for grid electricity.
- ✧ Use of weights estimated using installed capacity in place of annual electricity generation.

And it is suggested to use the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy.

For the Project: Firstly, calculate the share of different power generation technology in recent capacity additions. Secondly, calculate the weight for capacity additions of each power generation technology. And finally calculate the emission factor using the efficiency level of the best technology commercially available in China.

[33] http://cdm.unfccc.int/Projects/Deviations

Due to the installed capacities of coal based, oil based and gas based can not be separated and determined directly at present, BM is calculated with following steps and formula:

SubStep 1.5.1. Calculate the power generation emissions for solid, liquid and gas fuel and each share of total emissions based on the Energy Balance Table of the most recent year.

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

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

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

where:

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

$COEF_{i,j,y}$ is the CO_2 emission coefficient of fuel i (tCO_2/tCe), taking into account the carbon content of the fuels (coal, oil and gas) used by province j and the percent oxidation of the fuel in year(s) y, and COAL, OIL and GAS are footnote group for solid fuels, liquid fuels and gas fuels.

The CO_2 emission coefficient $COEF_i$ is then obtained from equation (7) as

$$COEF_i = NCV_i \cdot EF_{CO2,i} \cdot OXID_i \quad (7)$$

Where:

NCV_i is the net calorific value (energy content) per mass or volume unit of fuel i,

$OXID_i$ is the oxidation factor of the fuel i (see 2006 IPCC Guidelines for National Greenhouse Gas Inventories for Default Values), and

$EF_{CO2,i}$ is the CO_2 emission factor per unit of energy of the fuel i.

SubStep 1.5.2. Calculate emission factor for thermal power of each grid based on the result of *SubStep 1.5.1*. and the efficiency level of the best technology commercially available in China.

$$EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \quad (8)$$

Where: $EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ represent the efficiency level of the best coal-based, oil-based and gas-based power generation technology commercially available in China.

SubStep 1.5.3. Calculate BM of the grid based on the result of *SubStep 1.5.2*. and the share of thermal power of recent 20% capacity additions.

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \quad (9)$$

Where CAP_{Total} is total capacity additions while $CAP_{Thermal}$ is capacity additions of thermal power.

The data on different fuel consumptions for power generation and the net caloric values of the fuels are obtained from the China Energy Statistical Yearbook from 2004 to 2006 (published annually). Average low calorific values of fuels for electricity generation are obtained from China Energy Statistical Yearbook 2006 Edition, P287. The emission factors and oxidation factors of the fuels adopted are obtained from *Table 1.3 and Table 1.4 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories*" *Volume 2 Energy, Page 1.21 -1.24*

With reference to the Notification on Determining Baseline Emission Factors of China Power Grid issued on August 9th ,2007, the weighted average fuel consumption for power generation of 14 sets of 600 MW sub-critical coal-fired power generators built in 2005 (343.33 gCe/kWh) and the 200 MW oil/gas based combined cycle power generators (258 gCe/kWh) are taken as the efficiency level of the best technology commercially available in China.

SubStep 1.6. Calculate the combined margin emissions factor

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \quad (10)$$

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 (%)

The weight w_{OM} and the weight w_{BM} are both take 0.5 as default for the first crediting period. For the second and third crediting period, the weight w_{OM} will be taken 0.25 as default and the weight w_{BM} will be taken 0.75 as default.

Step 2. Project activity emissions

The project is to generate clean electricity by water power without any fossil fuel involved. Therefore, the annual project emissions by the project activity are zero, then PE_y =0 tCO_2e.

Step 3. Leakage

As run-of river hydropower plants, there is no energy generating equipment be transferred from another activity and no existing equipment be transferred to another activity involved in the project activities. No leakage is considered in the Project, as $L_y = 0$ tCO_2e.

Step 4. Emission reductions

The emission reductions (ER_y) by the Project activity during a given year y is the difference between baseline emissions (BE_y), project activity emissions (PE_y) and leakage (L_y), as follows:

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

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

Data / Parameter:	*Power generation*
Data unit:	*MWh*
Description:	*The total power generation and power generated by low-cost/must run power plants within CSPG in year 2001, 2002, 2003, 2004 and 2005.*
Source of data used:	*China Electric Power Yearbook 2002, 2003, 2004, 2005 and 2006.*
Value applied:	
Justification of the choice of data or description of measurement methods and procedures actually applied :	*CSPG is defined as the project boundary of the Project.* *According Tool to calculate the emission factor for an electricity system, method of simple OM can only be used where low-cost/must run resources constitute less than 50% of total grid generation.*
Any comment:	*Official data*

Data / Parameter:	$GEN_{j,y}$
Data unit:	*MWh*
Description:	*The power generation supplied to CSPG in year 2003, 2004 and 2005, excluding those generated by low-cost/must run power plants.*
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 :	*CSPG is defined as the project boundary of the Project.* *According Tool to calculate the emission factor for an electricity system, the generation by low-operating cost and must-run power plants within CSPG are excluded from calculation of simple OM emission factor.*
Any comment:	*Official data*

Data / Parameter:	*Electricity import*
Data unit:	*MWh*
Description:	*The electricity output form Central China Power Grid to China South Power Grid*
Source of data used:	*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 :	*According to Tool to calculate the emission factor for an electricity system, An import from a connected electricity system should be considered as one power source.*
Any comment:	*Official data*

Data / Parameter:	*Installed Capacity*
Data unit:	*MW*
Description:	*The installed capacity of different power sources within CSPG in year 2003, 2004 and 2005.*
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 :	*CSPG is defined as the project boundary of the Project.* *According to the deviation accepted by the EB, the installed capacities of different power sources within CSPG are used in place of annual electricity generation for calculation of BM emission factor.*
Any comment:	*Official data*

Data / Parameter:	$F_{i,j,y}$
Data unit:	*10^4t or 10^8m^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 :	*CSPG is the project boundary of the Project.*
Any comment:	*Official data*

Data / Parameter:	NCV_i
Data unit:	*MJ/t or MJ/10^3m^3*
Description:	*Average low calorific values of different fuels for electricity generation.*
Source of data used:	*China Energy Statistical Yearbook 2006 Edition, P287.*
Value applied:	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*China-specific values are adopted.*
Any comment:	*Official data*

Data / Parameter:	$EF_{CO2,i}$
Data unit:	*tC/TJ*
Description:	*Emission factors of fuels for electricity generation.*
Source of data used:	*Table 1.3 and Table 1.4, Volume 2 , " 2006 IPCC Guidelines for National Greenhouse Gas Inventories"*
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:	*IPCC data*

Data / Parameter:	$OXID_i$
Data unit:	
Description:	*Oxidation rates of fuels for power generation.*
Source of data used:	*Table 1.3 and Table 1.4, Volume 2 , "2006 IPCC Guidelines for National Greenhouse Gas Inventories"*
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:	*IPCC data*

Data / Parameter:	*Average emission rate*
Data unit:	tCO_2e/MWh
Description:	*Average emission rate of Central China Power Grid.（2003~2005）*
Source of data used:	*Notification on Determining Baseline Emission Factors of China Power Grid* published by Chinese DNA on Aug.9th 2007.
Value applied:	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*The electricity import from Central China Power Grid to China South Power Grid is less than 20% of electricity generation of Central China Power Grid According to Tool to calculate the emission factor for an electricity system, the emission factor of electricity import is the average emission factor of China South Power Grid*
Any comment:	*Official data*

Data / Parameter:	*Best efficiency level of thermal power*
Data unit:	
Description:	*The efficiency level of the best coal-based, 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* published by Chinese DNA on Aug.9th 2007.
Value applied:	*Detailed in Annex 3.*
Justification of the choice of data or description of measurement methods and procedures actually applied :	*According to the deviation accepted by EB, the efficiency level of the best technology commercially available in the national grid of China is used as a conservative value for the calculation of BM emission factor.*
Any comment:	*Official data*

B.6.3 Ex-ante calculation of emission reductions:

>>

Baseline emissions calculation

The OM emission factor ($EF_{OM,y}$) of CSPG is **1.0119**tCO_2e/MWh, and the build margin emission factor ($EF_{BM,y}$) of CSPG is **0.6748**tCO_2e/MWh. The detailed calculations and data are listed in Annex 3.

Based on formula (10) in section B.6.1, the baseline emissions factor (EF_y) of CSPG is calculated as **0.84335** tCO_2e/MWh.

According to the *The Expansion Feasibility Study Report* of the Project, the electricity output of the Project is estimated as 41.34GWh per year, therefore the baseline emissions of the Project is estimated as 34,864 tCO_2e per year.

Project activity emissions calculation

As described in section B.6.1, the Project activity emissions (PE_y) will be 0 tCO_2e.

Leakage

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

Emission reductions calculation

Based on formula (11) in section B.6.1, the ex-ante annual emission reductions are estimated as 34,864 tCO_2e.

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

>>

It is expected that the project activity will generate emission reductions for about 34,864 tCO_2e per year over the first 7-year crediting period from Jan. 1st, 2010 to Dec. 31st, 2016.

Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
2010	0	34,864	0	34,864
2011	0	34,864	0	34,864
2012	0	34,864	0	34,864
2013	0	34,864	0	34,864
2014	0	34,864	0	34,864
2015	0	34,864	0	34,864
2016	0	34,864	0	34,864
Total (tCO_2e)	**0**	**244,048**	**0**	**244,048**

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

B.7.1 Data and parameters monitored:

>>

Data / Parameter:	EG_{y1}
Data unit:	*GWh*
Description:	*Electricity supplied to the grid by the Project.*
Source of data:	*Project activity site.*
Measurement procedures (if any):	*Please refer to Part B.7.2.*
Monitoring frequency:	*Hourly measurement and monthly recording*
QA/QC procedures:	*Please refer to Part B.7.2.*
Any comment:	

Data / Parameter:	EG_{y2}
Data unit:	*GWh*
Description:	*Electricity purchased from the grid by the Project.*
Source of data:	*Project activity site.*
Measurement procedures (if any):	*Please refer to Part B.7.2.*
Monitoring frequency:	*Hourly measurement and monthly recording*
QA/QC procedures:	*Please refer to Part B.7.2.*
Any comment:	

Data / Parameter:	EG_{y}
Data unit:	*GWh*
Description:	*Net electricity supplied to the grid by the Project.*
Source of data:	*Project activity site.*
Measurement procedures (if any):	*Calculated as:* $EG_y = EG_{y1} - EG_{y2}$
Monitoring frequency:	*monthly recording*
QA/QC procedures:	*Double check by receipt of sales.*
Any comment:	

B.7.2 Description of the monitoring plan:

>>

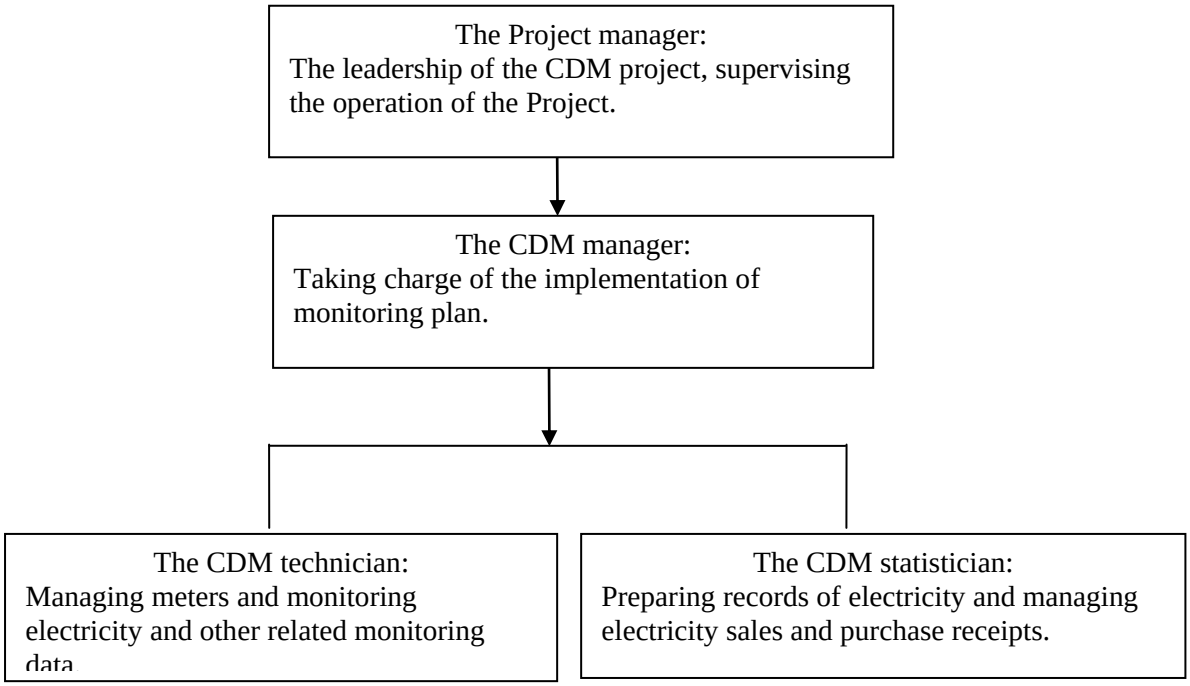
In this PDD, emission factor of the Project is determined ex-ante. Therefore the electricity supplied to the grid and purchased from the grid by the Project is defined as the key data to be monitored. The monitoring plan is drafted to focus on monitoring of the electricity output of the Project and import of the Project.

1. Implementation of the monitoring plan

The Project owner, Lushui Shengtenggu Electric Development Co., Ltd., will take the responsibility of the monitoring plan implementation.

The appointment staffs will undertake the monitoring tasks including watching metering equipments daily, collecting electricity data and completing records, checking and analyzing the data, archiving relevant records, reporting to company administrator or supervisor.

The staff concerned will receive training on monitoring and measurement to ensure the implementation of this monitoring plan before project operation. In the following years within the crediting period, the training will also be provided.



2. Monitoring of the electricity supplied to and purchased from the grid by the Project

The double-way revenue meter, installed at the high voltage side of the transformer, will be employed to record the electricity supplied to and purchased from the Grid continuously (please refer to the electric wiring diagram in Annex 4). Both the electricity supplied to and purchased from the Grid will be hourly measured and monthly recorded. The precision level of the revenue meter will be 0.5s.

The net electricity supplied to the CSPG will be calculated by the electricity supplied to the CSPG minus the electricity purchased form the CSPG. Moreover, the net electricity to the CSPG will be used to calculate the emission reduction of the project.

Staffs from the Project owner will be responsible for measured data collecting and recording on site monthly. All the relevant data records will be kept by the Project owner during the crediting period and two years after for DOE's verification.

3. Quality assurance and quality control

The quality assurance and quality control procedures involve data monitoring, recording, archiving, and equipment maintaining and calibration.

The electricity supplied to and purchased from CSPG by the Project will be monitored through the revenue meter and cross-checked against relevant electricity sales receipts and/or records from the grid company for quality control. Since the data required to be monitored is consistent with the data required during project operation by the Project owner and the grid company, the Grid Connection Agreement or the Power Purchase Agreement between these two parties can be used as guidance on data collection and documentation.

Calibration of Meters & Metering should be implemented annually according to national standards, *DL/T448-2000 the Technical Management Rules for Electric Power Measuring Installations*, and all the records should be documented and maintained by the Project owner for DOE's verification.

If the revenue meter of the project is found wrong, which will be informed to the grid company, a meter in the Liuku Center Substation side will be taken as the check meter, and the CER calculation will be based on the records of the check meter.

4. Procedures of exception handling and reporting

The CDM technical staffs will take real-time monitoring on the operation status of metering meters to ensure that any abnormity could be detected and the corresponding measures of processing, reporting and recording will be taken in time. In case of malfunction, the abnormal meter will be replaced and new meter must be calibrated by a qualified third-party before being put into use again.

Problem occurred in monitoring and measurement process will be recorded and reported to CDM manager and project manager. Consequently, the corrective actions will be updated to the Monitoring Manual by the CDM manager or project manager for the purpose of continuous improvement.

All the relevant records of exception handling will be kept by the Project owner during the crediting period and two years after for verification

5. Verification

It is expected that the verification of emission reductions generated from the Project will be done annually.

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: 15/09/2010

Entity: Cleanergy Investment Service (Beijing) Co., Ltd.

Address: Capital Times Square, 88 Xichang'an Jie, Beijing, China, 100031.

Tel: +86-10-83914567

Fax: +86-10-83914555

E-mail：CDM@hanergy.com

The entity is not the project participants listed in Annex 1.

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

>>

06/06/2006 (Construction starting date)

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

>>

20 y-0m.

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

C.2.1. Renewable crediting period

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

>>

01/01/2010 or registration date, whichever is later.

C.2.1.2. Length of the first crediting period:

>>

7 y-0m.

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 Assessment* (EIA) for this project was carried out by the Technology Consultant Development Centre of Yunnan University. The EIA report has already been approved by Environmental Protection Bureau of Nujiang Prefecture on Nov., 15th, 2005. Furthermore, regarding the expansion of installed capacity of the Project, Environmental Protection Bureau of Nujiang Prefecture also confirmed on Apr. 10th, 2006 that the approval letter of the EIA was still valid because the expansion would not result in other environmental impacts than those identified and analyzed in the EIA.

According to the *Expansion Feasibility Study Report* and the *Environmental Impact Assessment*, environmental impacts possibly caused by the Project and protect and guard measures adopted by the project owner are analyzed as follows:

Wastewater

Wastewater will be generated by production and living activities during the construction and operation of the Project. The waste water resulting from production activities are primarily suspending particulates which are not toxic and the measures such as digging gutter and sedimentation tank to remove the suspending particulates. The waste water resulting from living activities will be treated by the sets of sewage treatment equipment before discharge it. The standard of waster water will follow the waster water discharge standards (GB8978-1996).

Air pollution and Noise

The Project would cause air pollution from various dusts during construction and these will have temporary impacts on the quality of local air environment. The Project Owner will adopt the technology that causes less dust during construction and will sprinkle water regularly in the construction area to make sure that the air quality meets the requirement of the *Ambient Air Quality Standards* (GB3095-96).

The Project would generate various noises during construction of the Project and these will have temporary impacts on the quality of local sound environment. The Project owner will select the appropriate construction time for avoiding the impact on the nearby residents and employ the low noise machines and adopt corresponding labor protective measures on the construction staff who works near the noise.

Solid waste dumping

The solid waste includes the engineering waste residue during the construction period and the domestic garbage during the construction and operation time. The engineering waste residue will be transported to the residue ground and will be treated as the measures developed in the *Report of Soil and Water Conservation Plan*[34], The domestic garbage will be classified and those who can not be reused will be sent to fill land avoiding the environment pollution.

[34] The Report of Soil and Water Conservation is approved by Water Bureau of Lisu Prefecture on Sep. 13th, 2005 (Nu_Shui_Shui_Bao [2005]19).

Soil and water losses

Soil and water losses would take place with the construction of the Project because of excavation of earth, construction and solid waste dumping. For avoiding the problem, many comprehensive measures of the *Report of Soil and Water Conservation Plan*[9] will be taken such as building walls to block waste residues, planting vegetation, building water discharging facility and greening the permanent office area. With the implementing of these measures, the problem will be solved effectively.

Ecological environment

The Project activity didn't have Immigrants and plantation occupation. The vegetation involved in the occupied land is solo and there are no valuable plants in it. After the completion of the Project, except permanent occupied land, all the temporary occupied land will be leveled up and be greening again. Forestation will be carried out to recover the vegetation.

For the wild animal's protection, the constructor and the local government will propagate and supervise to the workers avoiding hunting wild animals.

In order to protect the environment of aquatic organism, the project owner will ensure 0.216m^3/s ecological flow in withered water period.

To sum up, negative impacts on the environment caused by the Project mainly centered on the construction period which will disappear along with the completion of the Project construction. In conjunction with the implementation of a series of environment protection measures during the construction and operation, the Project will not have significant impacts on the environment.

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

>>

The Project will not have significant impacts on local environment in general, and the EIA of the Project has been approved by the local environmental protection administration.

SECTION E. Stakeholders' comments

>>

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

>>

In March, 2006, the project owner conducted a survey by sending questionnaires. Before the survey was undertaken, the project owner had informed the relevant residents' committee in advance. Investigated stakeholders included representatives from several villages potentially influenced by the project activity.

Questionnaires were distributed according to the principle of both representations, considering the genders, ages, educated level, vocation and nationality, and randomness in order to reflect the public opinions and comments in a fair and real manner. The structure of the investigated persons is listed in Table E-1.

Subject	Table E-1. The structure of the investigated persons.

Genders	Male	Number	Percentage%	Female	Number	Percentage%
		28	70		12	30
Ages	≤25		26~40	41~60		>60
	3		25	9		3
Educated Level	Under High school(include High school)				Above Junior college	
	39				1	
Vocation	Technical	Civil servant	Peasant	Worker		Others
	1	3	30	4		2
Nationality	Han nationality			Minority		
	9			31		
Data source：*the Questionnaires of Gutanhe Hydropower in Lushui County*						

E.2. Summary of the comments received:

>>

Total 40 questionnaires were distributed and 40 were collected at last. The survey results show as follow:

- 40 persons (accounting for 100%) of the respondents support the construction of the Project.
- For positive impact of the Project, 36 people surveyed (accounting for 90%) believe that it will promote the overall development in local area, 31 persons surveyed (accounting for 77.5%) think it will improve local economy, 21 persons surveyed (accounting for 52.5%) consider that it will increase employment opportunities around the Project site and 17 persons surveyed (accounting for 42.5%) express that it can improve their living standard.
- For negative impact of the Project, 31 people surveyed (accounting for 77.5%) consider that the Project do not have visible impact on local environment and only 9 person surveyed (accounting for 22.5%) concern about the impact caused by construction noise.

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

>>

The owner of the Project pay high attention to these comments and they will take measures that mentioned in the responds of the questionnaire and *Environmental Impact Assessment Report* to realize the environment, social and economic benefits.

As for the concern about construction noise by the residents, the Project owner will make corresponding protective measures, as described in section D.1, according to local Regulations to reduce impacts of noise on the construction.

According all the result from the survey, the local people are very supportive to the Project. It is not necessary to take any adjustment for the Project design, construction and operation. Meanwhile, the Project owner will eliminate the negative impacts to the environment by taking reasonable measures, as per the requirement of EIA and corresponding approved documents.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Lushui Shengtenggu Electric Development Co., Ltd.
Street/P.O.Box:	Denggeng Village, Luzhang Town, Lushui County
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State/Region:	Yunnan Province
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FAX:	+86-886-3631028
E-Mail:	-
URL:	-
Represented by:	Fan Peiren
Title:	President
Salutation:	Mr.
Last Name:	Fan
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

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

Annex 3

BASELINE INFORMATION

1. Calculation of OM Emission Factor of CSPG

Table A1. Thermal power generation data within the 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.

Table A2. Thermal power generation data within the 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.

Table A3. Thermal power generation data within the 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.

With reference to the *on Determining Baseline Emission Factors of China Power Grid* published by Chinese DNA on Aug. 9th 2007, Table A4 shows the low calorific values, emission factors and oxidation rates of fuels consumed for electricity generation that are to be used in the following OM emission factor calculation and BM emission factor calculation.

Table A4. Data of fuels consumed for electricity generation

Fuel type	Low calorific value	Emission factor (tC/TJ)	Oxidation rate
Raw coal	20,908 kJ/kg	25.80	1
Cleaned coal	26,344 kJ/kg	25.80	1
Other washed coal	8,363 kJ/kg	25.80	1
Coke	28,435 kJ/kg	29.20	1
Crude oil	41,816 kJ/kg	20.00	1
Gasoline	43,070 kJ/kg	18.90	1
Kerosene	43,070 kJ/kg	19.60	1
Diesel	42,652 kJ/kg	20.20	1
Fuel oil	41,816 kJ/kg	21.10	1
Other petroleum products	38,369 kJ/kg	20.00	1
Natural gas	38,931 kJ/m^3	15.30	1
Coke over gas	16,726 kJ/m^3	12.10	1
Other coal gas	5,227 kJ/m^3	12.10	1
LPG	50,179 kJ/m^3	17.20	1
Refinery gas	46,055 kJ/m^3	15.70	1

Data sources: China Energy Statistical Yearbook 2006 edition, P287;
Notification on Determining Baseline Emission Factors of China Power Grid issued by Chinese DNA published on Aug. 9th 2007.
Table 1.3 and Table 1.4, Volume 2, "2006 IPCC Guidelines for National Greenhouse Gas Inventories

Table A5. Calculation of simple OM emission factor of the 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 1000m^3) H	Emission[35] (tCO_2e) I
Coal	10^4t	4,491.79	831.84	2,169.11	1,405.27	8,898.01	25.8	100	20,908	175,993,455.05
Cleaned coal	10^4t	0.05	0	0	0	0.05	25.8	100	26,344	1,246.07
Other washed coal	10^4t	0	0	36.38	20.37	56.75	25.8	100	8,363	448,971.84
Coke	10^4t	0	0	0	0.5	0.5	29.2	100	28,435	15,222.20
Coke oven gas	10^8m^3	0	0	0	0.04	0.04	12.1	100	16,726	2,968.31
Other coal gas	10^8m^3	3.21	0	0	11.27	14.48	12.1	100	5,227	335,797.81
Crude oil	10^4t	6.85	0	0	0	6.85	20	100	41,816	210,055.71
Gasoline	10^4t	0.02	0	0	0	0.02	18.9	100	43,070	596.95
Diesel	10^4t	31.9	0	0	0.76	32.66	20.2	100	42,652	1,031,759.27
Fuel oil	10^4t	627.22	0.3	0	0	627.52	21.1	100	41,816	20,301,304.48
LPG	10^4t	0	0	0	0	0	17.2	100	50,179	0.00
Refinery gas	10^4t	2.85	0	0	0	2.85	15.7	100	46,055	75,560.14
Natural gas	10^8m^3	0	0	0	0	0	15.3	100	38,931	0.00
Other petroleum products	10^4t	11.35	0	0	0	11.35	20	100	38,369	319,357.98
Net electricity import from the Central China Grid (MWh)						11,100				
Average emission factor of the Central China Grid (tCO_2e/MWh)						0.797442				
Total emission of CSPG (tCO_2e)						198,745,147.4				
Fossil power supply of CSPG (MWh)						208,736,900				

Data sources: China Energy Statistical Yearbook 2004 Edition

[35] If the unit of the fuel is 10^4 t, then $I=E\times F\times G\times H\times 44/12/10^4$; if the unit of the fuel is 10^8 m^3, then $I=E\times F\times G\times H\times 44/12/10^3$. The same about the calculation of I in Table A6 and Table A7.

Table A6. Calculation of simple OM emission factor of the 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 1000m^3) H	Emission (tCO_2e) I
Coal	10^4t	6,017.7	1,305	2,643.9	1751.28	11,717.88	25.8	100	20,908	231,767,573.55
Cleaned coal	10^4t	0.21	0	0	0	0.21	25.8	100	26,344	5,233.50
Other washed coal	10^4t	0	0	0	0	0	25.8	100	8,363	0.00
Coke	10^4t	0	0	0	0	0	29.2	100	28,435	0.00
Coke oven gas	10^8m^3	0	0	0	0	0	12.1	100	16,726	0.00
Other coal gas	10^8m^3	2.58	0	0	0	2.58	12.1	100	5,227	59,831.38
Crude oil	10^4t	16.89	0	0	0	16.89	20	100	41,816	517,932.98
Gasoline	10^4t	0	0	0	0	0	18.9	100	43,070	0.00
Diesel	10^4t	48.88	0	0	1.83	50.71	20.2	100	42,652	1,601,975.28
Fuel oil	10^4t	957.71	0	0	0	957.71	21.1	100	41,816	30,983,494.25
LPG	10^4t	0	0	0	0	0	17.2	100	50,179	0.00
Refinery gas	10^4t	2.86	0	0	0	2.86	15.7	100	46,055	75,825.26
Natural gas	10^8m^3	0.48	0	0	0	0.48	15.3	100	38,931	104,833.40
Other petroleum products	10^4t	1.66	0	0	0	1.66	20	100	38,369	46,707.86
Other energy	10^4tce	79.42	0	0	0	79.42	0	100	0	0.00
Net electricity import from the Central China Grid (MWh)						10,951,240				
Average emission factor of the Central China Grid (tCO_2e/MWh)						0.826448				
Total emission of CSPG (tCO_2e)						274,214,038				
Fossil power supply of CSPG (MWh)						258,317,469				

Data sources: China Energy Statistical Yearbook 2005 Edition

Table A7. Calculation of simple OM emission factor of the 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 1000m^3) H	Emission (tCO_2e) I
Raw Coal	10^4t	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	10^4t				0.15	0.15	25.8	100	26,344	3,738.21
Other washed coal	10^4t			10.39	33.88	44.27	25.8	100	8,363	350,237.59
Coke	10^4t	4.79			8.05	12.84	29.2	100	28,435	390,906.18
Coke oven gas	10^8m^3				0.79	0.79	12.1	100	16,726	58,624.07
Other coal gas	10^8m^3	1.87			15.96	17.83	12.1	100	5,227	413,485.84
Crude oil	10^4t	10.91				10.91	20	100	41,816	334,555.88
Gasoline	10^4t	0.68				0.68	18.9	100	43,070	20,296.31
Diesel	10^4t	31.96	2.02		1.81	35.79	20.2	100	42,652	1,130,638.84
Fuel oil	10^4t	887.21				887.21	21.1	100	41,816	28,702,703.26
LPG	10^4t					0	17.2	100	50,179	0.00
Refinery gas	10^4t	4.92				4.92	15.7	100	46,055	130,440.66
Natural gas	10^8m^3	0.93				0.93	15.3	100	38,931	203,114.71
Other petroleum products	10^4t	1.7				1.7	20	100	38,369	47,833.35
Other energy	10^4tce	104.66	133.15		59.72	297.53	0	100	0	0.00
Net electricity import from the Central China Grid (MWh)						96,363,000				
Average emission factor of the Central China Grid (tCO_2e/MWh)						0.771225				
Total emission of CSPG (tCO_2e)						369,546,731				
Fossil power supply of CSPG (MWh)						365,532,531				

Data sources: China Energy Statistical Yearbook 2006 Edition

The simple OM emission factor is weighted average value of simple OM emission factors of CSPG in 2002, 2003, 2004, as follows:

$$EF_{OM,y} = (369546731 + 274214038 + 198745147.4)/(365532531 + 258317469 + 208736900)$$

$$= 1.0119 \text{ tCO}_2\text{e/MWh}$$

2. Calculation of BM Emission Factor of CSPG

Table A8. The data of efficiency level of the best electricity generation technologies commercially available in China and the corresponding emission factors

	Parameter	Best efficiency of supplying electricity tce/MWh	Fuel emission factor (tc/TJ)	Oxidation rate	Emission factor (tCO_2e/MWh)
		A	B	C	D=3.6/A/1000*B *C*44/12
Coal-fired power plant	$EF_{Coal,Adv}$	0.3582	25.8	1	**0.9508**
Gas-fired power plant	$EF_{Gas,Adv}$	0.4767	15.3	1	**0.4237**
Oil-fired power plant	$EF_{Oil,Adv}$	0.4767	21.1	1	**0.5843**

Data sources: Notification on Determining Baseline Emission Factors of China Power Grid issued by Chinese DNA Table 1.4, Volume 2, "2006 IPCC Guidelines for National Greenhouse Gas Inventories"

Table A9. Data for calculating the thermal power emission factors

Energy	Unit	Guangdong A	Guangxi B	Guizhou C	Yunnan D	Total E=A+B+C+D	NCV (MJ/t or 1000m^3) F	Emission factor (tC/TJ) G	Oxidation Rate H	Emission (tCO_2e) I =E*F*G*H *44/12/100
Raw coal	10^4t	6,696.47	1,435	3,212.31	1,975.55	13,319.33	20,908	25.80	1	263,442,602
Cleaned coal	10^4t	0	0	0	0.15	0.15	26,344	25.80	1	3,738
Other washed coal	10^4t	0	0	10.39	33.88	44.27	8,363	25.8	1	350,238
Coke	10^4t	4.79	0	0	8.05	12.84	28,435	29.2	1	390,906
Sub-total										**264,187,484**
Crude oil	10^4t	10.91	0	0	0	10.91	41,816	20	1	334,556
Gasoline	10^4t	0.68	0	0	0	0.68	43,070	18.9	1	20,296
Diesel	10^4t	31.96	2.02	0	1.81	35.79	42,652	20.2	1	1,130,639
Fuel oil	10^4t	887.21	0	0	0	887.21	41,816	21.1	1	28,702,703
Other oil products	10^4t	1.7	0	0	0	1.7	38,369	20	1	47,833
Sub-total										**30,236,028**
Natural gas	10^7m^3	9.3	0	0	0	9.3	38,931	15.3	1	203,115
Coke oven gas	10^7m^3	0	0	0	7.9	7.9	16,726	12.1	1	58,624
Other coal gas	10^7m3	18.7	0	0	159.6	178.3	5,227	12.1	1	413,486
LPG	10^4t	0	0	0	0	0	50,179	17.2	1	0
Refinery gas	10^4t	4.92	0	0	0	4.92	46,055	15.7	1	130,440.6554
Sub-total										**805,665.2765**
Total										**2,952,29176.7**

Data sources: China Energy Statistical Yearbook 2006

Calculate with data provided in Table A8, A9 and formula (4) ~ (6), the value for

$\lambda_{Coal} = 89.48\%$,

$\lambda_{Oil} = 10.24\%$,

$\lambda_{Gas} = 0.28\%$,

Then $EF_{Thermal} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv}$

$= 0.9117$ tCO_2e/MWh

Table A10. Installed capacity of the CSPG in 2003

	Guangdong	Guangxi	Yunnan	Guizhou	Tianshengqiao	Total
Thermal power (MW)	27,231.4	3,190.1	3,556.8	6465.8	0	40,444.1
Hydro power (MW)	8,107.2	4,525.2	6,543.2	3713.7	2,520	25,409.3
Nuclear power (MW)	3780	0	0	0	0	3,780
Wind power and Other (MW)	83.4	0	0	0	0	83.4
Total (MW)	39,202	7,715.3	10,100	10,179.5	2520	69,716.8

Data source: China Electric Power Yearbook 2004.

Table A11. Installed capacity of the CSPG in 2004

	Guangdong	Guangxi	Yunnan	Guizhou	Total
Thermal power (MW)	30,172.9	4,378.1	4,306.9	7,801.8	46,659.7
Hydro power (MW)	8,584.6	5,040.4	7,058.6	6,896.5	27,580.1
Nuclear power (MW)	3,780	0	0	0	3,780
Wind power and Other (MW)	83.4	0	0	0	83.4
Total (MW)	42,621	9,418.5	11,365.5	14,698.3	78,103.3

Data source: China Electric Power Yearbook 2005.

Table A12. Installed capacity of the CSPG in 2005

	Guangdong	Guangxi	Yunnan	Guizhou	Total
Thermal power (MW)	35,182.6	4,931.2	4,758.4	9,634.8	54,507
Hydro power (MW)	9,035.7	6,085.3	7,993.1	7,233	30,347.1
Nuclear power (MW)	3780	0	0	0	3,780
Wind power and Other (MW)	83.4	0	0	0	83.4
Total (MW)	48,081.7	11,016.5	12,751.5	16,867.8	88,717.5

Data source: China Electric Power Yearbook 2006.

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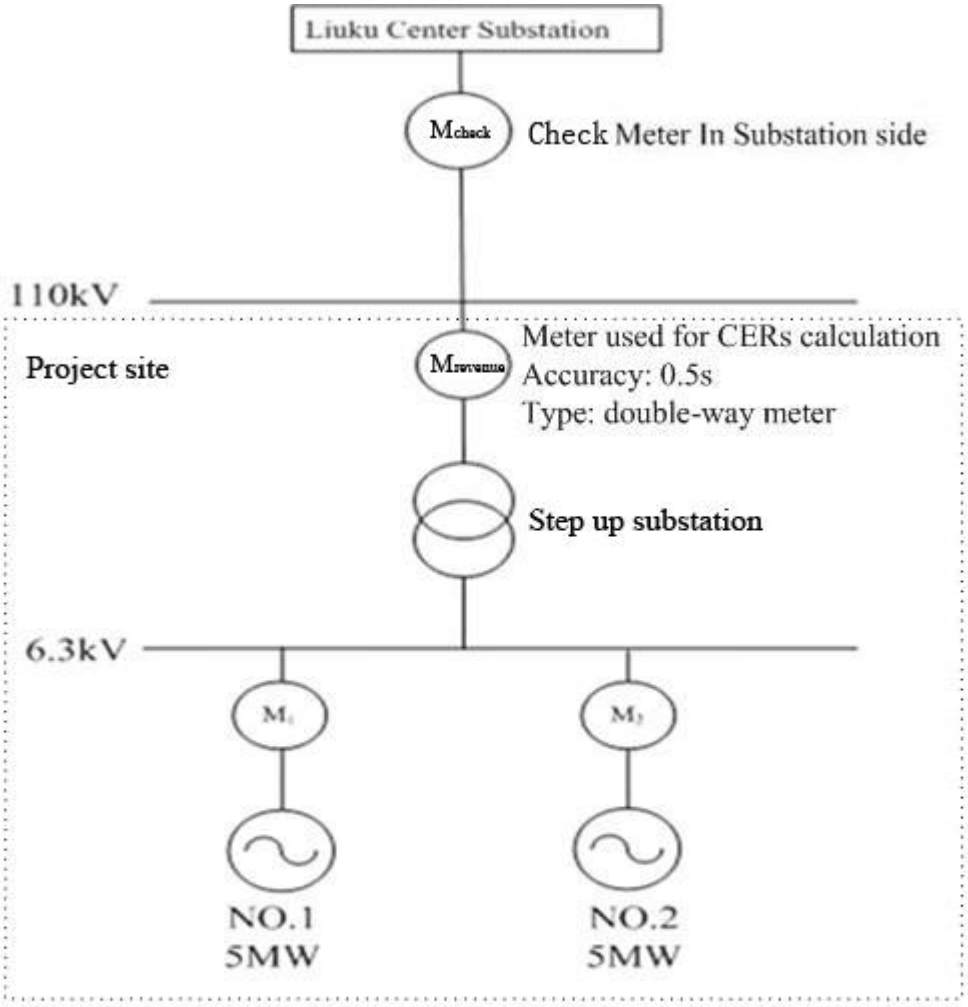
Table A13. Calculation of BM emission factor of the CSPG

	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	40,444.1	46,659.7	54,507	14,062.9	**74.01%**
Hydro power	25,409.3	27,580.1	30,347.1	4,937.8	25.99%
Nuclear power	3,780	3,780	3,780	0	0.00%
Wind power and Other	83.4	83.4	83.4	0	0.00%
Total	69716.8	78103.3	88717.5	19000.7	100.00%
Share in total installed capacity of 2005	78.58%	88.04%	100%		

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

Annex 4

MONITORING INFORMATION



As to the monitoring of the Project, the concerned meter is $M_{revenue}$ installed at the project site. M_{check} at the substation controlled and managed by the grid company is for QA/QC. Meters M_1 and M_2 are installed near the generators to measure electricity generation of each generators only, and they are also not involved in the CDM monitoring plan of the Project.

Please note that any external changes happened to the project will make the monitoring plan regulated accordingly for ensuring that the net electricity supplied to power grid by the project is true and creditable.