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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Project title: Sichuan Xiba Small Hydro Power Project
SSCPDD version: 4.0
Completion date: 04/01/2009

Revision history
Version 1.0: First draft for host country approval, 16/06/2008
Version 2.0: Revised, taking into account the *2008 Baseline Emission Factors for Regional Power Grids in China* for online stakeholder comment period, 28/07/2008
Version 3.0: Revised, taking into account the Draft Validation Report, 19/09/2008
Version 4.0: Revised for the Technical Review, 04/01/2009

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

>>
Sichuan Xiba Small Hydro Power Project ("the project") is a low-head power plant in the river channel. The project is located on the lower reach of Moxi River, Xiba Town, Wutongqiao District, Leshan City, Sichuan Province. The project is implemented by Leshan Kaiyuan Hydro Power Co., Ltd. The total installed capacity of the project activity will be 5MW (2×2.5MW). With an expected loadfactor of 8034h/y, the annual net electricity generation is expected to be 36,315MWh. The net generated electricity will be transmitted to the substation at the connection to the power grid, and then access to the Central China Power Grid (CCPG).

In the baseline scenario, the electricity would be supplied from grid-connected plant in CCPG. The CCPG is dominated by fossil fuel-fired power plants, and the estimated annual emission reductions from the project activity are 35,352tCO_2 on average during the first crediting period.

The project contributes to the local sustainable development in the following aspects:

1. Provide the clean electricity. The project can provide the clean electricity to the local residents and reduce the consumption of fossil fuel to achieve greenhouse gas (GHG) emission reductions.
2. Promote the local economic development. The project activity can provide several temporary employment opportunities during construction period and 15 permanent job positions in operation and maintenance during the operation period, which will increase the income of local residents.
3. Improve the local infrastructure. The project will improve electrical transmission capacity, as well as lead to improvement of the local roads, which will improve the living condition of the local residents.

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)
P.R. China (host)	Leshan Kaiyuan Hydro Power Co., Ltd	No
United Kingdom of Great Britain and Northern Ireland	Carbon Resource Management Ltd.	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.		

Both project participants are private entities.

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

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

A.4.1.1. Host Party(ies):

>>
People's Republic of China

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

>>
Sichuan Province

A.4.1.3. City/Town/Community etc:

>>
Leshan City, Wutongqiao District, Xiba Town

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 is located on the lower reach of the Moxi River in Xiba Town, Wutongqiao District, Leshan City, Sichuan Province. The coordinates of the powerhouse and dam are:

	longitude (E)	latitude (N)
Powerhouse	103°47'35”	29°22'31”
Dam	103°47'35”	29°22'32”

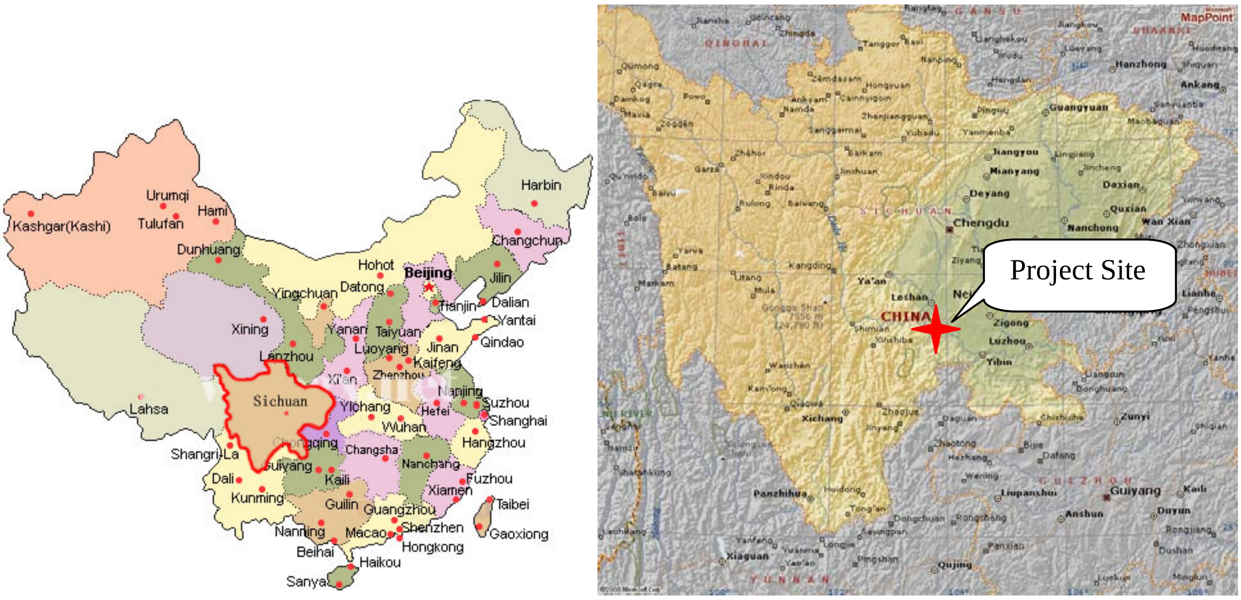

Figure 1 Project location

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

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Type: I. Renewable energy project

Category: I.D. Grid connected renewable electricity generation

The project is a low-head power plant with a total capacity of 5MW. The main structure includes a barrage and powerhouse. The barrage is a bulkhead sluice gate, to ensure the stability of the dam. The water pressure drives the turbines to rotate through diverting water from the intake water from the powerhouses, the turbines drive the generators to rotate, and thus the water energy is changed into electric energy. The electricity will be transmitted to the substation at the connection to the power grid by 35kV lines, and fed into the CCPG.

Staff of the project would be trained before the start of the construction of the station.

Table 1 Design features and characteristics of the project

	Parameter	**Value**
Barrage	Length (m)	112
	Width (m)	23
	Height (m)	16
	Gate number	7
Turbine*	Type	GD1250a—WP—300
	Single installed capacity (MW)	2.5
	Designed water head (m)	4.6
	Designed flow rate (m^3/s)	51
	Designed rotation speed (r/min)	136.4
	Manufactory	Guangdong Shaoguan Zongli Generating Equipment Co., Ltd
Generator*	Type	SFWG2005-44/3300

	Single installed capacity (MW)	2.5
	Designed voltage (kV)	6.3
	Manufactory	Guangdong Shaoguan Zongli Generating Equipment Co., Ltd

*Note: * The project activity involves the installations of 2 turbines and 2 generators.*

The technology adopted in the project activity is widely used has been proved to have no negative influence on environment. The technology is considered good practice in China. The main equipment is manufactured in the host country. No international technology is transferred from other countries to the project.

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

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Applying the proposed methodology, the project will achieve ex-ante estimated average annual emission reductions over the first seven-year renewable crediting period of 35,352tCO_2e, as shown in Table 2 below.

Table 2 Estimated amount of emission reductions in the first crediting period

Period	Annual estimation of emission reductions in tonnes of CO_2e
2009	35,352
2010	35,352
2011	35,352
2012	35,352
2013	35,352
2014	35,352
2015	35,352
Total estimated reductions (tonnes CO_2e)	247,464
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	35,352

Note: Using 12-monthly periods from the start of the crediting period, the start date of the crediting period is 01/09/2009.

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:

According to paragraph 2 of Appendix C to the Simplified Modalities and Procedures for Small-Scale CDM project activities, a small-scale project is considered a debundled component of a large project activity if there is a registered small-scale activity or an application to register another small-scale activity:

1. With the same project participants

2. In the same project category and technology
3. Registered within the previous two years
4. Whose project boundary is within 1 km of the project boundary of the proposed small scale activity

The project participants have not registered or applied to register a small-scale CDM project activity within 1 km of the project boundary of the proposed small-scale activity, in the same project category and technology. Therefore, the project activity is not considered a debundled component of a large-scale project activity.

SECTION B. Application of a baseline and monitoring methodology

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

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Approved baseline and monitoring methodology:
AMS-I.D.: Grid connected renewable electricity generation
Version 13 (Valid from 14 Dec 07 onwards)

Tools referenced in this methodology:
AM_Tool_07 "Tool to calculate the emission factor for an electricity system"
Version 01.1 (EB 35 Annex 12)

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

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This project activity comprises a renewable energy generation unit, i.e. hydro, that supplies electricity to and/or displace electricity from the regional power grid, i.e. CCPG, which is dominated by fossil fuel-fired power plants. The total installed capacity is 5MW, which is less than the maximum qualifying capacity of 15MW. Therefore, the simplified baseline methodology AMS-I.D is applicable to the project activity.

B.3. Description of the project boundary:

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The project boundary encompasses the physical, geographical site of the renewable generation source, as well as the project electricity system.

The generated electricity of the project will be delivered to CCPG[1], which, in line with the delineation by the DNA, include Jiangxi Province, Henan Province, Hubei Province, Hunan Province, Sichuan Province and Chongqing Municipality Power Grid.

[1] Chinese DNA, 2008 Baseline Emission Factors for Regional Power Grids in China, 30 December 2008.

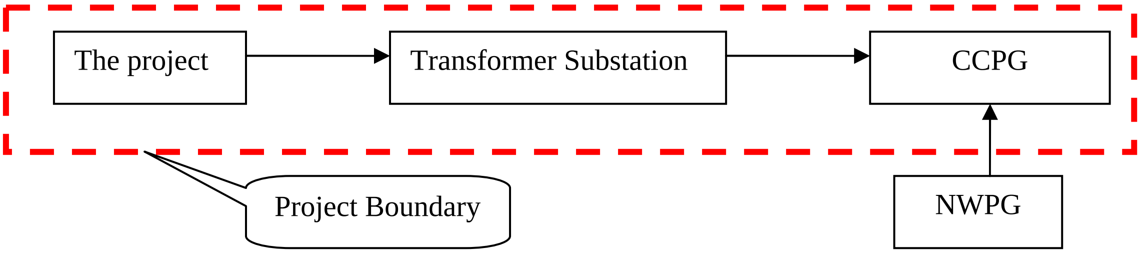

Figure 2 Flow diagram of the project boundary

B.4. Description of baseline and its development:

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The project activity is connected to the CCPG, which is dominated by fossil fuel-fired power plants. Therefore, following the methodology "the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO_2e/kWh) calculated in a transparent and conservative manner as: (a) a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the 'Tool to calculate the emission factor for an electricity system'. OR (b) The weighted average emissions (in kg CO_2e/kWh) of the current generation mix. The data of the year in which project generation occurs must be used."

Option (a) is chosen by the project participants, and the baseline is calculated in B.6 below using the 'Tool to calculate the emission factor for an electricity system'.

Table 3 Key parameters for determining baseline emissions

Variable	**Value**
EF_{OM}	1.2783 tCO_2e/MWh
EF_{BM}	0.6687 tCO_2e/MWh
EF	0.9735 tCO_2e/MWh
EG	36,315 MWh/y

Sources: See Section B.6.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

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Following attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities it can be demonstrated that the project activity is additional as it faces at least one of the following barriers:

a) Investment barrier
b) Technical barrier
c) Barrier due to prevailing practice
d) Other barriers

It is shown here that the project activity faces an investment barrier as there is a financially more viable alternative to the project activity which would have led to higher emissions. This is shown by using a benchmark analysis, rather than a comparison with a direct alternative, as the alternative baseline scenario is the generation of electricity by the grid.

Determination of the benchmark

Following the EB guidance on the assessment of investment analysis[2], if the alternative to the project activity is the supply of electricity from the grid, this is not considered an investment and a benchmark approach is considered appropriate. As the baseline alternative involves the continuation of current practices, supply of electricity from the grid, a benchmark analysis is used to identify whether the project is economically attractive. The use of a benchmark analysis is also in line with Chinese practice and is followed in the FSR.

According to the *Economic Evaluation Code for Small Hydropower Projects*[3] (SL16-95), approved by Ministry of Water Resources, the financial benchmark rate of return (after tax) for Chinese small hydropower projects is 10%. This benchmark is widely used in China's small hydro sector. A project will be financially viable when the IRR of total investment is better than the benchmark IRR of 10%.

Investment analysis

The Supplementary Preliminary Design Report (SPDR) is completed by the Sichuan University Engineering Research Institute (Certificate No. 221047, Grade B) which is an independent third party authorized by the Ministry of Construction of the People's Republic of China. The SPDR forms the basis for the decision of the project investment, includes an investment analysis and calculates the project IRR and compares the outcome to the 10% benchmark. The key assumptions of the investment analysis for the project activity as used in the SPDR are summarised in Table 4.

Table 4 Basic parameters for calculation of financial indicators of the project

Project	Unit	Value
Installed Capacity	MW	5
Total Investment	Million Yuan	59.8565
Net Power Generation	MWh	36,315
Expected operational lifetime	Years	20
Electricity Price (incl. VAT)	Yuan/kWh	0.25
Value Added Tax	/	6%
Urban Construction & Maintenance Tax	/	5%
Additional Education Fees	/	3%
Income Tax Rate	/	33%
Lifetime	Year	20

[2] Paragraph 15, 'Guidance on the Assessment of Investment Analysis' (version 02), EB 41 Annex 45

[3] http://apps.lib.whu.edu.cn/12/test/gfbz/2/j/xsdpj.html
Small hydropower projects in China are defined as those projects with installed capacity below 25MW, the benchmark IRR of which is 10%.

The project IRR is calculated using above key parameters, with the results for the project activity with and without registration as a CDM project presented in Table 5.

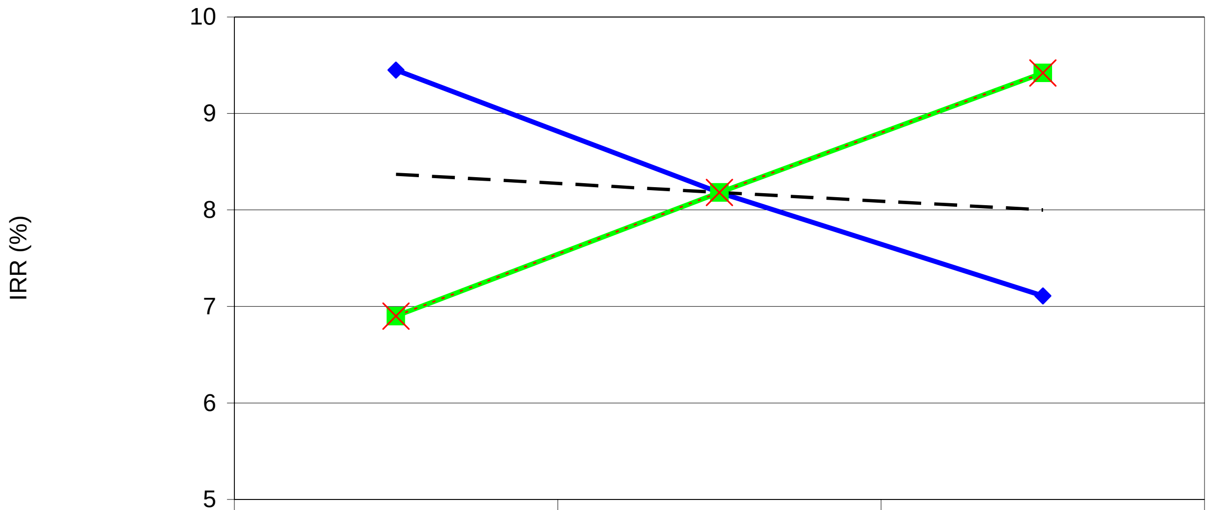
Table 5 Calculated project IRR and benchmark

	Benchmark	Without CER revenue	With CER revenue
IRR	10%	8.18%	14.28%

The investment analysis, therefore, shows that the project activity is not financially viable as compared to the benchmark without registering as a CDM project, while the potential CER revenues would make the project attractive.

Sensitivity analysis

The investment analysis is completed with a sensitivity analysis, confirming the credibility of the results obtained, for possible variations in the key parameters. Using a 10% variation in the main variables as mandated in the guidelines for completion of the FSR, and in line with the guidance from the EB, the results of the sensitivity analysis are shown in Figure 2 below.



	-10%	0%	10%
Investment	9.45	8.18	7.11
Tariff	6.90	8.18	9.42
Generation	6.90	8.18	9.42
O & M	8.37	8.18	8.00

Variation

Figure 3 Sensitivity analysis for the proposed project activity

The sensitivity analysis for the project activity confirms that, for all reasonable variations in the total investment level, the electricity feed-in tariff, generation and O & M costs, the project IRR would remain below the benchmark 10% without CER revues.

(1) Total investment
According to the data published by the National Bureau of Statistics of China in 2006[4] below, it indicates that there is an increasing trend of the Ex-Factory Price Indices of Industrial Products from 1998 to 2005.

Table 6 Ex-Factory Price Indices of Industrial Products

year=100)

Item	1998	1999	2000	2001	2002	2003	2004	2005
Total Industry Products	**95.9**	**97.6**	**102.8**	**98.7**	**97.8**	**102.3**	**106.1**	**104.9**
Means of Production	**95.4**	**98.3**	**105.1**	**98.8**	**97.7**	**103.6**	**107.8**	**106.8**
Mining & Quarrying Industry	98.4	104.5	124.9	100.1	101.9	113.3	118.8	125.8
Raw Materials Industry	93.4	98.2	108.4	99.7	98.0	106.7	110.2	109.8
Manufacturing Industry	96.8	97.1	98.6	98.1	96.9	100.2	104.8	102.2
Consumer Goods	**96.9**	**96.4**	**97.8**	**98.5**	**97.9**	**98.9**	**101.2**	**99.8**
Food	98.9	97.4	96.0	100.5	99.7	100.9	105.2	100.9
Clothing	96.2	96.1	100.6	99.0	98.8	99.8	100.9	100.8
Articles for Daily Use	96.7	96.0	98.0	98.3	97.9	99.5	101.9	101.9
Durable Consumer Goods	94.0	95.6	96.4	95.3	94.7	95.6	96.2	96.8

According to the statistics published by National Development of Reform Commission in China, the means of production increased by 3.5% in 2006[5], and the intending increase scale in 2007 is 2%~3%[6]. So the total investment of the project is impossible to decrease to 13.8%.

(2) Electricity tariff
The tariff was agreed and fixed in the approval of tariff authorized by the power grid company on May 8, 2006[7], therefore, it is not possible that the tariff increases. The tariff would need to increase by 14.8% in order for the IRR to reach the benchmark, which is not possible.

(3) Electricity generation
The estimate of the generation is high, with a load factor of 91.7%, based on accurate and long-term water flow studies. It is not likely that the load factor would be higher with the operation of the plant reliant on variable rainfall, as shown in the SPDR. It is not actually possible for the load factor to be 10% higher, as that would increase the load factor to above 100%. The power generation would need to increase by 14.8% in order for the IRR to reach the benchmark, which is not possible.

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[4] National Bureau of Statistics of China , Ex-Factory Price Indices of Industrial Products in 2006

http://www.stats.gov.cn/tjsj/ndsj/2006/html/I0913C.HTM

[5] National Development of Reform Commission in China, statistics about means of production in 2006, January 16, 2007

http://news.xinhuanet.com/fortune/2007-01/16/content_5614461.htm

[6] National Development of Reform Commission in China, intending increase scale of means of production in 2007, January 16, 2007

http://news.xinhuanet.com/fortune/2007-01/16/content_5613480.htm

[7] Leshan Grid Co., Ltd, Approval of tariff (Lediansihan [2006] No.13), May 8, 2006

(4) O & M costs
Even when the O & M costs reduces to zero, the IRR can not hit the benchmark. The O & M costs mainly include the salary, welfare, insurance and housing fund, repair cost, reservoir region maintenance fee, water resources fee and other fees. Therefore, it is unlikely for the O & M costs to reduce to zero. It also indicates the annual O & M costs are not considered sensitive.

Prior to the start of the project activity, the CDM was considered in the SPDR, which is completed by an independent third party.

CDM consideration

The FSR of the project was completed in July 2004[8] and the PDR of the project was completed in October 2005[9] and approved in March 2006[10]. In May 2006[11], the tariff approved by the Leshan Grid Co., Ltd was 0.25 yuan/kWh, which was lower than the estimated electricity tariff of 0.292 yuan/kWh in the PDR. Therefore, a Supplementary PDR was proposed to make a more precisely assessment of the financial feasibility. Based on the effective tariff and the materials price standards, the IRR of the project was only 8.18%, which was lower than the benchmark IRR of 10%. At the beginning of May 2007, the project owner knew about CDM according to the news of the successful registration of Chongqing Yutan Hydro Power Project[12], and then a Board Meeting was held to discuss the further plan of the project and the feasibility of the CDM application[13]. Based on the carbon price of the similar projects and the emission reduction factor published by Chinese DNA on December 15, 2006, the IRR would increase by 5.8%, which indicated a great improvement on the financial feasibility. Thus, the CDM had been considered in the SPDR in June 2007[14] and approved in July 2007[15]. On July 20, 2007, the second Board Meeting on CDM application was held, the special people were appointed to take responsibilities to investigate and negotiate the relevant affairs[16]. After a short negotiation, the project owner signed the Emission Purchase Term Sheet with CRM at the end of July[17]. In order to avoid the loss made by the continue increasing of the equipment price, the project owner signed the main equipments purchase agreement on August 6, 2007[18], which is considered the start date of the project activity according to the glossary of CDM terms. In November 2007, the construction of project was permitted by the

[8] SinoHydro Engineering Bureay 7th Conservancy Design Institute, Feasibility Study Report of Leshan Xiba Hydro Power Project, July 2004
The SinoHydro Engineering Bureay 7th Conservancy Design Institute is an independent third party authorized by the Construction Ministry of China in Nov 2002 (No.221043, Grade: B).
[9] SinoHydro Engineering Bureay 7th Conservancy Design Institute, Preliminary Design Report of Leshan Xiba Hydro Power Project, October 2005.
[10] Leshan Development and Reform Committee & Leshan Water Resource Bureau, Approval of the Preliminary Design Report of Leshan Xiba Hydro Power Project (Lefagaijiaoneng[2006] No.110), March 20, 2006.
[11] Leshan Grid Co., Ltd, Approval of tariff(Lediansihan [2006] No.13), May 8, 2006
[12] Registration News of Chongqing Yutan Hydro Power Project, May 8, 2007
http://cdm.ccchina.gov.cn/web/NewsInfo.asp?NewsId=1666 (Chinese version)
http://cdm.ccchina.gov.cn/english/NewsInfo.asp?NewsId=1665 (English version)
[13] Board Meeting Report (Kaiyuan[2007]No.012), May 26, 2007
[14] Sichuan University Engineering Design Institute, Supplementary Preliminary Design Report of Leshan Xiba Hydro Power Project, June 2007
[15] Leshan Development and Reform Committee & Leshan Water Resource Bureau, Approval of the Supplementary Preliminary Design Report of Leshan Xiba Hydro Power Project (Lefagaijiaoneng[2007] No.456), July 6, 2007.
[16] Board Meeting Report (Kaiyuan[2007]No.021), July 20, 2007

[17] Emission Purchase Term Sheet, July 31, 2007
[18] Main Equipments Purchase Agreement, August 6, 2007

Government[19] and the construction started in December 2007. The ERPA of the project was signed between buyer and seller on February 26, 2008 after a series of negotiations and site interview.

CDM consideration timeline

Time	Event
July 2004	FSR
October 2005	PDR
March 20, 2006	Approval of PDR
May 8, 2006	Approval of tariff
May 26, 2007	Board Meeting Report on the CDM consideration
June 2007	Supplementary PDR
July 6, 2007	Approval of the Supplementary PDR
July 20, 2007	Board Meeting Report on the establishment of CDM work group
July 31, 2007	Emission Purchase Term Sheet
August 6, 2007	Equipment Purchase Agreement
November 1, 2007	Construction permission granted

In conclusion, the project is additional and the CDM was seriously considered before the construction of the project.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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Baseline emissions (BEy)

Following the methodology, the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO_2e/kWh) calculated in a transparent and conservative manner as: (a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the 'Tool to calculate the emission factor for an electricity system'. Or (b) The weighted average emissions (in kg CO_2e/kWh) of the current generation mix. The data of the year in which project generation occurs must be used.

As stated in section B.4, the project participants have chosen option (a), the combined margin approach. This means that the baseline emissions are calculated as follows:

*BEy = EGy * EFy*

Where:
BEy is the baseline emissions in year y
EGy is the electricity produced by the project in year y
EFy is the combined margin emission coefficient calculated using the 'Tool to calculate the emission factor for an electricity system'

Using the 'Tool to calculate the emission factor for an electricity system' EF_y is calculated in the

[19] Leshan Development and Reform Committee, Approval of the construction permission of Leshan Xiba Hydro Power Project (Lefagainengjiao [2007] No.729), November 1, 2007

following 6 steps:

1. Identify the relevant electric power system.
2. Select an operating margin (OM) method.
3. Calculate the operating margin emission factor according to the selected method.
4. Identify the cohort of power units to be included in the build margin (BM).
5. Calculate the build margin emission factor.
6. Calculate the combined margin (CM) emissions factor.

Details of the calculations and data follow the published data from the Chinese DNA, and are also given in Annex 3 of the PDD.

STEP 1. Identify the relevant electric power system.

The power generated from the proposed project activity will be supplied to the grid. Following the delineation of Chinese DNA, the project electricity system is the Central China Power Grid (CCPG), which includes Jiangxi Province, Henan Province, Hubei Province, Hunan Province, Sichuan Province and Chongqing Municipality Power Grid.

There is no electricity import from other power grids to CCPG from 2002 to 2005. In 2006, the CCPG imports some electricity from the Northwestern China Power Grid (hereinafter as to NWPG), 3,028,950MWh. Electricity imports are taken into consideration in calculating the emission factor, using the average emission factor from the exporting grid. Electricity exports from CCPG are not subtracted from electricity generation data used for the calculations of the emission factor.

All the data and information mentioned above are derived from *2008 Baseline Emission Factors for Regional Power Grids in China* published by Chinese DNA on December 30, 2008[20].

STEP 2. Select an operating margin (OM) method.

According to the tool, four various methods are provided for calculating the operating margin emission factor ($EF_{OM,y}$), including:

a) Simple OM;
b) Simple Adjusted OM;
c) Dispatch data analysis OM;
d) Average OM

The Simple OM method can be used where low-cost/must-run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term normal data for hydroelectricity production. Low-cost/must-run resources do indeed constitute less than 50% of CCPG during 2003 to 2007 (see Annex 3), so, following the publication of the EF by the Chinese DNA, the project participants have chosen to use the Simple OM method (option a) for calculating the operating margin emission factor.

The Simple OM can be calculated using either of the two following data vintages for years(s) y:

[20] Chinese DNA, 2008 Baseline Emission Factors for Regional Power Grids in China, 30 December 2008.

- (ex-ante option) the full generation-weighted average for the most recent 3 years for which data are available at the time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period if or,
- (ex-post option) the year in which project generation occurs, if $EF_{OM,y}$ is updated based on ex-post monitoring.

The project participants choose the ex-ante option, fixing the emission factor in the PDD for the first crediting period. The three most recent years for which data is available are 2005-2007.

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

The Simple OM emission factor $EF_{OM,y}$ is defined as the generation-weighted average emissions per unit net electricity generation (in tCO_2/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants. Three options can be selected to calculate the Simple OM:

A. Based on data on fuel consumption and net electricity generation of each power plant / unit; or
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
C. Based on data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

Option C can be used if the necessary data for using options A and B is not available, and if only nuclear and renewable power generation are considered low-cost/must-run sources. Data for using options A and B is not available. And nuclear and renewables are considered the only low-cost/must-run power generation sources. Therefore, option C is chosen to calculate the OM emission factor.

For Option C, 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:

$$EF_{OM,y} = \sum_i (FC_{i\,y} \times NCV_{i\,y} \times EF_{CO2,i,y}) / EG_y$$

Where

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

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

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

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

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

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

y = (Using the ex-ante option) The three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation

On the basis of the data available, the three-year generation-weighted average operating margin emission factor is calculated by the DNA (see Annex 3) as:

EF_{OM} = 1.2783 tCO_2/MWh

STEP 4. Identify the cohort of power units to be included in the build margin (BM).

According to tool, the sample group of power units m used to calculate the build margin consists of the set of power units that comprise the larger annual generation 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.[21]

The set of power units as identified by option (b) would comprise the larger annual generation and is therefore chosen.

However, due to the limited publicly available data, it is not possible to identify the exact new-built plants which comprise the 20% of the system generation. Therefore, the project participants follow the method of calculations of the Chinese DNA, which uses the deviation accepted by EB to calculate EF_{BM}[22]: Using the latest statistical data available (from the China Power Yearbook), the most recent year from which the added generation capacity is equal to or just exceeds 20% of the latest year is determined. This added generation capacity is the sample group of power units m used to calculate the build margin.

In terms of vintage of data, the project participants can choose between ex-ante and ex-post data vintages. The project participants choose the ex-ante option, fixing the emission factor in the PDD for the first crediting period:

o 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.

STEP 5. Calculate the build margin emission factor (EF_{BM})

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

$$EF_{BM,y} = \sum_m (EG_{m,y} \times EF_{EL,m,y}) / \sum_m EG_{m,y}$$

Where

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

$EG_{m,y}$ = Net 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 data is available

The CO_2 emission factor of each power unit m ($EF_{EL,m,y}$) should be determined as per the guidance in

[21] If 20% falls on part capacity of a unit, that unit is fully included in the calculation.

[22] http://cdm.unfccc.int/Projects/Deviations: Application of approved methodology AM0005 (DNV, 07 Oct 05).

step 3 (a) for the Simple OM, using options B1, B2 or B3, using for y the most recent historical year for which power generation data is available, and using for m the power units included in the build margin. However, data on fuel consumption, fuel types and electricity generation from each of the units m is not available. Therefore, following the calculations of the Chinese DNA, the deviation mentioned above is used, which applies option B2 on an aggregate basis rather than for each power unit.

On the basis of the data available, the build margin emission factor is calculated by the DNA (see Annex 3) as:

EF_{BM} = 0.6687 tCO_2/MWh

STEP 6. Calculate the combined margin emissions factor (EF)

The combined margin emission factor is calculated as follows:

$$EF_y = w_{OM} \times EF_{OM,y} + w_{BM} \times EF_{BM,y}$$

Where
w_{OM} = Weighting of operating margin emissions factor (%)
$EF_{OM,y}$ = Operating margin CO_2 emission factor in year y (tCO_2/MWh)
w_{BM} = Weighting of build margin emissions factor (%)
$EF_{BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)

For hydro projects the default weights w_{OM} and w_{BM} are 50%.

With both EF_{OM} and EF_{BM} fixed in this PDD for the first crediting period, EF is also fixed for the first crediting period. The emission factor will be revised at the renewal of the crediting period.

EF = 0.9735 tCO_2/MWh

Having determined the combined margin emission fact, the baseline emissions (BE_y) can now be calculated as the emission factor multiplied by the annual net generation of the project as described above.

Leakage emissions (L_y)

As a Greenfield project, the energy generating equipment is not transferred from another activity, nor is existing equipment transferred to another activity. Therefore, in accordance with the methodology, leakage is not considered, i.e. leakage is zero.

$$L_y = 0$$

Emission reductions (ER_y)

Emission reductions are calculated as the baseline emissions minus project and leakage emissions. With leakage emissions equal to zero, emission reductions therefore are equivalent to the baseline emissions, as follows:

$$ER_y = BE_y - L_y = BE_y - 0$$

Therefore:

$ER_y = BE_y = EG_y \times EF_y$

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

Data / Parameter:	NCV_i
Data unit:	kJ/kg or kJ/m^3
Description:	The net calorific value (energy content) per mass or volume unit of fuel i
Source of data used:	China Energy Statistical Yearbook 2007
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied:	Data used are from Chinese authorities
Any comment:	Used for calculation of power grid emission factor

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

Data / Parameter:	$FC_{i,y}$
Data unit:	Tonnes or m^3
Description:	The quantity of fuel i (in a mass or volume unit) consumed by power plants in year(s) y
Source of data used:	China Energy Statistical Yearbook 2005-2007
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied:	Data used are from Chinese authorities
Any comment:	Used for calculation of power grid emission factor

Data / Parameter:	$EG_{,y}$

Data unit:	MWh
Description:	The gross electricity generated in province j in year y
Source of data used:	China Electric Power Yearbook 2005-2007
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied:	Data used are from Chinese authorities
Any comment:	Used for calculation of power grid emission factor

Data / Parameter:	Internal power use rate of power plant
Data unit:	%
Description:	The internal power consumption rate of power plants in province j in year y
Source of data used:	China Electric Power Yearbook 2005-2007
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied:	Data used are from Chinese authorities
Any comment:	Used for calculation of power grid emission factor

Data / Parameter:	$EF_{CO2,i}$
Data unit:	tCO_2/TJ
Description:	The CO2 emission factor per unit of fuel i
Source of data used:	Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods and procedures actually applied:	IPCC default value officially adopted in the DNA's calculation
Any comment:	Used for calculation of power grid emission factor

Data / Parameter:	$CAP_{i,j,y}$
Data unit:	MW
Description:	Installed capacities of power plant category i of province j in years y
Source of data used:	China Electric Power Yearbook 2003-2007
Value applied:	See Annex 3 for details
Justification of the choice of data or description of measurement methods	Data used are from Chinese authorities

and procedures actually applied:	
Any comment:	Used for calculation of power grid emission factor

Data / Parameter:	$EF_{coal,bat}$
Data unit:	
Description:	The power supply efficiency of coal-fired power plants with best commercially available technology
Source of data used:	Chinese DNA's Guideline of emission factors of Chinese grids
Value applied:	37. 28%
Justification of the choice of data or description of measurement methods and procedures actually applied:	Data used are from Chinese authorities
Any comment:	Used for calculation of power grid emission factor

Data / Parameter:	$EF_{oil,bat}$
Data unit:	
Description:	The power supply efficiency of oil-fired power plants with best commercially available technologies
Source of data used:	Chinese DNA's Guideline of emission factors of Chinese grids
Value applied:	48.81%
Justification of the choice of data or description of measurement methods and procedures actually applied:	Data used are from Chinese authorities
Any comment:	Used for calculation of power grid emission factor

Data / Parameter:	$EF_{gas,bat}$
Data unit:	
Description:	The power supply efficiency of gas-fired power plants with best commercially available technologies
Source of data used:	Chinese DNA's Guideline of emission factors of Chinese grids
Value applied:	48.81%
Justification of the choice of data or description of measurement methods and procedures actually applied:	Data used are from Chinese authorities
Any comment:	Used for calculation of power grid emission factor

Data / Parameter:	$Import_{NWPG,y}$

Data unit:	MWh
Description:	The electricity import from NWPG in year y
Source of data used:	China Electric Power Yearbook 2005-2007
Value applied:	2004: 0 2005: 0 2006: 3,028,950 (see Annex 3 for details)
Justification of the choice of data or description of measurement methods and procedures actually applied:	Data used are from Chinese authorities
Any comment:	Used for calculation of power grid emission factor due to imports to CCPG

Data / Parameter:	$EF_{average\_NWPG,y}$
Data unit:	tCO_2e/MWh
Description:	Average grid emission factor for NWPG in year y
Source of data used:	Chinese DNA's Guideline of emission factors of Chinese grids
Value applied:	2004: not applicable/no imports 2005: not applicable/no imports 2006: 0.8221 (see Annex 3 for details)
Justification of the choice of data or description of measurement methods and procedures actually applied:	Data used are from Chinese authorities
Any comment:	Used for calculation of power grid emission factor due to imports to CCPG

B.6.3 Ex-ante calculation of emission reductions:

>>

As described above, the Emission Reductions (ER_y in tCO_2) for each year y are calculated by multiplying the baseline emissions factor (EF_y in tCO_2/MWh) by the net supplied power of the project (EGy in MWh). With the net generation estimated to be 36,315 MWh/y once fully operational, the reductions can be calculated as follows:

$$ER_y = EG_y \times EF_y = 36,315\ MWh/y \times 0.9735\ tCO_2e/MWh = 35,352\ tCO_2e/y$$

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

>>

Table 7 Ex-ante estimation of the emissions and reductions

Period	Estimation of the project activity emissions (tCO_2e)	Estimation of the baseline emissions (tCO_2e)	Estimation of leakage (tCO_2e)	Estimation of overall emission reductions (tCO_2e)
2009	0	35,352	0	35,352
2010	0	35,352	0	35,352
2011	0	35,352	0	35,352
2012	0	35,352	0	35,352
2013	0	35,352	0	35,352
2014	0	35,352	0	35,352
2015	0	35,352	0	35,352
Total (tCO_2e)	0	247,464	0	247,464

Note: Using 12-monthly periods from the start of the crediting period, the start date of the crediting period is 01/09/2009.

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

B.7.1 Data and parameters monitored:

Data / Parameter:	EG_y
Data unit:	MWh
Description:	Net generated electricity delivered to CCPG in period y
Source of data to be used:	Calculated from $EG_{export, y}$ and $EG_{import, y}$
Value of data:	36,315 MWh/y once fully operational (Source: Supplementary Preliminary Design Report)
Description of measurement methods and procedures to be applied:	$EG_y = EG_{export, y} – EG_{import, y}$
QA/QC procedures to be applied:	Cross-checked with invoices and sales receipts
Any comment:	Used for electricity supply invoices and emission reduction calculations

Data / Parameter:	$EG_{export, y}$
Data unit:	MWh
Description:	Generated electricity export to CCPG in period y
Source of data to be used:	Electricity meter at the connection point to CCPG
Value of data	36,315 MWh/y once fully operational (Source: Supplementary Preliminary Design Report)
Description of measurement methods and procedures to be applied:	The data is measured hourly through a bi-directional meter (main meter) with an accuracy of 0.5s.
QA/QC procedures to be applied:	1) The data from the main and back-up meters are checked before the data is recorded and send to the grid company for the purpose of invoicing and emission calculations.

	2) Data is checked against invoices and sales receipts before the preparation of the monitoring report. 3) Main and back-up meters are maintained and calibrated according to industry standards by a qualified organization periodically.
Any comment:	

Data / Parameter:	$EG_{import, y}$
Data unit:	MWh
Description:	Electricity import from CCPG to the project in period y
Source of data to be used:	Electricity meter at the connection point to CCPG
Value of data	Supposed to be Zero (Source: Supplementary Preliminary Design Report)
Description of measurement methods and procedures to be applied:	The data is measured hourly through a bi-directional meter (main meter) with an accuracy of 0.5s.
QA/QC procedures to be applied:	1) The data from the main and back-up meters are cross-checked before the data is recorded and send to the grid company for the purpose of invoicing and emission calculations. 2) Data is cross-checked against invoices and sales receipts before the preparation of the monitoring report. 3) Main and back-up meters are maintained and calibrated according to industry standards by a qualified organization periodically.
Any comment:	

B.7.2 Description of the monitoring plan:

>>

1. Monitoring subject

The data required for the calculation of emission reductions are the export electricity supply to the power grid and the import electricity supply from the power grid, as described in B.7.1 above, the difference of which is the net electricity generation. Therefore the CDM monitoring follows the standard procedures for the grid-connected operation of the project.

2. Monitoring management structure

Following the standard procedures for the operation of the plant, the management structure ensures efficient and effective monitoring of all required data for the emission reduction calculations. Figure 3 below shows the management structure for the project. In addition to the normal structure, the developer has added a CDM Monitoring Director to take charge of supervising the measuring and recording tasks, such as collecting data (meter readings, sale receipts), calculating emission reductions and preparing monitoring report etc. specifically for CDM purposes.

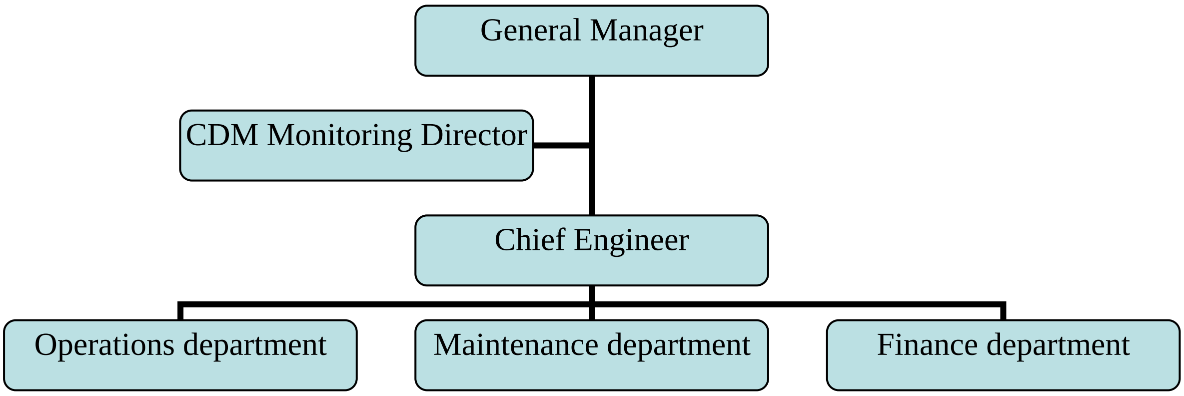

Figure 4 Operational and management structure

The main responsibility of each apartment:

General Manager: Overall responsibility.

CDM Monitoring Director: Cross-check data and submit the monitoring reports and data to DOE; liaise with DOE and CDM consultants.

Chief Engineer: Check electricity generation and consumption data and issuance of invoices to the grid company.

Operation department: Ensure effective operation of the turbines and generators; record, report and store electricity monitoring data.

Maintenance department: Maintain the facilities and tools of the hydropower station, taking charge of the hardware and software of the computer monitor system, ensuring the turbines and generators work in order; ensure timely calibrations of equipment.

Finance department: Set up and operate the financial system according to the regulations; calculate and validate the capital management and implement measures, record the increase and decrease status of the capital flow; cross-check invoices and sales receipts.

Training

The project owner will organize training for all the related staff. The training programme contains CDM knowledge, the operational regulations, the quality control (QC) standard flows, the data recording requirements and the management rules.

3. Monitoring apparatus and installation:

A main meter and a back-up meter will be installed at the transformer station where the project is connected to the grid. Each of these meters are bi-directional meters, recording exports and imports. The electricity meters will be installed according to Technology & Management Regulations for Power Metering Devices (DL/T448-2000). The accuracy of the meters is 0.5s. The meters will be examined and accepted by the project owner and the grid before the project is put into operation.

4. Quality control

Calibration

The calibration of meters is conducted by a qualified organization and must comply with national standard and sectional regulations to ensure the accuracy. The meters are owned and operated by the grid company, and not under the direct control of the project participant. However, the meters will be calibrated, in line with the requirements in the agreement with the grid company, so that the meters will always have a valid calibration certificate. The meters are sealed after calibration. The calibration records are archived with all other monitoring records and are available to the DOE.

When errors are detected in either the main or back-up meter, the project owner and grid company are informed and a qualified calibration organisation is employed to check, calibrate, test and repair the meter so as to restore accurate metering as soon as possible.

5. Data management

All monitoring data and records will be archived in electronic format as well as on paper. The project developer will also keep copies of sale receipts and prepare a monitoring report at the end of each year, which includes the net electricity generation, the monitoring data summary, the calibration records, and the emission reductions calculation.

All the electronic and paper documents will be archived during the crediting period plus two years.

6. Training program

The project developer will train all related staff before the start of the crediting period. The training contains CDM knowledge, operational regulations, quality control (QC), data monitoring requirements and data management regulations, etc.

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

>>

Date of completion of the application of the methodology: 04/01/2009

Name of the entity responsible: Carbon Resource Management (see Annex 1 for address)

Contact persons

- (China) Ms Zhu Qiyan, Mr Shi Xiangfeng and Ms Qian Yiwen (zqy@carbonresource.com)
- (UK) Mr Christiaan Vrolijk (cv@carbonresource.com)

Carbon Resource Management is a project participant.

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

>>

06/08/2007 (Date of the Equipment Purchase Agreement)

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

>>
20years (from commissioning)

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:

>>
01/09/2009 (or the registration date, whichever is later)

C.2.1.2. Length of the first crediting period:

>>
7y-0m

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
Not chosen

C.2.2.2. Length:

>>
Not chosen

SECTION D. Environmental impacts

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

>>
Leshan Environmental Science Research Center prepared the Environment Impact Assessment of the project. The project received approval from Leshan Environment Protection Bureau, stating: "The project should implement appropriate treatment measures to ensure that pollutants can be discharged in accordance with the national standard. The construction of the project is approved."

Table 7 Summary of the findings of the EIA report

Impacts	Assessment of environmental impacts	Environmental protection measures
Construction period		

Water quality	Waste water will come from the sewage and waste water from construction. Sewage will not be directly discharged into the river, but will be treated. The waste water from construction could lead to a high concentration of suspended solids and oil in the water; the PH value of the water is also likely to increase without treatment.	o Set up the sedimentation pool in constructing site; o Set up a special washing district to dispose waste oil; o Sewage will be treated and used as fertilizer by nearby farmers.
Air quality	Dust is likely to originate from the construction area, including the concrete mixer, drilling and transportation area.	o Sprinkle water in the construction area to prevent dust.
Noise	The impact of noise from the construction and transportation is minor because there are few people living nearby other than the workers for the project activity.	o Forbid the trucks' whistling loudly. o Adopt low-noise technology.
Human health	Due to the additional workers, there will be an increase in garbage and sewage. The living conditions and health & epidemic prevention measures may not be perfect at the construction site, so diseases can spread if the workers do not care about their diet and living habits.	o Set up a health & epidemic prevention institute, register and regularly check the health conditions of the workers, provide medicine for the workers. o Appoint special people to take charge of the sanitation of the construction site to ensure the water safety.
Ecosystem	There will be little impact on the area's ecosystem and the natural sight. However, the construction may cause some water & soil loss.	o Proper measurement should be adopted to recover the vegetation and prevent water & soil loss.
Operation period		
Ecosystem	1. The area's ecosystem will not be influenced during the operation period. 2. The biomass and quantity of the plankton will be increased.	o There is little negative impact on the ecosystem.

Therefore, there will be no negative impact on the environment during the operation period.

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 proposed project activity will not bring significant impacts on the environment.

SECTION E. Stakeholders' comments

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

>>

In June 2007, the project developer explained the proposals and consulted the stakeholders regarding their opinions and ideas about the proposed project. The stakeholders of the project include local residents, and village leaders, and those who are involved in the project activity in different roles and at different stages.

The project developer has sent out a questionnaire to the stakeholders in the directly affected area, requesting comments on the proposed project construction. 40 copies of questionnaire were distributed, and 40 copies of questionnaire were returned. The age of the participating stakeholders was in the range of 26 to 70 years old.

E.2. Summary of the comments received:

>>

The results of the questionnaires are as follows:

- 100% agreed to the construction of the project;
- 100% thought the project would be helpful to the local economy;
- 95% thought the project would not influence the water quality, the other people were unconcerned about the problem;
- 97.5% thought the project would not influence the natural scenery; the others were unconcerned about the problem;
- 92.5% thought the project would not influence the ecosystem; the other people were unconcerned about the problem.

All of the stakeholders thought the project would have many advantages such as alleviating the local power shortage, promoting the economic development and increasing the income of the local residents. In addition, they also put forward the following issues and suggestions:

- The project owner should establish a good relationship with local municipal and township.
- The vegetation destroyed during the construction should be re-established quickly.
- Work opportunities should provide work for local people.
- Enhance the management of the workers to ensure the social safety.

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

>>

Following the consultation and taking the comments of the stakeholders into account, the project owner will take the following measures:

1. Implement the measures described in the EIA strictly. The project owner will protect and re-establish the vegetation, and minimise water & soil loss during construction of the project.
2. The project owner will establish good relationship with local municipal and township. Good communication channels will be set up between the local people and the project owner.
3. More work opportunities will be provided for the local people.
4. The design and construction of the main buildings should be in harmony with its surroundings.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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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

Step 1

According to the *2008 Baseline Emission Factors for Regional Power Grids in China* revised by Chinese DNA's on 30 December 2008, the project electricity system is the Central China Power Grid (CCPG), which includes Jiangxi Province, Henan Province, Hubei Province, Hunan Province, Sichuan Province and Chongqing Municipality Power Grid.[23]

There is no electricity import from other power grid to CCPG from 2002 to 2005. In 2006, the import electricity of CCPG from Northwestern China Power Grid (hereinafter as to NWPG) is 3,028,950MWh. The average grid emission factor of the NWPG as determined by the DNA is used. The NWPG is the only connection electricity system to CCPG. Electricity exports from CCPG are not subtracted from electricity generation data used for the calculations of the emission factor.

Step 2

As the data in the table below, low-cost/must-run resources constitute less than 50% of CCPG in the five most recent years:

Table A3.1 Low-cost/must run resources in CCPG

Year	2002	2003	2004	2005	2006
Percentage (%)	35.95	34.43	38.37	38.56	35.84

Source: China Electric Power Yearbook 2003～2007

Step 3

The low calorific value, CO_2 emission factor and oxidation factor of fuels are listed in Table A3. 2 below:

[23] 2008 Baseline Emission Factors for Regional Power Grids in China 30 December 2008.

Table A3.2 Low calorific values, CO_2 emission factors and oxidation factors of fuels

Fuel	Low Calorific Value(kJ/kg,m^3)	Emission Factor (tC/TJ)	Oxidation Factor
Raw Coal	20,908	25.8	100%
Cleaned Coal	26,344	25.8	100%
Other Washed Coal	8,363	25.8	100%
Mould Coal	20,908	26.6	100%
Coke	28,435	29.2	100%
Crude Oil	41,816	20.0	100%
Gasoline	43,070	18.9	100%
Diesel Oil	42,652	20.2	100%
Fuel Oil	41,816	21.1	100%
Natural Gas	38,931	15.3	100%
Coke Oven Gas	16,726	12.1	100%
Other Gas	5,227	12.1	100%
LPG	50,179	17.2	100%
Refinery Dry Gas	46,055	15.7	100%
Other Oil Product	38369	20	100%
Other Oven Product	28,435	25.8	100%
Other Energy	0	0	100%

Table A3.3 Simple OM Emission Factors Calculation of CCPG for Year 2004

Fuel	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	EF	Oxidation	NCV	CO_2 Emission
									(tC/TJ)	(%)	(MJ/t,km^3)	(tCO_2e)
												K=G*H*I*J*44/12/10000 (for mass unit)
		A	B	C	D	E	F	G=A+B+C +E+F	H	I	J	K=G*H*I*J *44/12/1000 (for volume unit)
Raw Coal	10^4 t	1,863.80	6,948.50	2,510.50	2,197.90	875.50	2,747.90	17,144.10	25.8	100	20,908	339,092,605.29
Cleaned Coal	10^4 t		2.34					2.34	25.8	100	26,344	58,316.13
Other Washed Coal	10^4 t	48.93	104.22			89.72		242.87	25.8	100	8,363	1,921,441.23
Coke	10^4 t		109.61					109.61	29.2	100	28,435	3,337,011.41
Coke Oven Gas	10^8 m^3			1.68		0.34		2.02	12.1	100	16,726	149,899.53
Other Gas	10^8 m^3					2.61		2.61	12.1	100	5,227	60,527.09
Crude Oil	10^4 t		0.86	0.22				1.08	20.0	100	41,816	33,118.27
Gas oil	10^4 t		0.06			0.01		0.07	18.9	100	43,070	2,089.33
Diesel Oil	10^4 t	0.02	3.86	1.70	1.72	1.14		8.44	20.2	100	42,652	266,627.32
Fuel Oil	10^4 t	1.09	0.19	9.55	1.38	0.48	1.68	14.37	21.1	100	41,816	464,893.14
LPG	10^4 t							-	17.2	100	50,179	-
Refinery Dry Gas	10^4 t	3.52	2.27					5.79	15.7	100	46,055	153,506.38
Natural Gas	10^8 m^3						2.27	2.27	15.3	100	38,931	495,774.61
Other Oil Produce	10^4 t							-	20.0	100	38,369	-
Other Oven Product	10^4 t							-	25.8	100	28,435	-
Other Energy	10^4 t		16.92		15.20	20.95		53.07	-	100	-	-
											Total	**346,035,810**

Table A3.4 Fuel-fired Electricity Generation of CCPG for Year 2004

Province	Electricity Generation (10^8 kWh)	Auxiliary Power Ratio (%)	Supplied Electricity (MWh)
Jiangxi	301.27	7.04	28,006,059.20
Henan	1,093.52	8.19	100,396,071.20
Hubei	430.34	6.58	40,202,362.80
Hunan	371.86	7.47	34,408,205.80
Chongqing	165.20	11.06	14,692,888.00
Sichuan	346.27	9.41	31,368,599.30
Total			249,074,186.30

Table A3.5 Simple OM Emission Factors Calculation of CCPG for Year 2005

Fuel	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	EF	Oxidation	NCV	CO_2 Emission
									(tC/TJ)	(%)	(MJ/t,km^3)	(tCO_2e)
		A	B	C	D	E	F	G=A+B+C+E+F	H	I	J	K=G*H*I*J*44/12/10000 (for mass unit) K=G*H*I*J *44/12/1000 (for volume unit)
Raw Coal	10^4 t	1,869.29	7,638.87	2,732.15	1,712.27	875.40	2,999.77	17,827.75	25.8	100	20,908	352,614,496.76
Cleaned Coal	10^4 t	0.02	-					0.02	25.8	100	26,344	498.43
Other Washed Coal	10^4 t		138.12			89.99		228.11	25.8	100	8,363	1,804,669.00
Coke	10^4 t		25.95		105.00			130.95	29.2	100	28,435	3,986,695.05
Coke Oven Gas	10^8 m^3			1.15		0.36		1.51	12.1	100	16,726	112,053.61
Other Gas	10^8 m^3		10.20			3.12		13.32	12.1	100	5,227	308,896.88
Crude Oil	10^4 t		0.82	0.36				1.18	20.0	100	41,816	36,184.78
Gasoline			0.02			0.02		0.04	18.9	100	43,070	1,193.90
Diesel Oil	10^4 t	1.30	3.03	2.39	1.39	1.38		9.49	20.2	100	42,652	299,797.78
Fuel Oil	10^4 t	0.64	0.29	3.15	1.68	0.89	2.22	8.87	21.1	100	41,816	286,959.09
LPG	10^4 t							-	17.2	100	50,179	-
Refinery Dry Gas	10^4 t	0.71	3.41	1.76	0.78			6.66	15.7	100	46,055	176,572.11
Natural Gas	10^8 m^3						3.00	3.00	15.3	100	38,931	655,208.73
Other Oven Product	10^4 t				1.50			1.50	25.8	100	28,435	40,349.27
											Total	**360,323,575.39**

Table A3.6 Fuel-fired Electricity Generation of CCPG for Year 2005

Province	Electricity Generation	Auxiliary Power Ratio	Supplied Electricity
	(10^8 kWh)	(%)	(MWh)
Jiangxi	300.0	6.48	28,056,000.00
Henan	1,315.9	7.32	121,957,612.00
Hubei	477.0	2.51	46,502,730.00
Hunan	399.0	5.00	37,905,000.00
Chongqing	175.8	8.05	16,168,488.00
Sichuan	372.0	4.27	35,613,474.60
Total			286,203,304.60

Table A3.7 Simple OM Emission Factors Calculation of CCPG for Year 2006

Fuel	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total	EF (tC/TJ)	Oxidation (%)	NCV (MJ/t,km^3)	CO_2 Emission (tCO_2e)
		A	B	C	D	E	F	G=A+B+C+E+F	H	I	J	K=G*H*I*J*44/12/10000 (for mass unit) K=G*H*I*J *44/12/1000 (for volume unit)
Raw Coal	10^4 t	1,926.02	8,098.01	3,179.79	2,454.48	1,184.30	3,285.22	20,127.82	25.8	100	20,908	398,107,507.69
Cleaned Coal	10^4 t					5.79		5.79	25.8	100	26,344	144,295.04
Other Washed Coal	10^4 t	4.51	104.12		8.59	79.21		196.43	25.8	100	8,363	1,554,035.91
Moule Coal	10^4 t						0.01	0.01	26.6	100	20,908	203.92
Coke	10^4 t		17.23		0.32			17.55	29.2	100	28,435	534,299.34
Coke Oven Gas	10^8 m^3		0.52	1.07	4.24	0.38	0.01	6.22	12.1	100	16,726	461,571.81
Other Gas	10^8 m^3	12.69	3.95		1.70	4.36	0.01	22.71	12.1	100	5,227	526,655.27
Crude Oil	10^4 t		0.49					0.49	20.0	100	41,816	15,025.88
Gas oli	10^4 t		0.01					0.01	18.9	100	43,070	298.48
Diesel Oil	10^4 t	0.91	2.23	1.41	1.78	0.96		7.29	20.2	100	42,652	230,297.77
Fuel Oil	10^4 t	0.51	1.26	1.31	0.80	0.57	3.49	7.94	21.1	100	41,816	256,872.06
LPG	10^4 t							-	17.2	100	50,179	-
Refinery Dry Gas	10^4 t	0.86	8.10	1.00	0.97			10.93	15.7	100	46,055	289,779.75
Natural Gas	10^8 m^3			0.28		0.16	18.63	19.07	15.3	100	38,931	4,164,943.49
Other Oil Produce	10^4 t							-	20.0	100	38,369	-
Other Oven Product	10^4 t						0.01	0.01	25.8	100	28,435	269.00
Other Energy	10^4 t	17.45	37.36	31.55	18.29	29.35		134.00	-	100	-	-
											Total	**406,286,055.41**

Table A3.8 Fuel-fired Electricity Generation of CCPG for Year 2006

Province	Electricity Generation (10^8 kWh)	Auxiliary Power Ratio (%)	Supplied Electricity (MWh)
Jiangxi	344.49	6.17	32,323,496.70
Henan	1,512.35	7.06	140,557,809.00
Hubei	548.41	2.75	53,332,872.50
Hunan	464.08	4.95	44,110,804.00
Chongqing	234.87	8.45	21,502,348.50
Sichuan	441.93	4.51	42,199,895.70
Total			334,027,226.40

Imported electricty from NWPG	3,028,950	MWh
Average emission factor of NWPG (Source: NC4)	0.8221	tCO2e/MWh

From the data above, the 3-year generation weighted average of the Simple OM emission factor can be calculated.

Table A3.9 Weighted average EF_{OM} calculation

	2004	2005	2006	Total
Emissions (million tCO2e)	346.04	360.32	408.78	1,115.1
Net supply (million MWh)	249.07	286.20	337.06	872.3
Emission factor tCO2e/MWh)	**1.3893**	**1.2590**	**1.2128**	**1.2783**

Step 4

Table A3.10 Percentages of CO2 emissions from the coal-fired, gas-fired and oil-fired power plants in total fuel-fired CO2 emissions in 2006

Fuel	**CO_2 Emission (tCO_2e)**
Raw Coal	398,107,507.69
Cleaned Coal	144,295.04
Other Washed Coal	1,554,035.91
Mould Coal	203.92
Coke	534,299.34
Subtotal	**400,340,341.90**
Crude Oil	15,025.88
Gasoline	298.48
Diesel Oil	230,297.77
Fuel Oil	256,872.06
Other Oven Product	269.00
Subtotal	**502,763.18**
Natural Gas	4,164,943.49
Coke Oven Gas	461,571.81
Other Gas	526,655.27
LPG	-
Refinery Dry Gas	289,779.75
Subtotal	**5,442,950.32**
Total	**406,286,055.41**

Note: See Table A3.7 for detailed calculations

Step 5

Table A3.11 Parameters used for calculating fuel-fired emission factor

	Parameter	Efficiency of Power Suppy	Emission Factor of Fuel (tc/TJ)	Oxidation Factor	Emission Factor (tCO2/MWh)	Share of CO2 emissions (λ)
		A	B	C	D=3.6/A/1000*B*C*44/12	
Coal-fired Power Plant	$EF_{Coal,bat}$	37.28%	25.8	100%	0.9135	98.54%
Gas-fired Power Plant	$EF_{Gas,bat}$	48.81%	15.3	100%	0.4138	1.34%
Oil-fired Power Plant	$EF_{Oil,bat}$	48.81%	21.1	100%	0.5706	0.12%
Thermal Power Plant	*EF thermal*				0.9064	

According to Table above, the percentages of CO_2 emissions from the coal-fired, oil-fired and gas-fired power plants in total fuel-fired CO_2 emissions are calculated as:

λ_{Coal} = 98.54%, λ_{Oil} = 1.34%, λ_{Gas} = 0.12%
$EF_{Thermal}$ is 0.9064 tCO_2e/MWh

Table A3.12 Newly Added Installed Capacity

	2004	**2005**	**2006**	**Added from 2004 to 2006**	Newly added capacity (%)
	A	**B**	**C**	**D=C-A**	
Fossil fuel-fired (MW)	53,825.7	60,167.2	76,658.0	22,832.3	73.77%
Hydro (MW)	34,642.0	38,405.2	42,719.0	8,077.0	26.10%
Nuclear (MW)	-	-	-	-	0.00%
Wind & Others (MW)	-	24.0	41.0	41.0	0.13%
Total (MW)	88,467.7	98,596.4	119,418.0	30,950.3	100.00%
Newly installed capacity to 2006 (%)	26%	17%	0%		

From the recently added generating capacity it can be determined that the BM should be calculated from capacity added since 2004. It is calculated that of the total added capacity since 2004, 73.77% is thermal power.

Therefore, the EF_{BM} is now calculated from $EF_{Thermal}$ and the share of added capacity from thermal plant as:
EF_{BM} = 0.6687 tCO_2e/MWh

Step 6

The Combined Margin emission factor is now calculated using the default weights for hydro projects.

Table A3.13 title Combined Margin emission factor of CCPG

	Emission factor	Weighting
$EF_{OM,y}$	1.2783	50%
$EF_{BM,y}$	0.6687	50%
EF_y	0.9735	

Annex 4

MONITORING INFORMATION

No additional information. See Section B.7 for the parameters to be monitored and the monitoring plan.

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