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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Luodu Small Hydropower Project

Version 5

07 December 2009

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

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The Luodu Small Hydropower Project (hereafter referred to as the "Project") developed by Yibin Julang Electricity Power Development Co., Ltd. (hereafter referred to as the "Project Developer") is a small-scale hydropower project with an accumulation reservoir in Sichuan Province, in the People's Republic of China (hereafter referred to as the "Host Country"). Total installed capacity of the Project will be 10.5MW, consisting of three 3.5 MW turbines, with a predicted electricity supply to the grid of 47,673 MWh per annum.

The purpose of the Project is to utilise the hydrological resources of the Nanguang river in order to generate low emissions electricity for the Central China Power Grid, thereby displacing electricity that is relatively carbon intensive, with a combined margin emission factor of 0.9467 tCO_2/MWh, and reducing greenhouse gas (GHG) emissions.

The Project is contributing to sustainable development of the Host Country. Specifically, the Project:

- Achieves GHG emission reductions by avoiding CO_2 emission from the business-as-usual scenario electricity generation of those fossil fuel-fired power plants connected to the Central China Power Grid which dominated by fossil fuel fired electricity.
- Increases employment opportunities in the area where the Project is located (30[1] people will be permanently employed for the Project operation and the construction of the Projects secures jobs in the construction sector) and thereby contributes to poverty alleviation.
- Enhances the local investment environment and therefore improves the local economy.
- Diversifies the sources of electricity generation, important for meeting growing energy demands and the transition away from diesel and coal-supplied electricity generation.
- Makes greater use of renewable hydroelectric resources

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)

[1] Preliminary Design Report, p14-2

People's Republic of China (host)	Yibin Julang Electricity Power Co Ltd.	No
United Kingdom of Great Britain and Northern Ireland	EcoSecurities Group Plc.	No
United Kingdom of Great Britain and Northern Ireland	EcoSecurities Carbon I 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.		

Further contact information of project participants is provided in Annex 1.

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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People's Republic of China (P.R. China)

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

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Sichuan Province

A.4.1.3. City/Town/Community etc:

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Luodu Village, near Gong County, Yibin City

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

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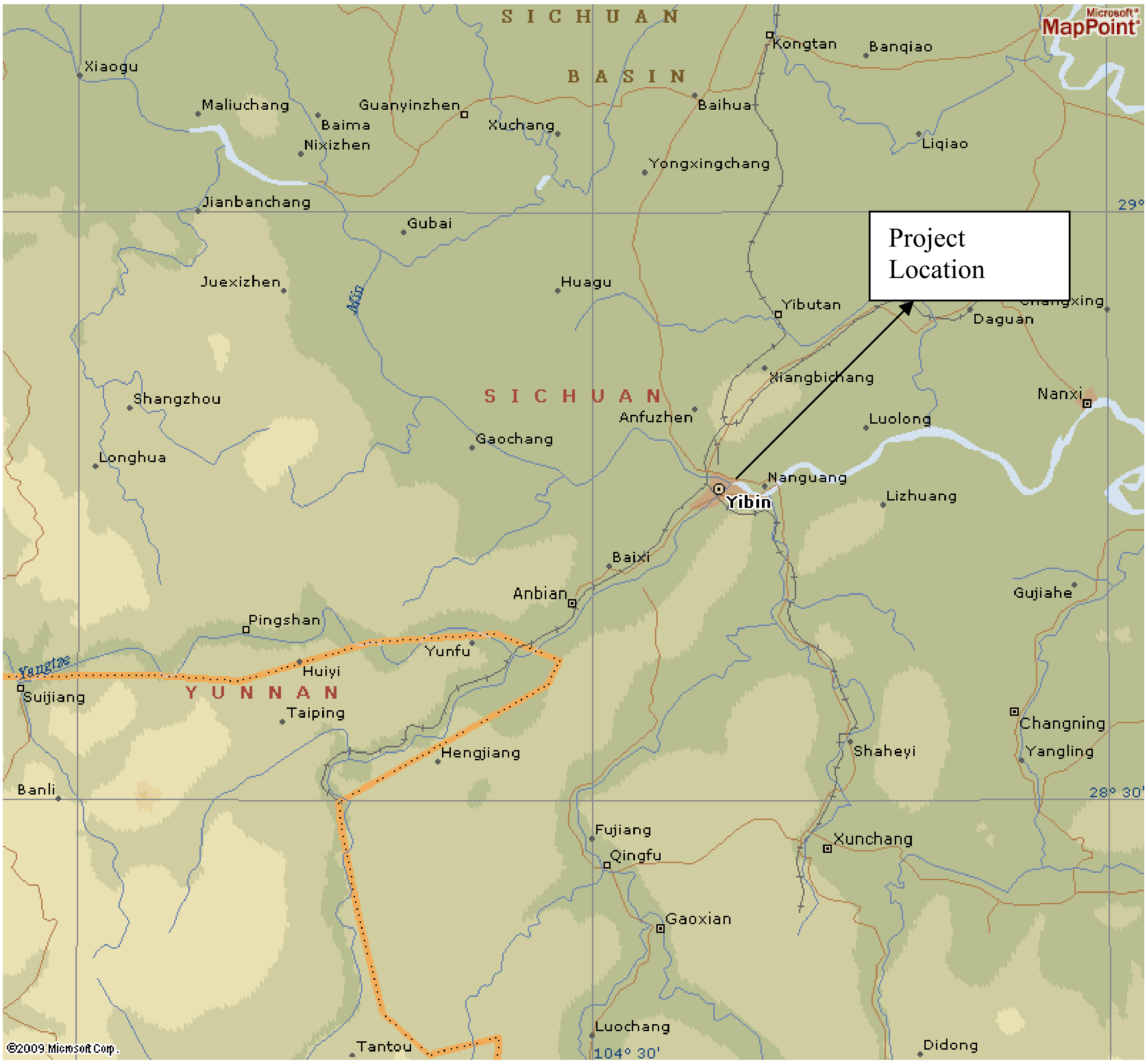
The proposed project is located on the Nanguang River. The exact location of the Project is defined using geographic coordinates obtained with a Global Positioning System (GPS) receiver: N 28º05'58'' Latitude, E 104º50'25'' Longitude. These geographic coordinates are for the power house.



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

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The Project falls under UNFCCC sectoral scope 1: Energy industries (renewable - / non-renewable sources). According to Appendix B of the UNFCCC's published simplified procedures for small scale activities, the category of this project activity is:

Type I: Renewable Energy Project

Category I.D: Grid Connected Renewable Energy Generation

The Project uses well established hydro power generation technology for electricity generation and transmission. It is a hydropower project with an accumulation reservoir and a total installed capacity of 10.5MW (consisting of 3×3.5MW turbines).

The Project is located on the Nanguang River, a branch of Yangzi River. It consists of a dam that creates an artificial reservoir with a water head of 19.5 m. The water enters into the turbine through an enclosed concrete channel. Three hydraulic turbines of 3.5 MW capacity each will be installed in the power house. After power generation the water is discharged into the Nanguang River through a tailrace.

A 9km 35kV one circuit transmission line from the switchyard to the Shangluo sub-station in the Shangluo Village is used for connecting the Project to the Gong County Power Grid. The electricity is then transmitted to the Sichuan Power Grid and finally to the Central China Power Grid.

The main technical parameters of the proposed Project are shown in Table A.4.1. below.

Table A.4.1. Main technical parameters of the proposed Project[2]

Name	Value	Source
Installed capacity (MW)	10.5	Preliminary Design Report p14-1*
Expected annual power supply to the grid (MWh)	47,673	Preliminary Design Report p14-11
Water head (m)	19.5	Preliminary Design Report p4-20
Design flow (m^3/s)	39.4	Preliminary Design Report p4-24
Increased flooded area due to the project (km^2)	0.426	Preliminary Design Report P1-4
Power density (W/m^2)	24	Calculated

*****the Preliminary Design Report was completed by the Sichuan Province Neijiang Hydroelectric & Power Exploration Research institute in July 2004 and approved by the Yibin Development and Planning Commission in September 2004

The Project started construction in November 2006 after the CDM was considered (see section B.5 for details) and is scheduled to start operation in June 2009.
The Project will use state-of-the-art but recognised technology in electricity generation and transmission. There will be no international technology transfer involved on this project, since the essential equipment used in the Project is produced domestically and the Project Developer is experienced in handling and operating this kind of equipment.

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

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Year	Estimation of annual emission reductions in tonnes of CO_2e
2009*	45,132
2010*	45,132
2011*	45,132
2012*	45,132
2013*	45,132
2014*	45,132
2015*	45,132

[2] Since this project is under construction, some information given in section A.4.2 might be subject to change.

Total estimated reductions (tonnes of CO_2e)	315,924
Total number of crediting years	7
Annual average of estimated reductions over the crediting period (tonnes of CO_2e)	45,132

* *Using 12-monthly periods, not calendar years.*

Refer to section B.6.3. for further details on the quantification of GHG emission reductions associated with the Project.

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

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The Project will not receive any public funding from Parties included in Annex I of the UNFCCC.

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

Based on the information provided in Appendix C of the Simplified Modalities and Procedures for Small-Scale CDM project activities[3], the Luodu Hydro Power Project is not a part of any large scale project or program and is not a debundled component of a large project activity.

The Project participants have not registered or are not applying to register any other small-scale CDM project activity

- With the same project participants;
- In the same project category and technology/measure; and
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the Project boundary of the Project at the closest point.

[3] http://cdm.unfccc.int/Projects/pac/howto/SmallScalePA/sscdebund.pdf

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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The category for the Project activity according to Appendix B of the UNFCCC's published simplified procedures for small-scale activities is:
Type I: Renewable Energy Project
Category I.D.: Grid Connected Renewable Energy Generation

The simplified baseline and monitoring methodology AMS I.D, version 13, 14 December 2007, is applicable.
The approved "Tool to calculate the emission factor for an electricity system", version 01.1, in effect as of EB 35, is applied to the project activity.

For more information about the methodology, please refer to the following website:
http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html

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

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AMS I.D. Version 13, 14 December 2007 is applicable since:

- The Project activity is a renewable electricity project (hydroelectric)
- The Project activity is not a combined heat and power (co-generation) system
- The Project activity has an output capacity lower than 15 MW (Decision -/CMP2 paragraph 28 (a): the Project has an installed capacity of 10.5 MW.
- The electricity generated by the Project activity is supplied to a grid that is or would have been supplied by at least one fossil fuel fired generating unit (the Central China Power Grid - CCPG). The CCPG includes the Jiangxi, Henan, Hubei, Hunan, Chongqing and Sichuan Provinces.

B.3. Description of the Project boundary:

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As referred to in Appendix B for small-scale project activities, methodology AMS-I.D, the project boundary for a small-scale hydropower project that provides electricity to a grid encompasses the physical, geographical site of the renewable generation source (see Table B.3. below). It also includes all all power plants connected physically to the Central China Power Grid to which the Project is connected.

The GHG and emission sources included in or excluded from the project boundary are shown in Table B.3. below.

Table B.3. Emission sources and gases included in the Project boundary for the purpose of calculating project emissions and baseline emissions.

	Source	Gas	Included?	Justification / Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants	CO_2	Included	According to AMS.I.D, only CO_2 emissions from electricity generation should be accounted for.

	connected to the Central China Power Grid	CH_4	Excluded	According to AMS.I.D.
		N_2O	Excluded	According to AMS.I.D.
Project Activity	Luodu Small Hydropower Project electricity production	CO_2	Excluded	According to AMS.I.D.
		CH_4	Excluded	According to AMS.I.D.
		N_2O	Excluded	According to AMS.I.D.

B.4. Description of baseline and its development:

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

Four realistic and credible alternatives to the Project activity are considered to determine the baseline:

Alternative 1: The proposed Project activity without CDM, i.e. the construction of a new hydroelectricity generation plant with an installed capacity of 10.5 MW connected to the local grid, implemented without considering CDM revenues.

Alternative 2: Continuation of the current situation, i.e. electricity will continue to be generated by the existing generation mix operating in the grid.

Alternative 3: Construction of a thermal power plant with the same installed capacity or the same annual power output.

Alternative 3 is not in line with applicable laws and regulations, since legislation in China strictly forbids the construction of thermal power stations with an installed capacity lower than 135 MW[4]. Therefore this alternative is not considered further in the assessment of the alternatives.

Alternative 4: Construction of a power plant using another renewable energy resource with the same installed capacity or the same annual power output.

The annual average wind speed is less than 2m/s in Yibin City[5], the grain production in Luodu village is only 6022 ton/year[6]. Hence there is no economically exploitable wind resource or biomass resource with a commensurate scale to the Project. Moreover, other renewable energy, such as solar PV, is suffering from high cost and is not commercially viable in China at present[7]. Furthermore, according to the China

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[4] See the announcement which strictly forbids the construction of thermal power stations with an installed capacity lower than 135 MW published by the State Council Office, Guo Ban Fa Ming Dian[2002] No.6

[5] http://www.ybta.gov.cn/web/t1/main.jsp?go=newsDetail&cid=7022&id=15430

[6] http://baike.baidu.com/view/1669624.html?goodTagLemma

[7] http://news.xinhuanet.com/fortune/2008-04/01/content_7897537.htm

Electric Power Yearbooks (2002-2007), the installed capacity of wind farms and other renewable energy technologies in Sichuan Province is 0 MW. Therefore, *alternative 4* is not realistic and credible and is not considered further in the assessment of the alternatives.

Therefore there are two three realistic and credible alternatives remaining after this assessment: *alternative 1* and *alternative 2. Alternative 2* is identified as the baseline scenario: in the absence of the Project activity, electricity will continue to be generated by the existing generation mix operating in the grid. For the full assessment of alternatives and the identification of the baseline see section B.5.

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:

In accordance to Attachment A of Appendix B of the simplified modalities and procedures for small-scale CDM project activities, additionality is demonstrated by showing that the Project activity would not have occurred anyway due to the existence of at least one barrier. One of the barriers listed is an investment barrier. This barrier is demonstrated by a financial analysis, substantiated by a benchmark analysis.

CDM consideration
In order to alleviate the investment barrier faced by the Project (see investment analysis below), the Project Developer decided in November 2005 to apply for the CDM. The Project Developer contacted EcoSecurities, a CDM developer and CER buyer (ERPA signed in May 2006), which started working on the PDD (Stakeholder consultation in June 2006 – see section E; first submission of the PDD for validation in August 2006). The construction of the Project started in November 2006. The validation was then put on hold because the project construction was being delayed. The project was delayed for two reasons: 1) the funding was secured later than expected ; 2) construction work was interrupted by several floods. Thus Ecosecurities, aware that the project would start operation later than expected, decided with the project developer to put the validation on hold due to limited personnel resources in 2007 and resumed the validation in July 2008 in order to get the project registered in time for the start of operation expected in June 2009.

Table B.5.1. Project timeline

Project activity	Time	CDM activity
Completion of PDR of Luodu project by Sichuan Province Neijiang Hydroelectric & Power Exploration Research institute	07/2004	
On Grid tariff approval by Gong County Price Bureau for Luodu small hydro project	26/07/2004	
PDR approval by Yibin Development and Planning Commission	13/09/2004	
	20/11/2005	Board Meeting held; Project owner decided to seek financial support from CDM to alleviate the financial unattractiveness of the project
	02/05/2006	After completing due diligence check and obtaining necessary materials, the

		Project developer signed an Emission Reduction Purchase Agreement (ERPA) with EcoSecurities
	02/08/2006	First submission of the PDD for validation[8]
Grid connection and Power Purchase Agreement of Luodu project with Gong County Hongli Electricity Power Company	09/10/2006	
	25/10/2006	Gong Branch, Agriculture Development Bank of China agreed to provide a loan to the proposed project based on the fact that the proposed project can obtain CDM income to overcome its financial barrier.
Construction approval by Chongqing Jianghe Construction Supervision Company	28/11/2006	Project start date
Turbine units Technical and Purchase Agreement with Yibin Fuyuan Electricity Generation Equipment Company	5/01/2007	
	02/2007	LOA requested from Chinese DNA
	05/03/2007	LOA obtained from Chinese DNA.
Construction contract with Zhonghang Nanfang Mechanical Hainan Construction Department, Southwest Branch	10/07/2007	
	02/09/2008	Validation was resumed in order to get the project registered in time for the start of operation expected in June 2009
Expected operating start date	06/2009	

Investment Barrier

Benchmark Analysis

The likelihood of the development of this Project, as opposed to continued generation of electricity by the existing generation mix operating in the grid (i.e. *Alternative 2* - the baseline) is determined by comparing the Project IRR without CDM financing (*Alternative 1*) with benchmark rates available to a local investor, i.e. those provided by local banks, or investment bonds in the Host Country. According to the "*Economic Evaluation Code for Small Hydropower Projects (Document No. SL16-95)*[9]", published by the Ministry

[8] http://cdm.unfccc.int/Projects/Validation/DB/7KHUCINSKNE9AGTHXUHW6T0MHJOFH4/view.html

[9] The 10% benchmark is given in the "Economic evaluation code for small hydropower projects (SL16-95)" (see http://www.cws.net.cn/guifan/bz%5CSL16-95). This code was developed by the Ministry of Water Resources of the

of Water Resources of the P.R.China, the IRR of small hydro power projects in P. R.China (installed capacity below 50 MW) should be higher than 10%. This benchmark is widely used for power project investments in P. R. China and serves as the sectoral benchmark rate on total investment for hydro projects. Therefore a 10% benchmark for the IRR of this Project applies.

Table B.5.1 below shows the financial analysis for the Project activity, at the time that the decision to go ahead was made, without and with CDM financing. As shown, the Project IRR without CDM financing was lower than the benchmark rate of return applicable. This therefore indicates that in comparison to other alternative investments, the Project was not financially attractive in the absence of CDM financing.

Table B.5.2. Summary of project financial analysis without CDM

	Without CDM	With CDM
IRR	5.91%	11.46%

Details for calculating the IRR are provided in table B.5.3

A sensitivity analysis was conducted by altering the following parameters, which have a material impact on the IRR:

- Electricity Tariff
- Investment Costs
- Operating Costs
- Power Supplied to Grid

Table B.5.2 summarizes the results of the sensitivity analysis, showing the variation of each parameter needed to reach the 10% benchmark.

Table B.5.3. Results of the sensitivity analysis

	Variation of the parameter needed to reach the 10% benchmark
Operating Costs	-153%
Investment Costs	-36%
Electricity Tariff	37%
Power Supplied to Grid	37%

- **Operating costs:** The results of the sensitivity analysis mean that even if the Project incurred zero operating costs, which is not feasible, the IRR of the Project would not reach the 10% benchmark.

People's Republic of China (MWR) and became effective on 01/07/1995. Section 1.2 of SL16-95 states that this code applies to small hydropower projects with an installed capacity below 50MW. The installed capacity of the proposed project activity is 10.5 MW. The code is thus applicable to the proposed project.

On 09/09/2006, the MWR announced that this regulation was still effective (see http://www.mwr.gov.cn/tzgg/qt/20060926000000479251.aspx). No new regulation has taken over the effectiveness of this code since then. This shows that the 10% benchmark was applicable at the time of the decision making (and still remains in effect today).

- **Investment costs:** The price of the raw materials (like steel and concrete) is constantly increasing in China10. For example, the cement budget price stated in PDR, page 13-3 was 305 RMB/tonne while in reality the project developer purchased cement at 390 RMB/tonne in 2008[11].The Project is still under construction, and RMB 85million (more than 80% of the estimated investment cost) have already been invested according to the investment report by the Gong County Water Conservancy Bureau, which is the local administrative bureau for hydropower projects entitled to regularly check the financial status of the Project[12]. Contracts including the main construction contract, the Turbine & Generator Purchase Agreement and the Hoist Contract have been provided to the DOE, the values in the contracts are higher than the values estimated in the PDR. This shows that a 36% decrease in investment costs is extremely unrealistic and that the IRR is not likely to reach the 10% benchmark.

- **Electricity tariff:** In China, the electricity tariff is strictly regulated by the central government. The electricity tariff will not be significantly changed without the permission of the central government. In order to ensure the stability of prices across the whole country (i.e. minimize inflation), the central government strictly controls basic prices such as electricity tariffs and commodity prices. For example, in 2002, the government issued the State Council Notification on the Power System Reform – GuoFa [2002] No.5 by which power plants are encouraged to lower the cost of electricity generation and feed-in tariffs. In May 2005, the National Development and Reform Commission, which regulates power production, also issued "Provisional Measures for the Administration of the Electricity On-Grid Tariffs"– NDRC [2005] NO.514, which aims at regulating the determination of the electricity tariff offered to power producers in order to stabilise tariffs and increase competitiveness in the electricity market.

  The Project Developer signed a Power Purchase Agreement with the local grid company in October 2006. The tariff was above average (293.8 RMB/MWh) for the first 8 years of operation in accordance with a policy supporting hydropower projects published by the Gong County government [13] and normal tariff (226 RMB/MWh) after 8 years of operation to be consistent with the local price level[14] . Even if the favorable tariff 293.8 RMB/MWh is used for the whole operation period, the IRR (7.39%) remains well under the benchmark. As the current tariff is already a preferential tariff, a further 37 % increase in the electricity tariff is highly unrealistic; therefore, the IRR is not likely to reach the 10% benchmark.

- **Power Supplied to Grid:** The theoretical annual power generation (and hence the load factor) of the proposed Project indicated in the Preliminary Design Report was calculated based on 44 years worth of historical hydrological data and this was approved by Yibin Development and Planning Commission on 13 September 2004. The plant load factor was also applied in the loan application reports to the Gong County Agriculture Bank[15] when the project activity applied for financing on 21 August 2007 and additional financing on 8 August 2009.

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[10] Barboza, David. "Costs rising, China to export inflation." *International Herald Tribune.* 01/02/2008; National Bureau of Statistics of China: http://www.stats.gov.cn/english/StatisticalCommuniques/

[11] Cement purchase invoice, 2008

[12] Investment status of Luodu small hydropower Project, Gong County Water Conservancy Bureau, 2 Nov 2009.

[13] Gongfufa [2003] 78: Gong County Government's Opinion on Facilitating the Development and Construction of Hydro and Hydro Power Engineering; issued on 01 August 2003 by Gong County Government Office.

[14] See On Grid tariff approval by Gong County Price Bureau for Luodu small hydro project and PPA.

[15] Yibin Julang Electricity Power Co., Ltd: Loan application report to Gong County Agriculture Credit Bank, 21

The most conservative situation has been used in the IRR calculation with no co-efficient factor considered, i.e. it is assumed that all the available water resources are used to generate electricity, which is not realistic given the regulating capacity of the power plant and the management of the operation of the grid.

Thus, assuming a 37% of increase in annual operating hours is extremely unrealistic, and the IRR is not likely to reach the 10% benchmark.

These results show that even under very favourable circumstances the Project IRR was still lower than the benchmark. We can conclude that the Best Case IRR was not financially attractive, and therefore that the Project overall was also not financially attractive. This demonstrates that the Project activity would not be implemented without the CDM.

Table B.5.4. Main parameters used in the investment analysis

Name	Value	Source
Installed capacity (MW)	10.5	Preliminary Design Report p14-1*
Total investment (RMB)	106,042,800	Preliminary Design Report p13-1
Theoretical annual Power generation (MWh)	48,890	Preliminary Design Report p14-11
Internal use rate (%)	0.5%	Preliminary Design Report p14-11
Transmission loss rate (%)	2%	Preliminary Design Report p14-11
Expected power supplied to the grid (MWh)	46,673	Electricity supplied to the grid =Theoretical annual Power generation * (1-internal use rate)*(1-transmission loss rate)
Expected operational lifetime (years)	30	Preliminary Design Report p14-2
Tariff, including VAT (RMB/MWh)	293.8 for the first 8 years, 226 for the remaining 22 years.	Power Purchase Agreement (PPA)**
VAT (%)	6	Preliminary Design Report p14-3
Income tax[16] (%)	0% for the first 2 years 15% for the remaining 28 years	Preliminary Design Report p14-3
Educational Surcharge Tax (%)	3	Preliminary Design Report p14-3
Lifetime of project	30	Preliminary Design Report p14-32
Annual operating costs (RMB/MWh)	first 10 years of operation: 2,961,700 then : 2,755,700	Preliminary Design Report p14-10,11,12-the difference (RMB206,000) is the reservoir supporting fund, which lasts for the first 10 years of operation.

August 2007 and 8 August 2009.

[16] As part of the Request for Review, the IRR was calculated to take into account of the actual interest payable in the calculation of income tax. This is in accordance with paragraph XX of the new version of the Guidelines of the assessment of investment analysis (Version 3) (EB51, Annex 58), The Project IRR without CDM revenue is 6.27%, below the benchmark of 10%.

*****the Preliminary Design Report was completed by the Sichuan Province Neijiang Hydroelectric & Power Exploration Research institute in July 2004 and approved by the Yibin Development and Planning Commission in September 2004
** the Grid Connection and Power Purchase Agreement was signed with the Gong County Hongli Electricity Power Company in October 2006. The tariff is the same as in the on-grid tariff approval granted by Gong County Price Bureau in July 2004 and the first Power Purchase Agreement also signed in July 2004.

The barrier analysis shows that the Project activity would not have occurred anyway due to an investment barrier. This barrier would prevent the implementation of the Project activity without the CDM but not the implementation of the relevant alternative, i.e. the continuation of the current situation (see Table B.5.4. below). The continuation of the current situation, which is identified as the baseline scenario, is a financially more viable alternative to the Project activity that would lead to higher emissions than the Project. In accordance to Attachment A of Appendix B of the simplified modalities and procedures for small-scale CDM project activities, we can conclude that the Project activity is not the baseline scenario and is considered to be additional.

Table B.5.5. Assessment of the alternatives

Barrier Evaluated	**Alternative 1**	**Alternative 2**
	The proposed Project activity undertaken without being registered as a CDM project activity	Continuation of the current situation
Investment	Yes	No
Conclusion of the barrier analysis	*The Project is deemed to be additional.*	*This is the baseline scenario.*

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

AMS I.D. (Version 13, EB 36) offers two choices for preparing the baseline calculation for this type of project activity. 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) above will be applied for this project, which uses 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”.

This PDD uses the calculations published by the DNA of P. R. China[17] to determine the Operating Margin (OM) emission factor and the Build Margin (BM) emission factor using the most recent data available.

[17] National Coordination Committee on Climate Change – National Development and Reform Commission (NDRC)

The description below follows the steps of the latest version of the "Tool to calculate the emission factor for an electricity system" and focuses on the key process of the calculation of the emission factors. Please see Annex 3 for the baseline data underlying the calculations.

Step 1. Identify the relevant electric power system

P. R. China is divided into regional electricity systems which are defined by the DNA of P. R. China[18]. The Project is located in Sichuan Province which belongs to the Central China Power Grid (CCPG). Therefore, the relevant electric power system is identified as the CCPG.

Step 2. Select an operating margin (OM) method

The "Tool to calculate the emission factor for an electricity system" offers four methods to calculate the OM emission factor ($EF_{grid,OM,y}$):

a) Simple OM, or
b) Simple adjusted OM, or
c) Dispatch data analysis OM, or
d) Average OM.

Of these procedures, Option (a) (Simple OM) is applied. This is because low-cost / must run resources constitute less than 50% of total grid generation in average of the five most recent years. From 2000 to 2004 respectively, 38%, 37%, 36%, 34%, and 38% of the electricity generated in the CCPG came from low-cost / must run resources[19].

Power plants registered as CDM project activities are included in the sample group that is used to calculate the OM as long as the criteria for including the power sources in the sample group apply.

The "Tool to calculate the emission factor for an electricity system" offers the choice between two data vintages calculate the Simple OM emission factor ($EF_{grid,OMsimple,y}$):

- *Ex-ante* option: A 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period.
- *Ex-post* option: The year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring.

$EF_{grid,OMsimple,y}$ is calculated *ex-ante* using the data from 2002 to 2004, available in the China Energy Statistics Yearbooks 2002-2004 and the China Electric Power Yearbooks 2002-2004. This data vintage remains fixed during the crediting period.

Step 3. Calculate OM emission factor according to the selected method

[18] See http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2008/200887164119674.pdf

[19] China Electric Power Yearbooks 2001-2005; see Annex 3 for detailed calculation.

The "Tool to calculate the emission factor for an electricity system" offers three options to calculate $EF_{grid,OMsimple,y}$:

- *Option A*: Based on data on fuel consumption and net electricity generation of each power plant / unit
- *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
- *Option 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.

Detailed data on the individual power plants connected to the CCPG necessary for applying option A and option B is not available; therefore, options A and B cannot be used. Since only nuclear and renewable power generation are considered as low-cost / must-run power sources and since the quantity of electricity supplied to the grid by these sources is known, option C is applicable and used to calculate the Simple OM emission factor.

$EF_{grid,OMsimple,y}$, using option C is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost / must-run power plants / units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows:

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

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) (country-specific values are used)
$EF_{CO2,i,y}$	=	CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
$EG_{y,grid}$[20]	=	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 for which data is available at the time of submission of the CDM-PDD to the DOE for validation

$EF_{grid,OMsimple,y}$ =1.2779 tCO_2/MWh

For detailed information, please see Annex 3.

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

According to the "Tool to calculate the emission factor for an electricity system", 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

[20] $EG_{y,grid}$ = GEN x (1-rate of internal use by the power station). See Annex 3 and section B.6.2. for details.

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.

However, due to the fact that data on electricity generation of each power plant / unit in the grid is currently not available in P. R. China (see Step 3), EB guidance on the estimation of the build margin in P.R. China can be applied for the purpose of defining the sample group[21]. In accordance with the guidance, the build margin consists of the set of power capacity additions in the electricity system that comprises 20% of the system generation capacity (in MW) and that have been built most recently. Therefore, the set of power capacity additions included in the build margin is determined as follows:

$$\frac{\sum_j CAP_{j,y-n}}{\sum_j CAP_{j,y}} \geq 20\% \qquad \textbf{(2)}$$

$\sum_j CAP_{j,y-n}$ = The aggregate incrementally installed power capacity of all kinds of power generation sources *j* (MW) in year *y-n*

$\sum_j CAP_{j,y}$ = The aggregate incrementally installed power capacity of all kinds of power generation sources *j* (MW) in year *y*

n = The number of years (y-1, y-2, …, y-n) which have to be considered to comprise 20% of the system generation capacity (in MW) and that have been built most recently

In the period from 2000 to 2004 (2004 being the most recent year for which data is available), the amount of power capacity additions made up over 20% of the total CCPG generation capacity in 2004. Therefore $n = 4$.

Since data on the electricity generation of each individual power plant / unit in the grid is not available in P. R. China, power plants registered as CDM project activities cannot be isolated and are taken into account in the build margin.

The "Tool to calculate the emission factor for an electricity system" offers the choice between two data vintages to calculate the BM:

- *Option 1*. For the first crediting period, the build margin emission factor is calculated *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.
- *Option 2*. For the first crediting period, the build margin emission factor shall be updated annually, *ex-post*, including those units built up to the year of registration of the project activity

The BM emission factor ($EF_{grid,BM,y}$) is calculated *ex-ante*(refer to Annex 3). This data vintage remains fixed during the first crediting period and will be updated for the second crediting period.

Step 5. Calculate the build margin emission factor

[21] See: EB guidance on estimating the build margin for AM0005, consolidated in ACM0002 which refers to the Tool to calculate the emission factor for an electricity system
http://cdm.unfccc.int/UserManagement/FileStorage/6POIAMGYOEDOTKW25TA20EHEKPR4DM and
http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_QEJWJEF3CFBP1OZAK6V5YXPQKK7WYJ

According to the "Tool to calculate the emission factor for an electricity system", $EF_{grid,BM,y}$ is the generation-weighted average emission factor of all power units *m* during the most recent year *y* for which power generation data is available. However, due to the fact that data on both electricity generation and emission factor of each power plant / unit in the grid is currently not available in P. R. China (see Step 3), EB guidance on the estimation of the build margin in P.R. China can also be applied for the purpose of estimating the BM emission factor[22] and $EF_{grid,BM,y}$ is calculated as follows:

$$EF_{grid,BM,y} = \frac{CAP_{thermal,y-n,y}}{\sum_j CAP_{j,y-n,y}} \times EF_{thermal,adv} \qquad \textbf{(3)}$$

$EF_{grid,BM,y}$	=	Build margin CO_2 emission factor in year *y* (tCO_2/MWh)
$CAP_{thermal,y-n,y}$	=	The incrementally installed power capacity of thermal power generation sources (MW) in the CCPG in year *y* compared to that of year *y-n*
$\sum_j CAP_{j,y-n,y}$	=	the aggregate incrementally installed power capacity of all kinds of power generation sources *j* (MW) in the CCPG in year *y-n* compared to that of year *y-n*
$EF_{thermal,adv}$	=	The emission factor of thermal power generation sources of the CCPG with the efficiency level of the best commercially available technology in P. R. China, for *y* the most recent historical year for which power generation data is available

$EF_{Thermal,Adv}$ is calculated as follows:

$$EF_{Thermal,Adv} = \lambda_{Coal} \times EF_{Coal,Adv} + \lambda_{Oil} \times EF_{Oil,Adv} + \lambda_{Gas} \times EF_{Gas,Adv} \qquad \textbf{(4)}$$

Where:

$EF_{i,Adv}$	=	The CO_2 emission factor of fuel *i* (tCO_2/MWh) using the best commercially available technology in P. R. China and taking into account the carbon content and the oxidation factor of fuel *i*[23]
Coal, Oil and *Gas*	=	Solid fuel, liquid fuel and gaseous fuel respectively
λ_i	=	The weight of CO_2 emissions from fuel *i* fired power plants in the total CO_2 emissions from thermal power, using the most recent available data

And

$$\lambda_{Coal} = \frac{\sum_{i=Coal} FC_{i,y} \times EF_{CO2,i,y}}{\sum_i FC_{i,y} \times EF_{CO2,i,y}} \qquad \textbf{(5)}$$

[22] See: http://cdm.unfccc.int/UserManagement/FileStorage/6POIAMGYOEDOTKW25TA20EHEKPR4DM and http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_QEJWJEF3CFBP1OZAK6V5YXPQKK7WYJ

[23] See http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1875.pdf

$$\lambda_{Oil} = \frac{\sum_{i=Oil} FC_{i,y} \times EF_{CO2,i,y}}{\sum_{i} FC_{i,y} \times EF_{CO2,i,y}} \quad \textbf{(6)}$$

$$\lambda_{Gas} = \frac{\sum_{i=Gas} FC_{i,y} \times EF_{CO2,i,y}}{\sum_{i} FC_{i,y} \times EF_{CO2,i,y}} \quad \textbf{(7)}$$

Where $FC_{i,y}$ and $EF_{CO2,i,y}$ are defined as in equation 1.

$EF_{grid,BM,y}$ = 0.6156 tCO_2/MWh

For detailed information, please see Annex 3.

Step 6. Calculate the combined margin emission factor

The combined margin (CM) emissions factor ($EF_{grid,CM,y}$) is calculated as follows:

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

Where:

$EF_{grid,CM,y}$ = Combined margin CO_2 emissions factor in year y (tCO_2/MWh)
$EF_{grid,BM,y}$ = 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, which is 0.5 by default
w_{BM} = Weighting of build margin emissions factor, which is 0.5 by default

$EF_{grid,CM,y}$=0.5*1.2779+0.5*0.6156=0.9467 tCO_2/MWh

For detailed information, please see Annex 3.

Then baseline emissions (BE_y) are obtained as:

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

Where:

BE_y = Baseline emissions in year y (tCO_2)
EG_y = Electricity supplied by the project p to the grid in year y (MWh)
$EF_{grid,CM,y}$ = Combined margin CO_2 emissions factor in year y (tCO_2/MWh)

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

Data / Parameter:	***Installed Capacity of the project activity***
Data unit:	**MW**
Description:	The installed capacity of the project activity

Source of data used:	Preliminary Design Report
Value applied:	10.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is from the Preliminary Design Report
Any comment:	

Data / Parameter:	$FC_{i,y}$
Data unit:	**t, m^3**
Description:	Amount of fossil fuel type *i* consumed in the project electricity system in year *y* (mass or volume unit)
Source of data used:	China Energy Statistics Yearbooks (2003-2005)
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released statistics; publicly accessible and reliable data source
Any comment:	

Data / Parameter:	$NCV_{i,,y}$
Data unit:	**MJ/t, kJ/m^3**
Description:	Net calorific value (energy content) of fossil fuel type *i* in year *y*
Source of data used:	China Energy Statistics Yearbook 2005
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released statistics; publicly accessible and reliable data source
Any comment:	

Data / Parameter:	$EF_{CO2,i,y}$
Data unit:	**tCO_2/TJ**
Description:	CO2 emission factor of fossil fuel type i in year y
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	See Annex 3

Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC default value
Any comment:	

Data / Parameter:	***$GEN_{j,y}$***
Data unit:	**MWh**
Description:	The electricity generation by source *j* in year *y* of each province connected to the CCPG
Source of data used:	China Electric Power Yearbooks(2003-2005)
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released statistics; publicly accessible and reliable data source
Any comment:	

Data / Parameter:	***Rate of internal use by the power station***
Data unit:	**%**
Description:	The rate of internal use of power source *j* in each province connected to the CCPG.
Source of data used:	China Electric Power Yearbooks (2003-2005)
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released statistics; publicly accessible and reliable data source
Any comment:	

Data / Parameter:	***$CAP_{j,y}$***
Data unit:	**MW**
Description:	The aggregate incrementally installed power capacity of all kinds of power generation sources *j* (MW) in the CCPG in year *y*
Source of data used:	China Electric Power Yearbooks (2003-2005)
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods	Official released statistics; publicly accessible and reliable data source

and procedures actually applied :	
Any comment:	

Data / Parameter:	***$CAP_{thermal,y-n,y}$***
Data unit:	**MW**
Description:	The aggregate incrementally installed power capacity of thermal power generation sources (MW) in the CCPG in year *y* compared to that of year *y-n*
Source of data used:	China Electric Power Yearbooks (2003-2005)
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released statistics; publicly accessible and reliable data source
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

>>

The *ex-ante* emission reductions (ER_y) are calculated as follows:

$$ER_y = BE_y - PE_y - L_y$$

Where:

ER_y = Emission reductions in year *y* (tCO_2)

BE_y = Baseline emissions in year *y* (tCO_2)

$PE_{,y}$ = Project Emissions in year *y* (tCO_2)

L_y = Leakage emissions in year *y* (tCO_2)

y: = a given year

According to AMS.I.D Version 13, project emissions need not be considered.
Therefore, $PE_y = 0$.

According to AMS I.D Version 13, a leakage calculation is only needed if the renewable energy technology equipment is transferred from another activity or to another activity. This is not the case with the project activity.
Therefore, $L_y = 0$.

As a result: $ER_y = BE_y$

Refer to Section B.6.1. for equations used to estimate baseline emissions.

	Per year (average)	**7 years**
Operating Margin Emissions Factor ($EF_{OM,y}$ in tCO_2/MWh)	1.2779	1.2779

Build Margin Emissions Factor ($EF_{BM,y}$ in tCO_2/MWh)	0.6156	0.6156
Baseline Emissions Factor (EF_y in tCO_2/MWh)	0.9467	0.9467
Electricity supplied to the grid by the Project (EG_y MWh)	46,673	326,711
Baseline Emissions (*BE* tCO_2)	45,132	315,924

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

Year	Estimation of project activity emission (tCO_2e)	Estimation of baseline emission (tCO_2e)	Estimation of leakage (tCO_2e)	Estimation of overall emission reductions (Tco_2e)
2009*	0	45,132	0	45,132
2010*	0	45,132	0	45,132
2011*	0	45,132	0	45,132
2012*	0	45,132	0	45,132
2013*	0	45,132	0	45,132
2014*	0	45,132	0	45,132
2015*	0	45,132	0	45,132
Total (tonnes of CO_2e)	**0**	**315,924**	**0**	**315,924**

Using 12-monthly periods, not calendar years.

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:	Electricity supplied to the grid by the Project
Source of data to be used:	Measured
Value of data	46,673
Description of measurement methods and procedures to be applied:	Electricity will be measured with an electricity meter and data recorded monthly. The accuracy of the meter(s) is at least 0.5s.
QA/QC procedures to be applied:	The electricity meter(s) measuring power supply to the grid (the revenue meter(s)) will be calibrated according to the relevant national standard. Data

	measured by the revenue meter(s) will be cross checked by receipts of sales.
Any comment:	Data will be archived at least for two years after the end of the crediting period.

Please refer to Annex 4 for further background documentation.

B.7.2 Description of the monitoring plan:

>>

This section details the steps taken to monitor the GHG emissions reductions on a regular basis from the Luodu Small Hydropower Project in P.R.China.

The Monitoring set up for this project has been developed to ensure that from the start, the Project is well organised in terms of the collection and archiving of complete and reliable data.

1. CDM Monitoring Organisation

Roles and responsibilities will be defined for the relevant staff involved in CDM monitoring, and the prospect of nominating a CDM Manager will be considered. If appointed, the CDM Manager will have the overall responsibility for the monitoring system on this project. All staff involved in the collection of data and records will be coordinated by him.

2. Staff training

Training is conducted on site to ensure that staff is capable to perform their designated tasks at high standards. This will include CDM specific training to warrant that they understand the importance of complete and accurate data and records for CDM monitoring.

3. Maintenance and Calibration of monitoring equipment

The main electricity meter(s) (revenue meter(s)) will be calibrated in line with the relevant national standard JJG596-1999[24]. This will assure that the equipment operates at the stated level of accuracy. Back up meter(s) is installed in case revenue meter(s) is broken.

The power exported to the grid is a net amount since the meter(s) are 2-way, which take into account the power exported to the grid as well as the power imported. The net power exported to the grid is used for the emission reduction calculations.

4. Data collection and record keeping arrangements

All CDM relevant data will be measured & collected as detailed in section B.7.1. All data required for verification and issuance will be backed-up and kept for at least two years after the end of the crediting period or the last issuance of CERs of this project, whichever occurs later.

Data collected on site will be compiled in an electronic format which will be sent to EcoSecurities on a regular basis.

5. Data Quality Control and Quality Assurance

All data collected on site will be checked internally before being compiled in an electronic format to assure it is complete and of an appropriate quality. EcoSecurities will perform a final check of the data and analyse project performance prior to any verification.

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[24] Subject to evolution of the Standard.

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

>>

The application of the baseline study and monitoring methodology was completed on 14/12/2007. The entity determining the baseline study and the monitoring methodology and participating in the Project as the Carbon Advisor is EcoSecurities Group PLC, listed in Annex 1 of this document as a project participant.

Contact: Yuhuan Shen, EcoSecurities Group PLC
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Telephone: +8610-65181081 Email: Yuhuan.Shen@ecosecurities.com

Detailed baseline information is attached in Annex 3.

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:

>>
28/11/2006 (construction approval)[25]

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

>>
30 years

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:

>>
The crediting period will start on 01/09/2009, or on the date of registration of the CDM project activity, whichever is later.

C.2.1.2. Length of the first crediting period:

>>
7 years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
Not applicable

C.2.2.2. Length:

>>
Not applicable

[25] See approval letter by the Chongqing Jianghe Construction Supervision Company, This is the earliest date of implementation, construction or real action on the Project, since until this approval is granted, the Project cannot be implemented.

SECTION D. Environmental impacts

>>

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

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According to the clauses 13 and 19 of the Environmental Protection Law of the P. R. China, the Project entity must analyse the environmental impacts of project activities in P. R. China before utilising natural resources and beginning project construction. The Project Developer therefore commissioned a third party, the Sichuan Province Hydroelectric & Power Exploration Research Institute, to conduct the required environmental impact assessment (EIA) in 2004, and the EIA report was approved by the Yibin Municipal Environmental Protection Bureau in August 2004.

The environmental impacts of Luodu Small Hydro Project are not considered significant. The construction of the Project will help to meet the growing electricity demand in the local area. In addition, the Project implementation includes soil and water conservation measures and the three main pollutants (namely waste water, exhaust fumes, and solid waste) due to the construction of the Project are treated during the construction of the Project. The environment management and monitoring plan are properly arranged. There is no transboundary impact related to the Project. The EIA comes to the conclusion that from the perspective of environmental protection, the Project can be built at the selected site.

Where impacts of the Project were identified, mitigation measures were suggested and defined. The EIA highlights the following with regards to the Project, as shown in the table below.

Table D.1. EIA summary

Identified environmental impacts	Measures taken
Water pollution	Make the drain connected to the sedimentation tank.
	Waste oil collected and reused. Oil residual combusted.
	Wastewater collect from the staff and treated in dry latrine and septic tank
	Household rubbish collected and sent to Luodu waste treatment station
	Reservoir bottom cleaned
Air pollution	Buffer blast
	A showering system is to be installed to dampen and control dust
	Optimized construction technology
	Workers Equipped with anti-dust mask and cap
Noise pollution	Choose equipment with low noise, arrange construction time
	Limit transportation speed, restrict ringing in the evenings and improve road conditions.
	Workers Equipped with earplug and ear cover
Health Protection measures	Provide Sanitation education
	Implement epidemic prevention measures

	Implement environmental sanitation measures
Solid waste	To rubbish dustbin and waste transferring station;
	To Luodu waste treatment station.
Biodiversity and ecosystems	Additional land erosion will be prevented through installation of effective monitoring and site reclamation,.
	Grow water plants and constrain fish industry in the reservoir; control powerboat and monitor water quality
Resettlement	The dam built as part of the the Luodu project is expected to inundate farmland and inhabited land belonging to Luodu, Luobiao and Caoying Villages. 630.87 mu farmland, 23 mu forest and 9858.02m^2 inhabited land, which is 0.426 km^2 in total (mu is Chinese area unit, 1 mu= 666 m^2) are expected to be inundated by the project and 297 people of 11 hamlets are expected to be affected directly due to resettlement. All of them are farmers. No one will lose income due to the resettlement. No one will be affected indirectly due to loss of work places. A resettlement plan was discussed and agreed upon by the local government, representatives from affected people and the Project Developer. The resettlement plan is in line with the "Regulations on Land Requisition Compensation and Resettlement for Construction of Large and Medium-sized Water Conservancy and Hydropower Projects" and "P.R.China Law on Land Management". The local government is responsible to carry out all resettlement compensation measures.

A stakeholder consultation with 117 people was conducted as part of the EIA. The results of the survey have shown that the public has a positive attitude toward the construction of the Project. It is the general opinion that the construction of this Project could help to solve the conflict between power supply and demand, and promote sustainable development of the national economy.

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:

>>

With mitigation controls planned as part of the Project construction and EIA process, and the contribution made by the Project to sustainable development for the local and national area, the Project is expected to have an overall positive impact on the local and global environment. Mitigation measures ensure that there are no residual significant adverse impacts associated with the Project.

SECTION E. Stakeholders' comments

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

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The stakeholder consultation for the Project activity took place in June 2006. The event was carried out through questionnaires and the local stakeholders were invited to submit comments on the Project activity.

The questionnaires included a technical description of the Project as well as a brief explanation of what the Clean Development Mechanism of the Kyoto Protocol is and how it mitigates climate change and brings sustainable development benefits to the Host Country. The questions asked were as follows:

- What impacts do you think the CDM Project activity will have on the environment, employment and social welfare in the local area?
- Are there any negative impacts on your livelihood during the construction of the CDM Project?
- What would be the overall positive effects of the construction and operation of the CDM Project?
- What would be the overall negative effects of the construction and operation of the CDM Project?
- What is your attitude towards the construction of the CDM Project?
- Do you support the construction of the CDM Project?

34 questionnaires were sent to the stakeholders by the Project Developer. The stakeholders included local governmental officials (7 people), local resettlers (24 people) and related employees (3 people). A full list of stakeholders consulted is available from the Project Developer.

E.2. Summary of the comments received:

>>

The survey received 100% participation (34 questionnaires returned out of 34). The survey shows the stakeholders believe that the proposed CDM Project activity will have positive impacts on the local ecological, environmental, employment and social life. All stakeholders expressed their support to the proposed Project. A full list of the filled-in questionnaires is available from the Project Developer.

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

>>

No negative comments have been received on the Project.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

This Project will not receive any public funding.

Annex 3

BASELINE INFORMATION

Database used for combined margin emissions factor calculation.
Baseline Information: Central China Power Grid (including Henan, Hubei, Hunan, Jiangxi, Sichuan, Chongqing)

Table A1 Operating Margin Emission Factor of Central China Power Grid (2002)

Fuel Type	**Unit**	**Jiangxi A**	**Henan B**	**Hubei C**	**Hunan D**	**Chongqing E**	**Sichuan F**	**Subtotal G=A+B+C+D+E+F**	**EF (tC/TJ) H**	**Oxidation Factor (%) I**	**NCV (MJ/t, km^3) J**	**CO_2 emission（tCO_2e） K=G*H*I*J*44/12/10000（mass unit） K=G*H*I*J*44/12/1000 (volume unit)**
Raw Coal	10000t	1062.63	4679.02	1710	1113.78	398.57	1964.32	**10928.32**	25.8	100	20908	216150891.6
Clean Coal	10000t	2.72						**2.72**	25.8	100	26344	67786.27328
Other washed coal	10000t	3.66	26.49			249.99		**280.14**	25.8	100	8363	2216299.036
Coke	10000t		1.15					**1.15**	29.2	100	28435	35011.06767
Coke Oven Gas	10^8m^3			1.11				**1.11**	12.1	100	16726	82370.5322
Other Coal Gas	10^8m^3		2.16					**2.16**	12.1	100	5227	50091.3864
Crude oil	10000t		0.67	1.17			0.81	**2.65**	20	100	41816	81262.42667
Diesel	10000t	1	1.34	1.08	2.19	0.51	0.51	**6.63**	20.2	100	42652	209447.7642
Fuel Oil	10000t	0.33	0.16	0.34	0.69		1.51	**3.03**	21.1	100	41816	98025.48536
LPG	10000t		0.02					**0.02**	17.2	100	50179	632.9244533
Refinery Gas	10000t	0.49			1.9			**2.39**	15.7	100	46055	63364.46472
Natural Gas	10^8m^3						1.75	**1.75**	15.3	100	38931	382205.0925
Other petroleum products	10000t							**0**	20	100	38369	0
other coking products	10000t							**0**	25.8	100	28435	0
Other energy	10000tce		3.38					**3.38**	0	0	0	0
											subtotal	219437388

Data source: China Energy Statistics Yearbook **2003**

Table A2 Electricity Generation of Central China Power Grid (2002)

Province	**Electricity generation （MWh)**	**Used by the power station （%）**	**power output （MWh)**
Jiangxi	18648000	7.67	17217698.4
Henan	84734000	8.03	77929859.8
Hubei	34301000	7.73	31649532.7
Hunan	20058000	7.73	18507516.6
Chongqing	14727000	10.21	13223373.3
Sichuan	27879000	9.59	25205403.9
total			183733384.7

Data source: China Electric Power Yearbook 2003

Table A3 Operating Margin Emission Factor of Central China Power Grid (2003)

Fuel Type	Unit	Jiangxi A	Henan B	Hubei C	Hunan D	Chongqing E	Sichuan F	Subtotal G=A+B+C+D+E+F	EF (tC/TJ) H	Oxidation Factor (%) I	NCV (MJ/t, km^3) J	CO_2 emission（tCO_2e） K=G*H*I*J*44/12/10000（mass unit） K=G*H*I*J*44/12/1000 (volume unit)
Raw Coal	10000t	1427.41	5504.94	2072.44	1646.47	769.47	2430.93	**13851.66**	25.8	100	20908	273971539.9
Clean Coal	10000t							**0**	25.8	100	26344	0
Other washed coal	10000t	2.03	39.63			106.12		**147.78**	25.8	100	8363	1169146.396
Coke	10000t				1.22			**1.22**	29.2	100	28435	37523.77383
Coke Oven Gas	10^8m^3			0.93				**0.93**	12.1	100	16726	69013.1486
Other Coal Gas	10^8m^3							**0**	12.1	100	5227	0
Crude oil	10000t		0.5	0.24			1.2	**1.94**	20	100	41816	59490.22933
Diesel	10000t	0.52	2.54	0.69	1.21	0.77		**5.73**	20.2	100	42652	181015.941
Fuel Oil	10000t	0.42	0.25	2.17	0.54	0.28	1.2	**4.86**	21.1	100	41816	157228.9963
LPG	10000t							**0**	17.2	100	50179	0
Refinery Gas	10000t	1.76	6.53		0.66			**8.95**	15.7	100	46055	275069.6282
Natural Gas	10^8m^3					0.04	2.2	**2.24**	15.3	100	38931	489222.5184
Other petroleum products	10000t							**0**	20	100	38369	0
other coking products	10000t							**0**	25.8	100	28435	0
Other energy	10000tce		11.04			16.2		**27.24**	0	0	0	0
											subtotal	276414383.7

Data source: China Energy Statistics Yearbook 2004

Table A4 Electricity Generation of Central China Power Grid (2003)

Province	**Electricity generation （MWh)**	**Used by the power station （%）**	**power output （MWh)**
Jiangxi	27165000	6.43	25418290.5
Henan	95518000	7.68	88182217.6
Hubei	39532000	3.81	38025830.8
Hunan	29501000	4.58	28149854.2
Chongqing	16341000	8.97	14875212.3
Sichuan	32782000	4.41	31336313.8
total			225987719.2

Data source: China Electric Power Yearbook 2004

Table A5 Operating Margin Emission Factor of Central China Power Grid (2004)

Fuel Type	**Unit**	**Jiangxi A**	**Henan B**	**Hubei C**	**Hunan D**	**Chongqing E**	**Sichuan F**	**Subtotal G=A+B+C+D+E+F**	**EF (tC/TJ) H**	**Oxidation Factor (%) I**	**NCV (MJ/t, km^3) J**	**CO_2 emission（tCO_2e） K=G*H*I*J*44/12/10000（mass unit） K=G*H*I*J*44/12/1000 (volume unit)**
Raw Coal	10000t	1863.8	6948.5	2510.5	2197.9	875.5	2747.9	**17144.1**	25.8	100	20908	339092605.3
Clean Coal	10000t		2.34					**2.34**	25.8	100	26344	58316.13216
Other washed coal	10000t	48.93	104.22			89.72		**242.87**	25.8	100	8363	1921441.232
Coke	10000t		109.61					**109.61**	29.2	100	28435	3371295.779
Coke Oven Gas	10^8m^3			1.68		0.34		**2.02**	12.1	100	16726	161049.0787
Other Coal Gas	10^8m^3					2.61		**2.61**	12.1	100	5227	65029.107
Crude oil	10000t		0.86	0.22				**1.08**	20	100	41816	33118.272
Diesel	10000t		0.06			0.01		**0.07**	20.2	100	43070	2089.3257
Fuel Oil	10000t	0.02	3.86	1.7	1.72	1.14		**8.44**	21.1	100	42652	266627.3198
LPG	10000t	1.09	0.19	9.55	1.38	0.48	1.68	**14.37**	17.2	100	41816	464893.1434
Refinery Gas	10000t							**0**	15.7	100	50179	0
Natural Gas	10^8m^3	3.52	2.27					**5.79**	15.3	100	46055	177950.0723
Other petroleum products	10000t						2.27	**2.27**	20	100	38931	495774.6057
other coking products	10000t							**0**	25.8	100	38369	0
Other energy	10000tce							**0**	0	100	28435	0
			16.92		15.2	20.95		**53.07**	25.8	0	0	0
											Subtotal	346045809.7

Data source: China Energy Statistics Yearbook 2005

Table A6 Electricity Generation of Central China Power Grid (2004)

Province	**Electricity generation （MWh)**	**Used by the power station （%）**	**power output （MWh)**
Jiangxi	30127000	7.04	28006059.2
Henan	109352000	8.19	100396071.2
Hubei	43034000	6.58	40202362.8
Hunan	37186000	7.47	34408205.8
Chongqing	16520000	11.06	14692888
Sichuan	34627000	9.41	31368599.3
total			249074186.3

Data source: China Electric Power Yearbook 2005

Table A7 Operating Margin Emission Factor of Central China Power Grid

		2002	2003	2004	**OM in average**
Total CO_2 emission	tCO_2e	215081402.8	270902650	346045809.7	1.2779
Electricity generation	MWh	183733384.7	225987719.2	249074186.3	

Calculation of the Build Margin Emission Factor for the Central China Power Grid

Table A8 Emission factor of coal-fired plants, gas-fired plants and oil-fired plants in the Central China Power Grid

	Efficiency A	**Carbon content (tC/TJ)** B	**Oxidation factor (%)** C	**Emission factor (tCO_2/MWh)** D=3.6/A/1000*B*C*44/12
EF coal,Adv	38.44%	25.8	100%	0.8860
EF gas,Adv	N/A	15.3	100%	0.0000
EF oil,Adv	N/A	21.1	100%	0.0000
Source	National Study on China Climate Change by Tsinghua University. (http://www.ccchina.gov.cn/cn/NewsInfo.asp?NewsId=4141) There are no available data source for calculating the **EF gas,Adv** and E**F oil,Adv**, thus these two parameters have been set as "0", this is conservative since they are lower than **EF coal,Adv.**	2006 IPCC Guidelines for National Greenhouse Gas Inventories	2006 IPCC Guidelines for National Greenhouse Gas Inventories	

Table A.9. Share of different fossil fuels in the total CO_2 emissions from thermal power plants of the Central China Power Grid

Item	**Value**
λcoal	99.534%
λoil	0.244%
λgas	0.222%

Therefore $EF_{thermal}$ =99.534%*0.8860 =0.8818tCO_2e/MWh

Table A9 Installed capacity in Central China Grid in 2004

Type	**Unit**	**Jiangxi**	**Henan**	**Hubei**	**Hunan**	**Chongqing**	**Sichuan**	**Total**
thermal power	MW	5496.0	21788.5	9509.3	6779.5	3271.1	6900.3	53744.7
hydro power	MW	2549.9	2438.0	7415.1	7448.2	1407.9	13382.9	34642.0
nuclear power	MW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
wind farm and others	MW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total	MW	8045.9	24226.5	16924.4	14227.7	4679.0	20283.2	88386.7

Data source: China Electric Power Yearbook 2005; http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2006/20061215144747182.pdf

Table A10 Installed capacity in Central China Grid in 2001

Type	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
thermal power	MW	4869.8	15349.0	8077.3	4997.8	2898.3	6377.0	42569.2
hydro power	MW	2067.8	2438.0	7125.6	5966.1	1268.0	11531.5	30397.0
nuclear power	MW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
wind farm and others	MW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total	MW	6937.6	17787.0	15202.9	10963.9	4166.3	17908.5	72966.2

Data source: China Electric Power Yearbook 2002; http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2006/20061215144747182.pdf

Table A11 Installed capacity in Central China Grid in 2000

Type	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
thermal power	MW	4474.3	13789.0	8038.8	4477.4	2995.0	6090.1	39864.6
hydro power	MW	1846.0	1528.0	7070.5	5858.0	1327.0	11008.3	28637.8
nuclear power	MW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
wind farm and others	MW	0.0	0.0	0.0	0.0	0.0	0.0	0.0
total	MW	6320.3	15317.0	15109.3	10335.4	4322.0	17098.4	68502.4

Data source: China Electric Power Yearbook 2001; http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2006/20061215144747182.pdf

Table A12 Build Margin Emission Factor of Central China Power Grid

	2000	**New added capacity (2004-2000)**	**2001**	**2004**
Total Installed capacity (MW)	68502	19884	72966	88387
Thermal power Installed capacity (MW)	39865	13880	42569	53745
Hydro power installed capacity (MW)	4604	2477	6093	7081
Total change	**22.50%**		17.45%	
Split of new capacity		69.80%		

$EF_{thermal}$	0.8818
Build Margin Emission Factor	0.6156

Table A13 Baseline Emisson Factor of Central China Power Grid (tCO_2/MWh)

Operating Margin Emission Factor	1.2779
Build Margin Emission Factor	0.6156
Combined Emission Factor (C=0.5*A+0.5*B)	**0.9467**

Baseline Calculation

Table A14 Generation of Central China Grid in 2000

	Jiangxi A	**Henan B**	**Hubei C**	**Hunan D**	**Chongqing E**	**Sichuan F**	**Total in China Central Grid G=A+B+C+D+E+F**
Thermal generation(GWh)	14881	67999	27773	16574	12968	18733	158928
Hydro generation(GWh)	5225	2274	28140	21063	3822	36905	97429
Generation from other sources(GWh)	0	0	0	0	0	0	0
Total generation in province(GWh)	20106	70273	55913	37637	16790	55638	256357

Percentage of thermal generation in 2000	62%
Percentage of generation by all other resouces in 2000	38%

Data source: China Electric Power Yearbook 2001

Table A15 Generation of Central China Grid in 2001

	Jiangxi A	**Henan B**	**Hubei C**	**Hunan D**	**Chongqing E**	**Sichuan F**	**Total in China Central Grid G=A+B+C+D+E+F**
Thermal generation(GWh)	16191	76022	32045	19403	13687	20808	178156
Hydro generation(GWh)	5425	3572	27025	21340	3354	42839	103555
Generation from other sources(GWh)	0	0	0	0	0	0	0
Total generation in province(GWh)	21616	79594	59070	40743	17041	63647	281711

Percentage of thermal generation in 2001	63%
Percentage of generation by all other resouces in 2001	37%

Data source: China Electric Power Yearbook 2002

Table A16 Generation of Central China Grid in 2002

	Jiangxi A	**Henan B**	**Hubei C**	**Hunan D**	**Chongqing E**	**Sichuan F**	**Total in China Central Grid G=A+B+C+D+E+F**
Thermal generation(GWh)	18648	84734	34301	20058	14727	27879	200347
Hydro generation(GWh)	6151	4859	27854	25329	3748	44500	112441
Generation from other sources(GWh)	0	0	0	0	0	0	0
Total generation in province(GWh)	24799	89593	62155	45387	18475	72379	312788

Percentage of thermal generation in 2002	64%
Percentage of generation by all other resouces in 2002	36%

Data source: China Electric Power Yearbook 2003

Table A17 Generation of Central China Grid in 2003

	Jiangxi A	**Henan B**	**Hubei C**	**Hunan D**	**Chongqing E**	**Sichuan F**	**Total in China Central Grid G=A+B+C+D+E+F**
Thermal generation(GWh)	27165	95518	39532	29501	16341	32782	240839
Hydro generation(GWh)	3864	5457	38775	24401	3951	50000	126448
Generation from other sources(GWh)	0	0	0	0	0	0	
Total generation in province(GWh)	31029	100975	78307	53902	20292	82782	367287

Percentage of thermal generation in 2003	66%
Percentage of generation by all other resouces in 2003	34%

Data source: China Electric Power Yearbook 2004

Table A18 Generation of Central China Grid in 2004

	Jiangxi A	**Henan B**	**Hubei C**	**Hunan D**	**Chongqing E**	**Sichuan F**	**Total in China Central Grid G=A+B+C+D+E+F**
Thermal generation(GWh)	30127	109352	43034	37186	16520	34627	270846
Hydro generation(GWh)	3890	6884	69512	24236	5670	58902	169094
Generation from other sources(GWh)	0	0	0	0	0	0	
Total generation in province(GWh)	34017	116236	112546	61422	22190	93529	439940

Percentage of thermal generation in 2004	62%
Percentage of generation by all other resouces in 2004	38%

Data source: China Electric Power Yearbook 2005

Annex 4

MONITORING INFORMATION

FURTHER DETAILS OF THE MONITORING PLAN

Table 4.1. CDM Monitoring System Procedures

Procedure name	Description
CDM Staff training	This procedure outlines the steps to ensure that staff receive adequate training to collect and archive complete and accurate data necessary for CDM monitoring.
CDM data and record keeping arrangements	This procedure provides details of the sites data and record keeping arrangements. The arrangements ensure that complete and accurate records are retained by the CDM Manager, or an appropriate senior manager, within the quality control system.
Data collection	This procedure will outline the steps to collect the data from the revenue meter(s).
CDM data quality control and quality assurance	Data and records will be checked prior to being stored and archived. Data from the project will be checked to identify possible errors or omissions. The data checks will include meter(s) check, checks of the electricity figures on the receipts. All records will be checked for completeness.
Electricity meter check	This procedure outlines the steps to provide regular and preventative check to the meter(s).
Equipment failure	This procedure details the process of data collection in the case that a problem with any meter occurs.
Equipment calibration	This procedure details the process of organising and managing the calibration process. The procedure includes details of how a suitable company or organisation is commissioned to undertake the calibration to the relevant standards.

The above procedures will be available during the verification and will be documented as part of the monitoring support material. The procedures may be contained in a single document (e.g. a monitoring manual) for CDM monitoring rather than separate procedures.

Table 4.2. Operational procedures and responsibilities for monitoring and quality assurance of emissions reductions from the Project activity

Task	On-site technician	Operations manager	Project developer's head office	Head of Maintenance / External company	EcoSecurities
Collect Data	E	R	N/A	N/A	N/A
Enter data into Spreadsheet	N/A	E	R	N/A	N/A
Make monitoring reports	N/A	E	E/R	N/A	I
Archive data & reports	N/A	E	R	N/A	N/A
Calibration/ Maintenance	I	R	I	E	I

Legend: *E = responsible for executing data collection, R = responsible for overseeing and assuring quality, I = to be informed*

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