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

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Revision history of this document

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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Sichuan Miyaluo Hydroelectric Station
Version: 4[1]
Date:24/02/2009

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

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The Sichuan Miyaluo Hydroelectric Station (hereafter referred to as the "Project") developed by Li County Jiaxing Hydropower Development Co., Ltd (hereafter referred to as the "Project Developer") is a run-of-river small-scale hydropower project 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 15 MW, consisting of three 5 MW turbines, with a predicted electricity supply to the grid of 66,440 MWh per annum.

The project will utilise the hydrological resources of the Zagunao River in a run-of-river hydro power facility that will generate low emissions electricity for the Central China Power Grid (hereafter referred to as the "Grid"). The electricity currently generated by the grid is relatively carbon intensive, with an operating margin emission factor of 1.2909 tCO_2/MWh and a build margin emission factor of 0.6592 tCO_2/MWh. The project is therefore expected to reduce emissions of greenhouse gases by an estimated 64,782 t CO_2e per year during the first crediting period.

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

- Increases employment opportunities in the area where the project is located (70[2] people will be permanently employed for the project operation and the construction of the projects secures jobs in the construction sector) thereby contributing to poverty alleviation
- Enhances the local investment environment and therefore improves the local economy
- Diversifies the sources of electricity generation, which is important for meeting growing energy demands and the transition away from diesel and coal-supplied electricity generation
- Makes use of renewable hydroelectric resources.

A.3. Project participants:

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[1] Version history:

Version 1, dated 14/08/2007, submitted for Validation;

Version 2, dated 31/10/2007, revised for Validation Protocol;

Version 3, dated 30/05/2008, submitted for Registration;

Version 4, dated 24/02/2009, revised following Review process.

[2] Preliminary Design Report for Miyaluo Hydropower Station in Li County Aba State Sichuan Province

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)	Li County Jiaxing Hydropower Development Co., Ltd	No
Sweden	EcoSecurities Group plc	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):

>>
People's Republic of China

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

>>
Sichuan Province

A.4.1.3. City/Town/Community etc:

>>
Li County, Aba State

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 in the area of Li County, Aba State. The power plant is about 55 km away from the Li County. The exact location of the project is defined using geographic coordinates obtained using a Global Positioning System (GPS) receiver: Longitude 102°45′13″E; Latitude 31°41′ 43″N. These coordinates are for the site of the diversion dam.

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 proposed project is a run-of-river project constructed on the upper reaches of the Zagunao river, the right tributary of the Min river. It consists of a low diversion dam, without regulation and storage capacity, which directs part of the river flow into the water conveyance system. The power density of the Project is shown to be 1,899 W/m^2, which is well above 4 W/m^2.

The 6,954 m long water conveyance system consists of the water intake on the right bank of the river, a settling basin, a pressure tunnel, a pressure adjustment device and a pressure pipe. It forms a water head of 121 m and transports the water to the power house. In the power house, there are three HLA520-LJ-115 turbines and three SF5000-10/2600 generators, the installed capacity being 5 MW each. After power generation the water is discharged into the Zagunao river through a tailrace.

A 35kV one circuit transmission line (total distance 1 km) from the station to the 110 kV Miyaluo sub-station is used for connecting the station to the power grid[3].

Table A.4.1 Main technical parameters of the proposed project

	Value	**Source**
Installed capacity (MW)	15	Preliminary Design Report*
Annual operating time (hours)	4,452	Calculated according to the Preliminary Design Report
Expected annual power supply to the grid (MWh)	66,440	Preliminary Design Report
Water head (m)	121	Preliminary Design Report
Design flow (m^3/s)	14.82	Preliminary Design Report
Parasitic Power loss (%)	0.5	Preliminary Design Report

*****the Preliminary Design Report for Miyaluo Hydropower Station in Li County Aba State Sichuan Province was approved by the Development and Planning Committee of Aba Zangzu and Qiangzu Autonomous State in 2004

The Project started construction in August 2005[4] and is expected to start operation in March 2009.

The Project will use state-of-the art but proven technology in electricity generation and transmission. 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*	64,782
2010*	64,782
2011*	64,782
2012*	64,782
2013*	64, 782

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

[4] After consideration of CDM. Details are provided in the concluding paragraph of Section B.5.

2014*	64, 782
2015*	64, 782
Total estimated reductions (tonnes of CO_2e)	453,476
Total number of crediting years	7
Annual average of the estimated reductions over the crediting period (tCO_2e)	64, 782

* full years from March to March

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[5], the Sichuan Miyaluo Hydroelectric Station 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 Sichuan Miyaluo Hydroelectric Station at the closest point.

[5] 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 12, 10 August 2007, is applicable. 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 12, 10 August 2007[6] is applicable since:

- The project activity is a renewable electricity project (hydroelectric)
- The project has an installed capacity of 15 MW[7] (Decision -/CMP2 paragraph 28 (a).
- The electricity generated 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).

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, such as the Sichuan Miyaluo Hydroelectric Station, encompasses the physical, geographical site of the renewable generation source (see Table B.3.1. below).

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[6] According to the definition of Small Scale renewable energy project activity in the Paragraph 6 of the Decision 17/cp.7 in the document. FCCC/CP/2001/13/ADD/2, and the Appendix B to the decision 21/cp.8 of the document FCCC/CP/2002/7/Add.3, of simplified procedures for small-scale activities: Type I.D – Renewable Electricity Generation for a Grid, as "This category comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal, and biomass, that supply electricity to an electricity distribution system that is or would have been supplied by at least one fossil fuel or non-renewable biomass fired generating unit.

[7] The proposed project consists of three sets of 5MW turbines and generators, the total of which is exactly 15MW, as planned in the approved PDR and confirmed in the PDR approval letter from the local government (Development and Planning Committee of Aba Zangzu and Qiangzu Autonomous State and the Water Conservancy Bureau of Aba Zangzu and Qiangzu Autonomous State). The installed capacity of the proposed project will not exceed the 15 MW limit for small-scale CDM project activity, given the following reasons. Firstly, in China, once the installed capacity of a project gets approved by local authorities or government, it is not possible for the project developer to increase the installed capacity without the formal approval from the Chinese government. Secondly, the proposed project would not be able to exceed 15MW because of the limitation of water flow at the project site. Thirdly, the installed capacity can be confirmed by the Purchase Agreement of Turbines & Generators, which indicates clearly that the installed capacity of this project is 15MW (3*5MW); Fourthly, the capacity of the equipment installed on site was checked and confirmed during the site audit together with the DOE. Therefore, the installed capacity of the proposed project conforms to the small scale threshold of 15MW.

The baseline includes the emissions related to the electricity produced by the facilities and power plants to be displaced by the Sichuan Miyaluo Hydroelectric Station. This involves emissions from displaced fossil fuel use at power plants connected to the Central China Power Grid (See Table B.3.1. below).

Table B.3.1. 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	Central China Grid electricity production	CO_2	Included	According to AMS.I.D, only CO_2 emissions from electricity generation should be accounted for.
		CH_4	Excluded	According to AMS.I.D.
		N_2O	Excluded	According to AMS.I.D.
Project Activity	Sichuan Miyaluo Hydroelectric Station 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.

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

Variable	**Value / Unit**	**Original Data Source**
Operating Margin Emissions factor	1.2909 tCO_2/MWh	China Energy Statistic Yearbook 2004-2006 China Electric Power Yearbook 2002-2006
Build Margin Emissions Factor	0.6592 tCO_2/MWh	China Energy Statistic Yearbook 2006 China Electric Power Yearbook 2003-2006
Combined Margin Emissions Factor	0.9751tCO_2/MWh	China Energy Statistic Yearbook 2004-2006 China Electric Power Yearbook 2002-2006
Expected electricity supplied to the grid by the project in year y	66,440 MWh	Preliminary Design Report

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

Four realistic and credible alternatives to the project activity are considered to investigate the baseline:

Alternative 1: The proposed project activity without CDM, i.e. the construction of a new hydroelectricity generation plan with installed capacity of 15 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 4: Construction of a power plant using another renewable energy resource with the same installed capacity or the same annual power output

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 with 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 an investment barrier.

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) will be 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)[8]" published by the Ministry of Water Resources of the People's Republic of China, the IRR of small-scale hydro power projects in the country (smaller than 50 MW) should be higher than 10%. Therefore a 10% benchmark for the IRR of this Project is applicable and used to assess the Project.

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 (see Appendix 1 for details). As shown, the Project IRR without CDM financing was lower than the benchmark rate 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.5.1. Summary of project financial analysis without and with CDM financing

	Without CDM	With CDM
IRR	7.95%	11.97%

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

A sensitivity analysis was conducted by altering the following parameters:
- Electricity Tariff
- Investment Costs
- Operating Costs

[8] http://www.cws.net.cn/guifan/bz%5CSL16-95

Table B.5.2 summarizes the results of the sensitivity analysis, in showing the variations needed to reach the 10% benchmark.

Table B.5.2. IRR results of sensitivity analysis

	Variation of the parameter needed to reach the 10% IRR benchmark
Operating Costs	88.5% decrease
Investment Costs	18.5% decrease
Electricity Tariff	17.6% increase

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

These variations do not reflect a realistic range of assumptions for the input parameters of the financial analysis.

- **Operating costs:** Along with a rapid economic development, China is experiencing rising labour and materials costs. As a result, a significant 88.5% decrease in operating costs is not realistic and the IRR is not likely to reach the 10% benchmark.
- **Investment costs:** A 18.5% decrease in investment costs was very unlikely to happen, as many hydro power projects experience cost increases rather than cost savings during construction. For the proposed Project, some geological structures were discovered during the construction; the presence of these structures was not foreseen in the Preliminary Design Report (PDR). This, along with the rise in the price of construction materials, increased the investment costs by 18.5% compared to what was estimated in the PDR[9]. This shows that a decrease in investment costs was extremely unrealistic and that the IRR was not likely to reach the 10% benchmark.
- **Electricity tariff:** According to the Tariff Regulation by the National Development and Reform Committee, the electricity tariff given by the provincial grid to new projects should be based on the average tariff of the year before. The average electricity tariff in Sichuan Province was 244.79 RMB/MWh (including VAT) in year 2003[10]; the average electricity tariff offered to newly operational hydro power projects dispatched by Sichuan Power Grid was thus 244.79 RMB/MWh (including VAT) in 2004. The average electricity tariff was 250.10 RMB/MWh (including VAT) in year 2004[11]; the average electricity tariff offered to newly operational hydro power projects dispatched by Sichuan Power Grid was thus 250.10 RMB/MWh (including VAT) in 2005. This represents only a 2% increase. This shows that the electricity tariff is quite stable. As a result, the electricity tariff of the proposed Project was unlikely to be increased by 17.6% and the 10% benchmark unlikely to be reached[12].

These results show that only with highly unrealistic very favourable circumstances would it be possible to reach the Project IRR benchmark. In reality, circumstances are typically more unfavourable than projected and the IRR would decrease even further away from the benchmark. We can conclude that the IRR was lower than the benchmark for a realistic range of assumptions for the input parameters of the sensitivity

[9] Information about Opinions for Adjustment Report for Budgetary Estimate of Miyaluo Hydroelectric Station from Aba State Development and Reform Committee. (No.506[2006] of Aba DR)

[10] ChuanJiaFa (2004) No.155, Sichuan Provincial Power Bureau, the approval for the average tariff in Sichuan Grid in Year 2003

[11] ChuanJiaHan No.46 (http://www.scpi.gov.cn/newzcfg/zcfg-content.asp?id=930) 03/03/2005

[12] The average tariff at the time of the decision making (244.79 RMB/MWh including VAT in 2004) is comprised in the 17.6% increase included in the sensitivity analysis.

analysis, and therefore that the Project was not financially attractive. This demonstrates that the project activity would not be implemented without the CDM.

Table B.5.3. Main parameters used in the investment analysis

Name	Value	Source
Installed capacity (MW)	15	Preliminary Design Report
Expected power supplied to the grid (MWh)	66,440	Preliminary Design Report
Income tax (%)	0% for the first two years and then 15%	Preliminary Design Report
VAT (%)	17	Preliminary Design Report
Project lifetime (years)	30	Preliminary Design Report
Tariff, excluding VAT (RMB/kWh)	0.182	Preliminary Design Report
Investment for the power station (RMB)	73,248,000	Preliminary Design Report
Investment for the connection system (RMB)	16,030,000	Feasibility Study of the Connection System of the Miyaluo Hydropower Station
Operating costs (RMB)	2,351,600	Preliminary Design Report

The barrier analysis shows that the proposed project faces barriers that would prevent its implementation 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 project activity is thus not the baseline scenario and is deemed to be additional.

Table B.5.4. Summary of the Barrier Analysis

Barrier Evaluated	Alternative 1	Alternative 2	Alternative 3	Alternative 4
	The proposed project activity undertaken without being registered as a CDM project activity	Continuation of the current situation	Construction of a thermal power plant with the same installed capacity or the same annual power output	Construction of a power plant using another renewable energy resource with the same installed capacity or the same annual power output
Investment	Yes	No	This is not in line with applicable laws and regulations, and is not considered in the assessment of alternatives[13].	Sichuan Province lacks the other renewable sources, such as wind resources[14], solar energy[15]. So far, there was little use of the other renewable sources in Sichuan Province, the installed capacity of wind farms and other

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

[14] http://www.newenergy.org.cn/html/2003-9/2003991.html

[15] http://www.newenergy.org.cn/html/2003-8/2003883.html

				renewable energy technologies is 0 MW[16]. Therefore, *Alternative 4* is not realistic and credible and is not considered in the assessment of the alternatives

CDM revenues help partially mitigate the Project's financial unattractiveness by providing additional cash flows and raising the IRR up to 11.53%. As a result, the Project Developer considered the impact of the CDM on the project cash flow and reached consensus in May 2005 on the development of the Project and the introduction of the CDM to ensure the successful construction and operation of the Project[17]. Subsequently the Project Developer applied for a loan at the Agricultural Bank of China Li County Branch, which agreed to grant the loan in June 2005, when considering the additional CDM revenues[18]. In parallel the Project Developer contacted CDM consultants and commissioned in December 2005 Sichuan Huayuan Rural Electrization Development Co. Ltd to be in charge of the CDM application for this project[19]. This local consultancy, which had previously signed a CDM cooperation agreement with EcoSecurities[20], then put the Project Developer in touch with EcoSecurities. The Project Developer and EcoSecurities started negotiating an ERPA and signed it in October 2006[21]. This started off the work on the PDD. In February 2007 the Host Nation Approval was requested[22] and in August 2007 the PDD was submitted to validation[23]. The Project is still under construction and is expected to start operation in March 2009, later than scheduled due to delays caused mainly by the May 2008 earthquake that affected the Project

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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AMS I.D. (Version 12, 10 August 2007) offers two choices for preparing the baseline calculation for this type of project activity:

(a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the approved methodology ACM0002. Any of the four procedures to calculate the operating margin can be chosen, but the restrictions to use the Simple OM and the Average OM calculations must be considered.

OR

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[16] CHINA ELECTRIC POWER YEARBOOKS (2003-2006)

[17] See the Meeting minutes of Li County Jiaxing Hydropower Development Co., Ltd – May 2005

[18] See Letter from the Agricultural Bank of China Li County Branch granting a loan to the Miyaluo project – June 2005

[19] See the contract between Li County Jiaxing Hydropower Development Co., Ltd and Sichuan Huayuan Rural Electrization Development Co. Ltd – December 2005.

[20] See the cooperation agreement between Sichuan Huayuan Rural Electrization Development Co. Ltd and EcoSecurities – November 2005.

[21] See the ERPA signed between Li County Jiaxing Hydropower Development Co., Ltd and EcoSecurities – October 2006.

[22] See http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1212.pdf - approval granted in March 2007.

[23] See http://cdm.unfccc.int/Projects/Validation/DB/CQEPAQBL8SVC6HAJHZJJSGRPSM9GSJ/view.html

(b) The weighted average emissions (in kg CO_2equ/kWh) of the current generation mix.

Option (a) above will be applied for this project.

Of the procedures given within ACM0002 Consolidated methodology for grid-connected electricity generation from renewable sources for calculation of the operating margin, Option (a) will be applied (i.e. using the Simple Operating Margin). This is because low-cost must run resources constitute less than 50% of total grid generation (from 2001 to 2005 respectively, 37%, 36%,33%, 32% and 31% of the electricity generated in the Central China Power Grid came from the low-cost/ must run resources[24]), detailed data to apply option (b) is not available, and detailed data to apply option (c) is also unavailable.

This PDD follows the calculation steps published by the Chinese DNA (the Director Office of the Chinese National Climate Coordination body of NDRC[25]) to determine the Operating Margin (OM) emission factor and the Build Margin (BM) emission factor using the most recent data available[26].

The description below focuses on the key process of the calculation of the emission factor. Please see Annex 3 for the baseline data underlying the calculations.

a) *Simple OM emission factor*

The simple Operating Margin (OM) emission factor ($EF_{OM,simple,y}$) is calculated *ex-ante* as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants. A three-year average, based on the most recent fuel consumption statistics available at the time of PDD submission, is used.

Detailed data on the individual power plants connected to the grid is not available, therefore information by type of generating source has been used – please refer to Annex 3 for details.

$$EF_{OM,y} = \frac{\sum F_{i,j,y} \cdot COEF_{i,j}}{\sum GEN_{j,y}} \qquad \textbf{(1)}$$

Where:
$F_{i,j,y}$ is the amount of fuel i (in a mass or volume unit) consumed by relevant power sources j in years y,
j refers to the power sources delivering electricity to the grid, including low-operating cost and must-run power plants, and including imports to the grid,
$COEF_{i,j}$ is the CO_2 emissions coefficient of fuel i (tCO_2/mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources j and the percent oxidation of the fuel in years y, and
$GEN_{j,y}$ is the electricity (MWh) delivered to the grid by source j.

The CO_2 emission coefficient is obtained as

$$COEF_i = NCV_i \cdot EF_{CO2,i} \cdot OXID_i \qquad \textbf{(2)}$$

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[24] China Electric Power Yearbooks 2002-2006; refer to Annex 3 for detailed calculation.

[25] See http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2006/20061215911571 81.xls for the EF_{OM} and http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1374.pdf for the EF_{BM} of calculations

[26] China Energy Statistics Yearbook 2004-2006, China Electric Power Yearbook2003- 2006, 2006 IPCC Guidelines for National Greenhouse Gas Inventories

Where:
NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel *I* (country-specific values are used);
$OXID_i$ is the oxidation factor of the fuel (IPCC 2006 default values are used);
$EF_{CO2,i}$ is the CO_2 emission factor per unit of energy of the fuel *I* (IPCC 2006 default values are used).

$EF_{OM,y}$= 1.2909 tCO_2/MWh

For detailed information, please see Annex 3.
The Operating Margin emission factor ($EF_{OM,y}$) is calculated ex-ante, and cannot be changed during the crediting period.

b) *BM emission factor*
The Build Margin (BM) emission factor ($EF_{BM,y}$) is calculated as the generation-weighted average emission factor (tCO_2/MWh) of a sample of power plants *m*, as follows:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m}}{\sum_{m} GEN_{m,y}} \qquad \textbf{(3)}$$

$F_{i,m,y}$, $COEF_{i,m}$ and $GEN_{m,y}$ are analogous to the variables described for the simple OM method above for plants *m*.

The Build Margin emission factor $EF_{BM,y}$ is calculated *ex-ante* based on the most recent information available on plants already built for sample group *m* at the time of PDD submission.
However, due to the fact that data of power plant generation and fuel consumption is not currently available in the People's Republic of China, EB guidance on the application of approved methodology AM0005 now consolidated into ACM0002 can be applied for the purpose of estimating the build margin (BM) for each fuel type[27].

The formula derived from the deviation from the methodology is expressed as:

$$EF_{BM,y} = \frac{CAP_{thermal,y-n,y}}{\sum_j CAP_{j,y-n,y}} \bullet EF_{thermal,adv} \qquad \textbf{(4)}$$

Where:
$CAP_{thermal,y-n,y}$ is the incrementally installed capacity of thermal power generation sources (MW) in year *y* compared to that of year *y-n*;
$\sum_j CAP_{j,y-n,y}$ is the aggregate incrementally installed capacity of all kinds of power generation sources (MW) in year *y* compared to that of year *y-n*;

The way of defining "*n*" is the following:
The generation capacity addition used to calculate the BM has to be above 20% of the current electricity generation capacity in year *y*. "n" is therefore the number of years (y-1, y-2, …, y-n) which have to be considered to achieve the 20% capacity addition to the current electricity generation capacity.

The result for "n" should mean that:

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

$$\frac{\sum_j CAP_{j,y-n}}{\sum_j CAP_{j,y}} \geq 20\% \qquad \textbf{(5)}$$

From 2002 to 2005 (2005 being the most recent year for which data is available), the amount of capacity additions made up over 20% of the total capacity in 2005 in the Central China Power Grid. Therefore “n” = 3.

$EF_{thermal,adv}$ is the emission factor of thermal power generation sources of the applicable electricity system with the efficiency level of the best commercially available technology in the People’s Republic of China. It is calculated as follows:

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

Where:
$EF_{i,.adv,}$ is the CO_2 emission factor of fuel i (tCO_2/MWh) using the best commercially available technology in the People’s Republic of China and taking into account the carbon content and the oxidation factor of fuel i[28]
COAL, OIL and *GAS* represent solid fuel, liquid fuel and gaseous fuel respectively, and
λ_i is 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.

$EF_{BM,y}$= 0.6592 tCO_2/MWh

For detailed information, please see Annex 3.
The Build Margin emission factor ($EF_{BM,y}$) is calculated ex-ante, and cannot be changed during the crediting period.

c) *Combined margin emission factor*
The baseline emission factor (EF_y) is calculated as the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$), as follows:

$$EF_y = \omega_{OM} \cdot EF_{OM,y} + \omega_{BM} \cdot EF_{BM,y} \qquad \textbf{(7)}$$

EF_y =0.5*1.2909+0.5*0.6592=0.9751 tCO_2/MWh

Where:
- EF: baseline emission factor (tCO_2/MWh)
- ω_{OM}: Operating Margin weight, which is 0.5 by default
- $EF_{OM,y}$: Operating Margin emission factor (tCO_2/MWh)
- ω_{BM}: Build Margin weight, which is 0.5 by default
- $EF_{BM,y}$: Build Margin emission factor (tCO_2/MWh)
- y: a given year

Then baseline emissions (BE_y) are obtained as:

$$BE_y = EG_y * EF_y \qquad \textbf{(8)}$$

Where:

[28] See http://cdm.ccchina.gov.cn/website/cdm/upfile/file1051.pdf

BE: Baseline emissions (tCO_2)
EG: Electricity supplied by the project to the grid (MWh)
EF: baseline emission factor (tCO_2/MWh)
y: a given year

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:	15
Justification of the choice of data or description of measurement methods and procedures actually applied :	This data is from the Preliminary Design Report.
Any comment:	

Data / Parameter:	$F_{i,j,y}$
Data unit:	**t, m^3**
Description:	The amount of fuel *i* consumed by relevant power source *j* in years *y*.
Source of data used:	China Energy Statistics Yearbook 2004-2006
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:	$GEN_{j,y}$
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 Yearbook 2002-2006
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:	***Internal use rate of power station***
Data unit:	**%**
Description:	The internal use rate of power source *j* in each province connected to the CCPG.
Source of data used:	China Electric Power Yearbook 2004-2006
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
Data unit:	**MJ/t, kJ/m^3**
Description:	The net calorific value (energy content) per mass or volume unit of fuel *i*.
Source of data used:	China Energy Statistics Yearbook 2006
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:	$EF_{CO2,i}$
Data unit:	**tC/TJ**
Description:	The CO_2 emission factor per unit of energy of the fuel *i*.
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:	$OXID_i$
Data unit:	**%**
Description:	The oxidation factor of the fuel
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:	***$CAP_{m,y,j}$***
Data unit:	**MW**
Description:	The installed capacity of power source *j* of province *m* in years *y*.
Source of data used:	China Electric Power Yearbook 2003-2006
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 calculations are as follows:

$$ER_y = BE_y - PE_y - L_y$$

Where:

ER: Emission reduction (t CO_2e)
BE: Baseline emissions (t CO_2e)
PE: Project Emissions (t CO_2e)
L: Leakage emissions (t CO_2e)
y: a given year

$PE_y = 0$ as emissions by sources are zero since hydroelectric power is a zero CO_2 emissions source of energy.

According to AMS I.D Version 12, 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, $L_y = 0$.

Therefore: $ER_y = BE_y$

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

$$BE_y = EG_y * EF_y$$

Where:

BE: Baseline emissions (t CO_2e)
EG: Electricity supplied by the project to the grid (MWh)
EF: baseline emission factor (tCO_2e / MWh)
y: refers to a given year

See Table B.6.1 below for a summary of the values used and the results of the calculation.

Table B.6.1 Key Information and Data Used to Determine the Baseline Scenario

	Per year (average)	7 years
Operating Margin Emissions Factor (EF_{OMy} in tCO_2/MWh)	1.2909	1.2909
Build Margin Emissions Factor (EF_{BMy} in tCO_2/MWh)	0.6592	0.6592
Baseline Emissions Factor (EF_{CMy} in tCO_2/MWh)	0.9751	0.9751
Electricity generated by Project (EG MWh)	66,440	465,080
Baseline Emissions (BE tCO_2)	64,782	453,476

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

Year	**Estimation of project activity emissions (tCO_2e)**	**Estimation of baseline emissions (tCO_2e)**	**Estimation of leakage (tCO_2e)**	**Estimation of overall emission reductions (tCO_2e)**
2009*	0	64,782	0	64, 782
2010*	0	64, 782	0	64, 782
2011*	0	64, 782	0	64, 782
2012*	0	64, 782	0	64, 782
2013*	0	64, 782	0	64, 782
2014*	0	64, 782	0	64,782
2015*	0	64, 782	0	64, 782
Total (tonnes of CO_2e)	**0**	**453,476**	**0**	**453,476**

* full years from March to March

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 activity
Source of data to be used:	Measured
Value of data	66,440
Description of measurement methods and procedures to be applied:	Hourly measured and monthly recording
QA/QC procedures to be applied:	According to national standards, meters will be calibrated periodically. Data measured by meters will be cross checked by electricity sales receipt. The project developer and the grid operator will agree on a procedure for reading the main meter prior to the project's operational start date.
Any comment:	Data will be archived at least for two years after crediting period.

B.7.2 Description of the monitoring plan:

>>

This section details the steps taken to monitor on a regular basis the greenhouse gas emissions reductions from the Sichuan Miyaluo Hydroelectric Station in the People's Republic of China.

The Monitoring Plan 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. Monitoring organisation

The organisation of the monitoring team will be established prior to the start of the crediting period. Clear roles and responsibilities will be assigned to all staff involved in the CDM project 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 employees involved in CDM monitoring will have clearly defined roles and responsibilities. A CDM Manager, or an appropriate senior manager, will manage the process of training new staff, ensuring trained staff perform the monitoring duties and that where trained monitoring staff are absent, the integrity of the monitoring system is maintained by other trained staff.

All staff involved in the CDM project will receive some relevant training from either EcoSecurities, or a contracted consultant.(further details of the training procedure is provided in Annex 4). Records of trained CDM staff will be retained by the Project Developer.

A formal set of monitoring procedures will be identified prior to the start of the crediting period of the project. A description of these procedures is provided in Annex 4. They include issues such as training, data quality assurance and control, and relevant back-up procedures.

Li County Jiaxing Hydropower Development Co., Ltd and EcoSecurities will collaborate on the drafting of any new procedures. Any changes to procedures will need to be agreed to by both parties. The CDM Manager, or an appropriate senior manager, will be responsible for ensuring that the procedures are followed on site and for continuously improving the procedures to ensure a reliable monitoring system is established.

2. Monitoring equipment and installation

Given that the emission factor is calculated ex-ante, and referring to the Monitoring Methodology AMS ID, the only data to be monitored is the electricity supplied to the grid by the project (detailed in B.7.1). The electricity supplied to the grid will therefore be monitored primarily by the main revenue meter. As this meter provides the main CDM measurement, it will be a key part of the verification process.

Electricity meter should meet the relevant national standards at the time of installation. Before the installation, the meter should be calibrated according to the relevant national standards. Records of the meter (type, make, model and calibration documentation) will be retained in the quality control system.

3. Quality Assurance and Quality Control

The quality assurance and quality control procedures involves of data monitoring, recording, maintaining and archiving, internal check, staff training and monitoring equipment calibration. Please refer to the Annex 4 for the details.

The electricity supplied to the Grid will be double-checked against the electricity sale receipt. Calibration for the main meter will be implemented according to the national standards and rules. And all the records will be documented and maintained by the project developer and available to the verifier.

For further details on the CDM data quality control and quality assurance see the CDM Monitoring System Procedures in Annex 4.

4. Data recording procedure, management and archiving

The process for collecting the electricity meter data will be detailed in a procedure. A summary of this procedure is provided below.

At a fixed day of each month, the project developer and the grid company will take a meter reading and record this figure in the form of a receipt.

Each month the monitoring data needs to be filed electronically. The electronic files need to have CD/computer back-up and/or print-out. The project developer needs to keep a copy of electricity sale and purchase receipts.

All written documentation such as maps, drawings, the Environmental Impact Assessment (EIA) and the Preliminary Design Report, should be stored and should be available to the verifier so that the reliability of the information may be checked.

In order to make it easy for the verifier to retrieve the documentation and information in relation to the project emission reduction verification, the project developer should provide a document register. The document management system will be developed as part of an applicable procedure. All the data shall be kept until two years after the end of credit period.

For details of the operational and management structure used for the monitoring of the project activity, please see **Annex 4**.

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 30/05/2008. 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: Noémie Klein, noemie.klein@ecosecurities.com ; Ying Li, ying.li@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:

>>

22/08/2005 (construction permit)

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:

>>

01/03/2009 (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, 0 months

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>

Not applicable

C.2.2.2. Length:

>>

Not applicable

SECTION D. Environmental impacts

>>

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

>>

According to the clauses 13 and 19 of the Environmental Protection Law of the People's Republic of China, the project entity must analyse the environmental impacts of project activities in the People's Republic of China before utilising natural resources and beginning project construction. The project developer therefore commissioned a third party to conduct the required environmental impact assessment (EIA) in 2004, and the EIA report was approved by the Environmental Protection Bureau in Aba Zangzu and Qiangzu Autonomous State in April 2004.

The environmental impacts of the Sichuan Miyaluo Hydroelectric Station are not considered significant. There is no resettlement or relocation of population, buildings or public services required, therefore social and environmental influences are partial, short-term and reversible.

The main environmental impacts and the mitigation measures taken are summarized in the table below.

Identified environmental impacts	Measures taken
Water Environment	
Wastewater from concrete mixing	Treated by sedimentation.and then re-used.
Wastewater from the staff	Treated to meet the national discharge standards (GB8978-1996) and then used for irrigation.
River flow decrease in the section of the river that is diverted.	Maintain a minimum flow in this section of the river.
Air pollution	
Dust during the blast	Use of wet blast. Use personal protection equipment (PPE) on site.
Dust during the construction	Use showing to dampen and control dust/particulate matter.
Dust during the transportation	Supervise the transport of material/construction waste.
Noise pollution	
Blast and excavation during construction	Choose equipment with low noise, arrange construction time, and construction activity is banned in the evenings. Use personal protection equipment on site.
Transportation during the construction	Limit transportation car's speed while passing residential areas and forbid horn use during night and loud horn during the day.
Solid waste	
Waste from the construction	Sent to the specific landfill.
Waste from the staff	Collected and sent to the local waste treatment station
Biodiversity and ecosystems	
Parts of agriculture and forest will be removed	Reforest and restore the green lands after the construction.
Erosion impact assessment	
Land erosion in the project area occurring prior to the project activity,	Additional erosion will be prevented through implementation of measures such as effective monitoring

e.g. the movement onsite of construction-related vehicles	and site reclamation, and re-vegetation of the area affected by the construction.

A stakeholder consultation with 100 people was conducted as part of the EIA.

The results of the survey showed 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 improve the local economic development, 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

>>

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

>>

The stakeholder consultation for the project activity took place in July 2007. The local stakeholders were invited to submit comments on the project activity filling a questionnaire sent out by the project developer. 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 local environment?
- What impacts do you think the CDM project activity will have on 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?

40 questionnaires were sent to the stakeholders by the project developer. The stakeholders included local governmental officials (2.5% people), local residents (92.5% people) and related employees (5% 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 (40 questionnaires returned out of 40). The survey shows the stakeholders believe that the proposed CDM project activity will have positive impacts on the local ecology and employment. Some stakeholders expressed concerns about potential increased soil erosion in the area due to the project activity. 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:

Erosion mitigation measures prescribed within the EIA should address these concerns and ensure that there are no significant residual adverse effects related to the project.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Represented by:	-
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

This project will not receive any public funding.

Annex 3

BASELINE INFORMATION

Baseline Information for the Central China Power Grid (including Henan, Hubei, Hunan, Jiangxi, Sichuan, Chongqing)

Calculation of the Operating Margin Emission Factor of the Central China Power Grid

Table A1 CO_2 emissions from thermal power plants of the the Central China Power Grid (2003)

Fuel Type	**Unit**	**Jiangxi** A	**Henan** B	**Hubei** C	**Hunan** D	**Chongqing** E	**Sichuan** F	**Subtotal** E=A+B+C+D	**EF** （tC/TJ） F	**Oxidation factor (%)** G	**NCV MJ/t, kJ/m^3）** H	**CO_2 emissions（tCO_2e）** I=G*H*F*E*44/(12*100) （mass unit） I=G*H*F*E*44/(12*10) (volume unit)
Raw Coal	10000t	1427.41	5504.94	2072.44	1646.47	769.47	2430.93	13851.66	25.8	100%	20908	273971540
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
Coke	10000t				1.22			1.22	29.2	100%	28435	37142
Coke Oven Gas	10^8m^3			0.93				0.93	12.1	100%	16726	69013
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
Diesel	10000t	0.52	2.54	0.69	1.21	0.77		5.73	20.2	100%	42652	181016
Fuel Oil	10000t	0.42	0.25	2.17	0.54	0.28	1.2	4.86	21.1	100%	41816	157229
LPG	10000t							0	17.2	100%	50179	0
Refinery Gas	10000t	1.76	6.53		0.66			8.95	15.7	100%	46055	237285
Natural Gas	10^8m^3					0.04	2.2	2.24	15.3	100%	38931	489223
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

												total	276371085

Data source: China Energy Statistics Yearbook 2004

Table A2 Electricity Generation of the 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 A3 CO_2 emissions from thermal power plants of the 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, kJ/m^3)** J	**CO_2 emissions（tCO_2e）** K=G*H*I*J*44/(12*100)（mass unit） K=G*H*I*J*44(12*10) (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	58316.1
Other washed coal	10000t	48.93	104.22			89.72		242.87	25.8	100%	8363	1921441.2
Coke	10000t		109.61					109.61	29.2	100%	28435	3337011.4
Coke Oven Gas	10^8m^3			1.68		0.34		2.02	12.1	100%	16726	149900
Other Coal Gas	10^8m^3					2.61		2.61	12.1	100%	5227	60527
Crude oil	10000t		0.86	0.22				1.08	20	100%	41816	33118.3
Gasoline	10000t		0.06			0.01		0.07	18.9	100%		2089.3
Diesel	10000t	0.02	3.86	1.7	1.72	1.14		8.44	20.2	100%	43070	266627.3
Fuel Oil	10000t	1.09	0.19	9.55	1.38	0.48	1.68	14.37	21.1	100%	42652	464893.1
LPG	10000t							0	17.2	100%	41816	0.0
Refinery Gas	10000t	3.52	2.27					5.79	15.7	100%	50179	153506
Natural Gas	10^8m^3						2.27	2.27	15.3	100%	46055	495774.6
Other petroleum products	10000t							0	20	100%	38931	0.0
other coking products	10000t							0	25.8	100%	38369	0.0
Other energy	10000tce		16.92		15.2	20.95		53.07	0	0	28435	0.0
											total	346035810

Data source: China Energy Statistics Yearbook 2005

Table A4 Electricity Generation of the 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 A5 CO_2 emissions from thermal power plants of the Central China Power Grid (2005)

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, kJ/m^3)** J	**CO_2 emissions** （**tCO_2e**） I=G*H*F*E*44/(12*100) （mass unit） I=G*H*F*E*44/(12*10) (volume unit)
Raw Coal	10000t	1869.29	7638.87	2732.15	1712.27	875.4	2999.77	17827.75	25.8	100%	20908	352614496.8
Clean Coal	10000t	0.02						0.02	25.8	100%	26344	498.42848
Other washed coal	10000t		138.12			89.99		228.11	25.8	100%	8363	1804668.998
Coke	10000t		25.95		105			130.95	29.2	100%	28435	3986695.053
Coke Oven Gas	10^8m^3			1.15		0.36		1.51	12.1	100%	16726	112054
Other Coal Gas	10^8m^3		10.2			3.12		13.32	12.1	100%	5227	308897
Crude oil	10000t		0.82	0.36				1.18	20	100%	41816	36184.77867
Gasoline	10001t		0.02			0.02		0.04	18.9	100%	43070	1193.9004
Diesel	10000t	1.3	3.03	2.39	1.39	1.38		9.49	20.2	100%	42652	299797.7802
Fuel Oil	10000t	0.64	0.29	3.15	1.68	0.89	2.22	8.87	21.1	100%	41816	286959.0941
PLG	10000t							0	17.2	100%	50179	0
Refinery Gas	10000t	0.71	3.41	1.76	0.78			6.66	15.7	100%	46055	176572
Natural Gas	10^8m^3						3	3	15.3	100%	38931	655208.73
Other petroleum products	10000t							0	20	100%	38369	0
other coking products	10000t				1.5			1.5	25.8	100%	28435	40349.265
Other energy	10000tce		2.88		1.74	32.8		37.42	0	0	0	
											total	360323575

Data source: China Energy Statistics Yearbook 2006

Table A6 Electricity Generation of the Central China Power Grid (2005)

Province	**Electricity generation (MWh)**	**Used by the power station (%)**	**Power output (MWh)**
Jiangxi	30000000	6.48%	28056000
Henan	131590000	7.32%	121957612
Hubei	47700000	2.51%	46502730
Hunan	39900000	5.00%	37905000
Chongqing	17584000	8.05%	16168488
Sichuan	37202000	4.27%	35613474.6
total			286203304.6

Data source: China Electric Power Yearbook 2006

Table A7 Operating Margin Emission Factor of the Central China Power Grid

		2003	2004	2005	**Average EF_{OM}** (tCO_2/MWh)
Total CO_2 emissions	tCO_2	276371085	346035810	360323575	1.2909
Electricity generation	MWh	225987719.2	249074186.3	286203304.6	

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	35.82%	25.8	100%	0.9508
EF gas,Adv	47.67%	15.3	100%	0.4237
EF oil,Adv	47.67%	21.1	100%	0.5843
Source	Statistics by the State Electricity Regulatory Commission (SERC) on newly built thermal plants in the 10th "Five-Year Plan" period 2000-2005, and Data from the NDRC (http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1374.pdf)	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	99.48%
λoil	0.17%
λgas	0.35%

Therefore $EF_{thermal}$ =99.48%*0.9508 + 0.17%*0.4237 + 0.35%*0.5843 = 0.948 tCO_2e/MWh

Table A10 Installed capacity in the Central China Power Grid in 2005

Type	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
thermal power	MW	5906.0	26267.8	9526.3	7211.6	3759.5	7496.0	60167.2
hydro power	MW	3019.0	2539.9	8088.9	7905.1	1892.7	14959.6	38405.2
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	24.0	0.0	24.0
total	MW	8925.0	28807.7	17615.2	15116.7	5676.2	22455.6	98596.4

Data source: China Electric Power Yearbook 2006, http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1374.pdf

Table A11 Installed capacity in the Central China Power Grid in 2003

Type	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
thermal power	MW	5407.8	17635.5	8173.3	6446.7	3126.2	6104.0	46893.5
hydro power	MW	2307.4	2438.0	7337.2	6603.1	1329.8	12341.5	32357.0
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	7715.2	20073.5	15510.5	13049.8	4456.0	18445.5	79250.5

Data source: China Electric Power Yearbook 2004, http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1374.pdf

Table A12 Installed capacity in the Central China Power Grid in 2002

Type	Unit	Jiangxi	Henan	Hubei	Hunan	Chongqing	Sichuan	Total
thermal power	MW	5128.8	15904.5	8147.8	4975.6	3004.5	6142.0	43303.2
hydro power	MW	2197.4	2438.0	7213.9	6135.3	1195.5	11854.6	31034.7
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	7326.2	18342.5	15361.7	11110.9	4200.0	17996.6	74337.9

Data source: China Electric Power Yearbook 2003, http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1374.pdf

Table A13 Determination of the Build Margin of the Central China Power Grid

Type	**installed capacity in 2002** A	**installed capacity in 2003** B	**installed capacity in 2005** C	**new added installed capacity from 2002 to 2005** D = C - A	**Split of new capacity**
Thermal power	43303.2	46893.5	60167.2	16864	69.52%
Hydro power	31034.7	32357.0	38405.2	7370.5	30.38%
Nuclear power	0.0	0.0	0.0	0	0.00%
Wind farm and others	0	0	24.0	24	0.10%
Total	74337.9	79250.5	98596.4	24258.5	100%
Compared to the capacity in 2005	75.40%	80.38%	100.00%		

Therefore, EF_{BM} = 0.948*69.52% = 0.6592 tCO_2e/MWh

Table A14 Baseline Emission Factor of the Central China Power Grid (tCO_2/MWh)

A	Operating Margin Emission Factor (tCO_2/MWh)	1.2909
B	Build Margin Emission Factor (tCO_2/MWh)	0.6592
C	Combined Emission Factor (C=0.5*A+0.5*B) (tCO_2/MWh)	**0.9751**

Baseline Calculation

Table A14 Generation of the Central China Power 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 resources in 2001	37%

Data source: China Electric Power Yearbook 2002

Table A15 Generation of the Central China Power 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 resources in 2002	36%

Data source: China Electric Power Yearbook 2003

Table A16 Generation of the Central China Power 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	30168	24401	3951	50000	117841
Generation from other sources (GWh)	0	0	0	0	0	0	0
Total generation in province (GWh)	31029	100975	69700	53902	20292	82782	358680

Percentage of thermal generation in 2003	67%
Percentage of generation by all other resources in 2003	33%

Data source: China Electric Power Yearbook 2004

Table A17 Generation of the Central China Power 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	30372	24236	5670	58902	129954
Generation from other sources (GWh)	0	0	0	0	0	0	0
Total generation in province (GWh)	34017	116236	73406	61422	22190	93529	400800

Percentage of thermal generation in 2004	68%
Percentage of generation by all other resources in 2004	32%

Data source: China Electric Power Yearbook 2005

Table A18 Generation of the Central China Power Grid in 2005

	Jiangxi A	Henan B	Hubei C	Hunan D	Chongqing E	Sichuan F	Total in China Central Grid H=A+B+C+D+E+F
Thermal generation (GWh)	30000	131590	47700	39900	17584	37202	303976
Hydro generation (GWh)	5000	6700	32467	24100	6036	64498	138801
Generation from other sources (GWh)	0	10	0	0	0	0	10
Total generation (GWh)	35000	138300	80167	64000	23620	101700	442787

Percentage of thermal generation in 2005	69%
Percentage of all other resources in 2005	31%

Data source: China Electric Power Yearbook 2006

Annex 4

MONITORING INFORMATION

FURTHER DETAILS OF THE MONITORING PLAN

Table: 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 as well as the maintenance and operation for the monitoring equipments on site.
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 within the quality control system.
Data collection	This procedure will outline the steps to collect the data from the main electricity meter.
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 checks of the electricity figures on the receipts. All records will be checked for completeness.
Internal audits	This procedure will outline the process of internal audits, where the performance of the project will be assessed. It will also provide details on the follow-up of corrective actions arising after a third party verification.
Electricity meter check	This procedure outlines the steps to provide regular and preventative check to the main electricity meter.
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 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. It is worth noting that some procedures may already exist in the form of on-site practises.

Table: Operational procedures and responsibilities for monitoring and quality assurance of emissions reductions from the project activity
(E = responsible for executing data collection, R = responsible for overseeing and assuring quality, I = to be informed)

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 monthly and annual reports	N/A	E	E/R	N/A	I
Archive data & reports	N/A	E	R	N/A	N/A
Calibration/ Maintenance	I	I	R	E	I

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