CLEAN DEVELOPMENT MECHANISM
SIMPLIFIED PROJECT DESIGN DOCUMENT
FOR SMALL-SCALE PROJECT ACTIVITIES (SSC-CDM-PDD)
Version 02

CONTENTS

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>.

SECTION A. General description of the small-scale project activity

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

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The title of the project：Yuliangwan Small Hydroelectric Project (YSHP) ，Hunan Province，China
Version: V2
Date of Submission: 09/08/ 2006

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

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Description of the projects activity:

The Yuliangwan Small Hydropower Project (hereinafter referred to as "YSHP"), a run-of-river hydropower project, is located on Wushui River in Hongjiang Distric of huaihua City, Hunan Province, China. The total power capacity is 8 MW power station projects and the average annual export is 36.32 million kWh. The generated electricity will be connected to regional grid, which is a part of Central China Power Grid (CCPG).

YSHP constructs barrage, and through intake sluice, open ditch and tunnel to powerhouse to generate electricity. Total installed capacity will be 8MW, provided by two (2) 4MW turbines, and average annual output will be 36.32GWh. The project had been constructed on November, 2004, and the whole project will be terminated before December 31, 2006, but may be delayed due to the lack of financing.

Purpose of the project activity:

The main purpose of the projects activity is to generate electrical energy through sustainable means without causing any negative impact on the environment and to contribute to climate change mitigation efforts. Apart from the generation of electrical power, the project also contributes to the following:

(a) Sustainable development, through utilization of renewable hydro resources available in the project region

(b) Rural development due to the location of the project being in rural area

(c) Capacity addition to the present installed capacity and generation increase in the energy availability

Views of the project participants on the contribution of the project activity to sustainable development:

Due to their own nature, the Yuliangwan SHP will definitely contribute to local and national sustainable development goals. The project contributes to the sustainable development of the region in a number of ways as follows:

(a) Environmental well being

(b) Economic well being

(c) Social well being

Environmental well being:

(1) Since, the project uses renewable hydro resources for power generation; it does not lead to any emissions in the environment. It will contribute to the reduction of GHG emissions by displacing energy production using fossil fuels. In this, yearly reduces about 30,761.22 t CO_2 by using renewable resources for the generation of electrical energy.

(2) The project activity is a step towards environmental sustainability by saving exploitation and depletion of a natural, finite and non-renewable resource like coal/gas.

Economic well being:

(1) It contributes to poverty reduction by creating employment through the operation of the hydroelectric plant and conservation river basin activities.
(2) The project has created a business opportunity for local stakeholders such as suppliers, manufacturers, contractors etc.

Social well being:

(1)The projects have the ability to distribute some of its electricity to local inhabitants, improving their quality of life. The project activity results in alleviation of poverty by generating direct and indirect employment during construction of the project as well as during operation.
(2)The projects will have associated benefits such as job creation and increased the revenue of the municipality. During the project construction, there is a peak labor force of 350 mostly rural poor people, which otherwise would not have happened in the absence of the project. In addition, the project created direct permanent employment for about 30 persons for operation of the plant, which will create a sizeable demand to promote local shops, markets and services.
(3) More and more rural industries will be set up and new opportunities for development will be created as a consequence to the hydroelectric project in the area. This will result in infrastructure development, which ultimately lead to the rural development and prevent the migration of rural poor to cities.
In views mentioned above, proposed project activity strongly contributes to the sustainable development.

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)
Peoples' Republic of China (Host)	Hongjiang Yuliangwan Hydroelectric Co. Ltd	No
The Kingdom of Sweden	Carbon Asset Management AB	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.		

Host Country: People's Republic of China, which has ratified the Kyoto Protocol to the United Nations Framework Convention on Climate Change in September 2002

Yuliangwan hydroelectric project is operated, maintained and management by Yuliangwan Utilities Co.Limited. Yuliang Bay Utilities Limited is a private joint-stock companies, shareholders include Huaihua Baishun Co.Lt ,Hongjiang Sihai cotton Co.lt,., Hongjiang Development and Investment Limited, Xu hygiene, Panxiaoling, Peng Zhiren and Hechunhui, legal representative Dongwenxiao. The estimated total project investment is 86 million yuan and 60 million yuan currently been completed.

Carbon Asset Management AB is a part of Tricorona AB Sweden. Tricorona AB Sweden is listed on the Stockholm Stock Exchange since 1989. Shareholder's Equity is about 35 million Euros. (SEK330million). The shareholders include the 4th Swedish National Pension Fund.

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

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

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A.4.1.1. Host Party(ies):

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The People's Republic of China

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

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Hunan province

A.4.1.3. City/Town/Community etc:

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Huaihua City ,Hongjiang District

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

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, The proposed project will be located on the headstream of Wushui River, which located on the last stage stairs of Wushui water hydropowe ,8.31km down from Changtian hydroelectric power station about 1.5 km from Hongjiang City, with north latitude of27°06′ 08″ , east longitude of 109°09′ 30″ .Figure 1 below shows the location of Yuliangwan Hydropower Project .

Coordinates: Longitude 109°09′ 30″ , E

Latitude : 27°06′ 08″ N;

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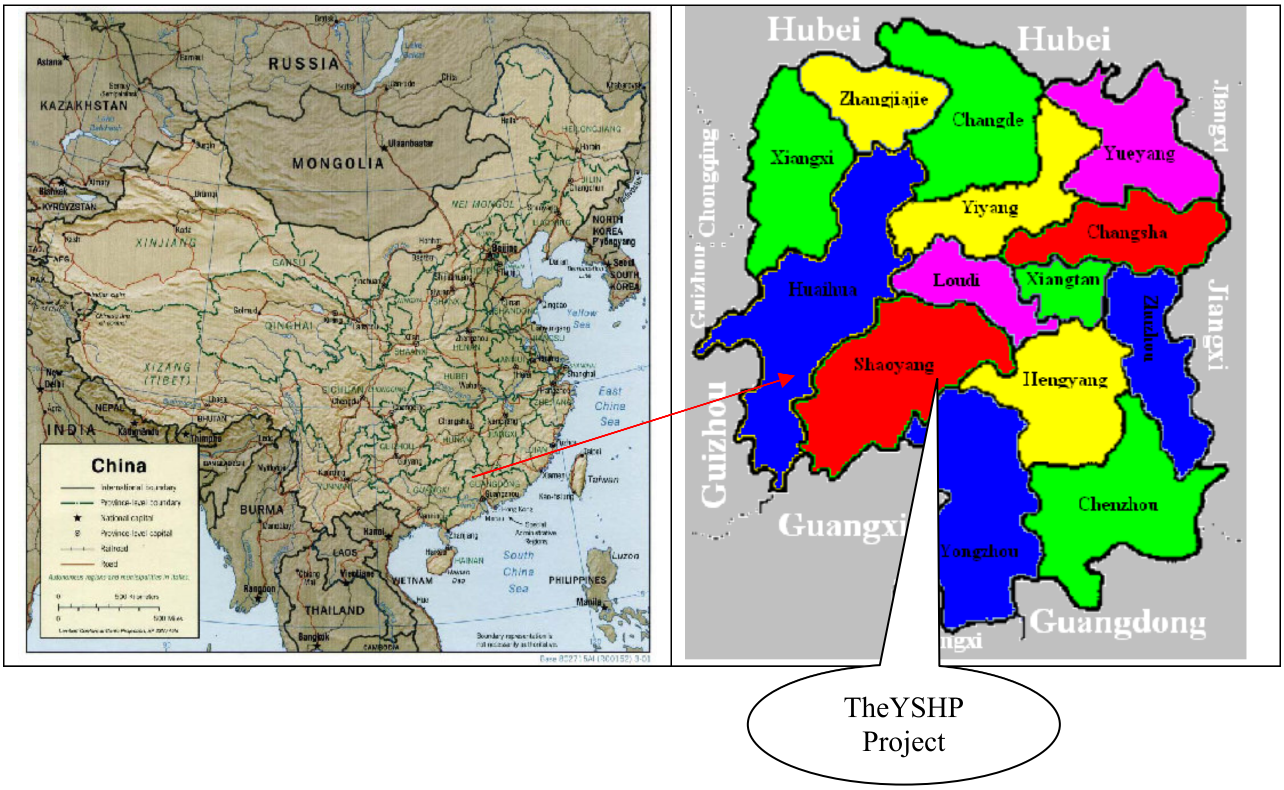

Figure 1 Location of Yuliangwan Hydropower Project

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

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Type and Category ：

The project activity utilizes the hydro potential for power generation and exports the generated electricity to the grid. Since the total capacity of the proposed project is only 8 MW ,which is less than the maximum qualifying capacity of 15MW established in the decision 17/CP. 7.paragraph 6(c)(i). The project activity has been considered as a small scale CDM project activity and UNFCCC indicative simplified modalities and procedures are applied. According to small-scale CDM modalities the project activity falls under:

Type – I Renewable Energy Projects
Category -I-D Renewable Electricity Generation for a grid.

Technical description of the project activity:
The total capacity of hydropower stations is 8 MW and average of multi-annual energy production estimated willo reach 36.32MWh.

The Yuliangwan SHP will use common run-of-river technology used in different countries.The technology or power generation process uses hydro resource and converts the potential energy available in the water flow into mechanical energy using hydro turbines and then to electrical energy using alternators. The generated power is to be supplied to the nearest grid sub-station for proper interconnection and smooth evacuation of power.
The various project components proposed are:

- Main dam on Wushui River
- Head race tunnel (HRT)
- Intake structure for diverting dam water into the HRT
- Surge tank
- Pressure shaft/ penstock
- Power house
- A tail race channel
- Switchyard at the down stream of powerhouse
- Inter-link with existing grid.

Table below provides the main design features and characteristics of the J-S SHP.

Design features and characteristics of the project

		Yuiangwan Hydrogen	
		First step	Sencond step
Capacity (MW)		4	4
Generation (MWh)		18.16	18.16
storage (Mm^3)		15.80	
Main Construction	Main Dam	Max 24.1 m high，112m long	
	strobe (m)	7 holes，7.3×12arc strobe	
	Plant size (m)	41.7×33.2×35.1	
	others	下游防洪墙、出口检修闸和尾水渠	

Equipment	Turbine	type	GZTFO8B-WP-370	GZTFO8B-WP-370
		unit	1	1
	Generator	type	SFWG-4500-48/3970	SFWG-4500-48/3970
		unit	1	1
		Capacity（kW）	4500	4500
	Transportation line		10.5kV×1.5km	

A 110 kV transmission line circuit connects the proposed project to the Huaihua Sangzhi County Grid, and then to the larger Hongjiang City Grid , and simultaneously , they will be connected to the Centre China Power Grid, which is linked to National System. Please see the flowchart below for an illustration of how the proposed project fits in with current grid setup.

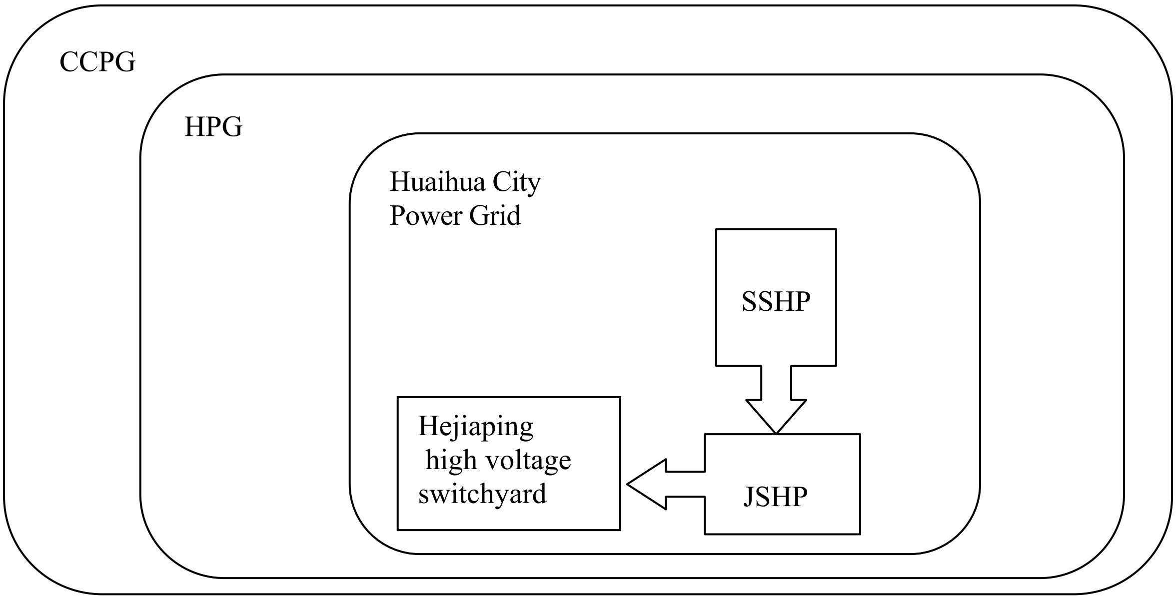

FIG 2.Transportation structure to the Power Grid

Environmental Safe Technology:
The technology, which has used worldwide, used is safe on environment. Characteristics of the JSHP and its construction methodology will not permit a negative damage to the ecosystem. Moreover, it will allow the project to conserve the biodiversity of this particular zone on the local region. The generation electricity from the Projects will enable the farmer to have electricity for cooking in dry season instead of fuel wood, directly contributing to protecting local forests and promoting sustainable development.

Technology transfer:
China possesses the technological capacity to manufacture the necessary components and skilled engineers to construct all the parts of the project. No technology transferred from other countries is involved in this project activity.

A.4.3. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed small-scale project activity, including why the emission reductions would not occur in the absence of the proposed small-scale project activity, taking into account national and/or sect oral policies and circumstances:

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Emissions Reductions from the Project:
The proposed project generates electrical power using hydro potential and exports the net generated power to the CCPG system. Hence, the generation by the proposed project activity is non-GHG source and it is expected that the proportion of fossil fuel based generation in the grid will be reduced by the project activity leading to less carbon intensity in the grid.

Quantity of emissions reductions out of the project:

The proposed activity, with its 8 MW installed capacity and effective annual generation of 36,320 MWh, will directly reduce the greenhouse gas emissions from existing and future generation facilities in the Chinese provincial electricity grid that use fossil fuels for thermal generation. Under the business as usual scenario, there will be continuing growth in thermal generation, primarily coking coal-based electricity generation.Considering the present energy mix in the Centre China Power Grid system, it is estimated that about 30,761.22 tons of CO_2 will be avoided every year.

A.4.3.1 Estimated amount of emission reductions over the chosen crediting period:

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The project will be first commissioned recently during January 2007 and the whole project will be operated in August 2007. Hence, the project activity will start generating emission reductions from January 2007 with the electricity capacity of 9.4MW and August 2007 with the electricity capacity of 8 MW.

Year	Annual estimation of emission reductions (tCO_2e)
2007	30,761.22
2008	30,761.22
2009	30,761.22
2010	30,761.22
2011	30,761.22
2012	30,761.22
2013	30,761.22
Total estimated reductions (tones of CO_2e)	215,328.54
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tones of CO_2 e)	30,761.22

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

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The project proponents hereby confirm that public funding from parties included in Annex-I is not involved in the project activity.

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

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

- With the same project participants
- In the same project category and technology
- Registered within the previous two years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small scale activity

The project participants hereby confirms that none of the above mentioned conditions are applicable to the project participants .The project proponents further confirm that they have not registered any small scale CDM activity or applied to register another small scale CDM project activity within the same project boundary, in the same project category and technology/measure.

SECTION B. Application of a baseline methodology:

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

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Project Type: I. Renewable energy project
Project Category: I D Renewable electricity generation for a grid

Reference: Appendix B of the simplified modalities and procedures for small scale CDM project activities in the latest version 09 (28th July 2006)

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

B.2 Project category applicable to the small-scale project activity:

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The Methodology is applicable to the proposed project for the following reasons:

- The project is a hydropower project, a grid-connected generation project from renewable source. The sum capacity of the of the technology or measure utilized in the is will remain 8MW every year during the crediting period, which is under the limits for small-scale CDM project activities as set in paragraph 6 (c) of the decision 17/CP.7.
- The power density of YSHP project is 7.7W/m^2. According to the “Thresholds and criteria for the legibility of hydroelectric power plants with reservoirs as CDM project activities” (http://cdm.unfccc.int/meetings/023/eb23_repan5.pdf), the project emissions from the reservoir may be neglected.

Grid System of the proposed project activity:

As per to ACM0002 (version06,19 May 2006), the system boundary for the proposed project is defined as the CCPG, with all the power plants in Hunan connected to it. The project boundary for the baseline will include all the direct emissions involving emissions from displaced fossil fuel used at power plants and other facilities related to the electricity producing which is to be replaced by the projects.

Emission factor for the grid :

Out of the methodologies specified in Appendix B to the simplified Modalities and Procedures for Small-Scale CDM project activities, the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO_2equ/kWh) calculated in a transparent and conservative manner .The first method：(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(version06,19 May 2006). Simple OM method of the four procedures is chosen to calculate the operating margin. Calculations must be based on data from an official source (where available) and made publicly available.

To more accurately and conveniently linked with the development of international rules and CDM focus areas CDM projects of China, according to the international CDM Executive Board approved the unified methodology ACM0002 (and the clarification of alternative calculation), China DNA--National Development and Reform Commission to coordinate the national response to climate change research group identified China's official the baseline emission factors of regional grid as terms of reference for the CDM project owners and developers to calculate emission reductions and prepare project documents. Because of the lack of necessary data, the value of China DNA released for the calculation of emission reductions is used in this document. Please see the website of China DNA http://cdm.ccchina.gov.cn/ And http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1029.pdf for more details. Baseline emission factors methodology, data sources and value explained below.

Step 1: Calculation of Operating Margin emission factor of the Centre China Power Grid Approximate Operating Margin Calculations:

Table 4 shows the installed power capacity in CCPG from year 2000 to 2004. The low-cost/must run resource is only hydropower plants because no wind power plants or tidal power plants in CCPG. Based on the installed capacity data of recent 5 years (2000-2004), the percentage of hydropower plant is less than 50% of the total installed capacity (See Table 4 for details). Thus, simple OM method can be chosen in this project.

Table 4 The installed power capacity in CCPG from year 2000 to 2004

	Installed capacity in 2000	Installed capacity in 2001	Installed capacity in 2002	Installed capacity in 2003	Installed capacity in 2004
	A	B	C	D	C

Thermal plants (MW)	39864.6	42569.2	43303.2	48578.5	53744.7
Hydro plants (MW)	28637.8	30397.0	31034.7	36822.6	34642.1
Total (MW)	68502.4	72966.2	74337.9	85401.1	88386.8
The percentage of Hydro plants to the total capacity (%)	41.81	41.66	41.75	43.12	39.19

As the dispatch data from the dispatch center or power producers isn't available in China, meanwhile low-cost/must run resources constitute less than 50% of CCPG generation in average of the five most recent years, The Simple OM method is adopted for the Calculation of Operating Margin emission factor. The latest available data for baseline calculation has been used for calculation purpose. The full generation-weighted average for the most recent 3 years (2002~2004) for which data are available at the time of PDD submission.

The Simple OM emission factor ($EF_{OM,simple,y}$) is calculated as the generation-weighted average emissions per electricity unit (tCO2/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants:

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

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(2002~2004), j refers to the power sources delivering electricity to the grid, not including low-operating cost and must run power plants, and including imports6 to the grid,

$COEF_{i,j\,y}$ is the CO2 emission coefficient of fuel i (tCO2 / 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 year(s) y, and

$GEN_{j,y}$ is the electricity (MWh) delivered to the grid by source j.

In the China Electric Power Year Book and other data resources, only generation data is available. The generation from source j can be translated into electricity delivered to the grid by source j by the following formulation:

$$GEN_{j,y} = G_{j,y} \times (1 - e_{j,y}) \qquad (2)$$

Where *Gj,y* is the amount of generation (in MWh) by source j in year y;

$e_{j,y}$ is the rate of plant self consumption of source j in year y. The default value is 10% according to the 'Economic evaluation for hydropower project construction SL72-94' (seehttp://www.cws.net.cn/guifan/new_show_05_jj.asp?id=75)

The CO2 emission coefficient COEFi is obtained as:

$$COEF_i = NCV_i \cdot EF_{CO2,i} \cdot OXID_i \qquad (3)$$

where:

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

$OXID_i$ is the oxidation factor of the fuel (see page 1.29 in the 1996 Revised IPCC Guidelines for default values),
$EFCO_{2,i}$ is the CO2 emission factor per unit of energy of the fuel i.
Where available, local values of NCV_i and $EFCO_{2,i}$ should be used. If no such values are available, country-specific values (see e.g. IPCC Good Practice Guidance) are preferable to IPCC world-wide default values.

Moreover, according to the ACM0002, for the purpose of determining the Operating Margin (OM) emission factor, use the following options to determine the CO_2 emission factor for net electricity imports ($COEF_{i,j,imports}$) from a connected electricity system within China: (b) the emission factor(s) of the specific power plant(s) from which electricity is imported, if and only if the specific plants are clearly known, or(c) the average emission rate of the exporting grid, if and only if net imports do not exceed 20% of total generation in the project electricity system. Electricity exports should not be subtracted from electricity generation data used for calculating and monitoring the baseline emission rate.

Step 2: Calculation of Build Margin Emission factor
According to the methodology ACM0002, The Build Margin is calculated from the sample group comprising the most recently additions to the grid that comprise 20% of the system generation, which contributes larger generation.

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \times COEF_{i,m,y}}{\sum_{m} GEN_{m,y}} \qquad (4)$$

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

The calculating procedure is as following:
Firstly, the amount of newly added installed capacity and various electricity generation technologies are calculated; Secondly, the ratio of each electricity generation technology is calculated; at last, the Build Marge Emission Factor is calculated based on the most efficient commercial technology.

As per the clarification on use of approved methodology AM0005 for several projects in China, Capacity additions during last 1 - 3 years for estimating the build margin emission factor for grid electricity and weights estimated using installed capacity in place of annual electricity generation was used in the estimated progress of BM. Because of conservative principles of the alternative method, it will be underestimated China BM.

Step 3: Calculation of Combined Margin Emission factor
The baseline emission factor i.e. the Combined Margin emission factor will be calculated as the average of E_{OM} and E_{BM}.

$$EF_y\,(tCO_2/MWh) = \omega_{OM} * EF_{OM,\,simple,\,y} + \omega_{BM} * EF_{BM,y} \qquad (5)$$

where the weights ω_{OM} and ω_{BM}, by default, are 50% (i.e., wOM = wBM = 0.5), and EFOM,y and EFBM,y are calculated as described in Steps 1 and 2 above and are expressed in tCO_2/MWh.

Data resources:

For the calculation of baseline emission factors , coal, fuel oil, diesel and gas fuels low heat value, the sub-species of fuel potential carbon emission factors and the rate of oxidation etc sources from the electricity sector of *Initial National Communication on Climate Change* and also can be seen in table 2. Submitted 2004 by the China climate change initial national communications.

Table 1 Fuel Related Parameters

	NCV (GJ/t,m^3)	Emission factor per TJ of fuel (tC/TJ)	Oxidation factor (%)
Coal	19.22	26.72	96.56
Fuel Oil	40.19	21.1	99
Diesel	43.33	20.2	98.74
Gas Fuel combined	19.54	13.22	99

Data used for OM calculation such as plant / unit level capacity, electricity generation, electricity rates for auxiliary power system, coal consumption for per electricity generation, fuel types for power generation, fuel consumption and other detailed data from China Electricity Council

The data sources of each power plant/generator unit for OM calculation, such as the installed capacity, electricity amount, and ratio of plant self consumption, net calorific value per ton or m^3 of a fuel, electricity delivery efficient, type of fuel and amount of fuel consumption, are from China Electricity Council, (CEC), a consolidated organization of all China's power enterprises and institutions, which is also a non-profit social and economic organization. The data base covers the whole country.

Because of data available limitations, the calculation of BM did not use plant / unit level power supply and sub-species fuel consumption data. Data from *China Electric Power Yearbook*, and some other sources of statistical data (to distinguish from electricity and gas oil electricity) is used.

On the basis of EB clarified alternative approaches and China's current situation, the efficiency level of the best technology commercially available in the national grid identified as follows : 60 million domestic electricity sub-critical plant efficiency 37.6% (327 gce/kWh), gas turbine electric power plant efficiency to 45.9% (268 gce/kWh).

Because the data of electricity generation and the fuel consumption of each power plants/ electricity generation unit are unavailable, the BM was calculated based on the statistic data from the Chinese Electricity Yearbook and other source (to differentiate the electricity generated from oil or gas). According to the alternative method clarified by CDM EB and Chinese present situation, the technical parameters of the most advanced commercial technology are: the power supply efficiency is 37.6% (327 gce/kWh) for sub-critical power plant and 45.9% (268 gce/kWh) for flaming power plant. According to the data publicized on 8th August 2006 from the National Development and Reform Committee(China DNA), the Building Marge of CCPG is 0.6829 tCO_2/MWh (see: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1025.pdf) 。

Table2 Emission factors for CCPG

OM （tCO2/MWh）	BM（tCO2/MWh）	CM（tCO2/MWh）
1.1910	0.6829	0.93695

Note :

1. The data in the table will be based on public data availability and the need for timely necessary updating.

The data was obtained from DNA of China。

The baseline emissions are calculated by multiplying the Baseline emission factor calculated as above .The EF_{OM} is estimated as 1.1910 tCO_2/MWh. The EF_{BM} is estimated as 0.68290 tCO_2/MWh, therefore baseline Emission factor (Average EF_{OM} & EF_{BM}) is 0.93695 tCO2/MWh

B.3. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

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Justification for application of simplified methodologies to the project activity.

The total installed capacity of the project is 8 MW, which is less than the limiting capacity of 15 MW and is thus eligible to use small-scale simplified methodologies. Further, the project activity is generation of electricity for a grid system using hydro potential. The projects activity under consideration generates about 36,320MWh of electricity annually and will continue to operate for a period of 50 years. This non-GHG electricity is fed into the regional electricity grid, which practically replaces the electricity generated by fossil fuels contributing to the grid thereby improving the grid energy mix (more contribution from non-GHG sources). Hence, the type and category of the project activity matches with I.D. as specified in Appendix B of the indicative simplified baseline and monitoring methodologies for small-scale CDM project activities.

Justification for additionality of the projects :

The approved methodology AMS-I.D prescribes the use of Attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities for determining whether the project is additional. The Attachment A asks the project proponents to justify the additionality by showing that the project activity (and so the GHG emission reduction) faced prohibitive barriers such as:

- Investment barrier
- Technological barrier
- Barrier due to prevailing practice
- Other barriers

The propsed Project faced a combination of these barriers as explained below. The project, therefore has been proposed as a CDM project to overcome these barriers.

Barrier Analysis:

According to Attachment A to Appendix B of the simplified modalities and procedures for CDM small-scale project activities evidence to why the proposed project is additional, Project participants identified the following barriers for the proposed project activity:(a) investment barrier, (b) technological barrier, and (c) prevailing practice.

(a) Investment Barrier

According to the “Economic Evaluation Code for Small Hydropower Project SL16-95” (see also http://www.cws.net.cn/guifan/bz%5CSL16-95), the sectoral benchmark FIRR on total investment for small hydropower projects is 10%. A project will be financially acceptable when the FIRR is better than the sectoral benchmark FIRR. In the remote western area, due to the relatively poorer economic base, causing more risks to the project than it may happen to the project in a more developed area, the project developer always expects a higher investment return hurdle for them to face the extra challenges. In the area of the proposed project, it's commonly expected that the project rate of return should be more than 10% to be financially attractive.

The proposed project is located in Wushui river, Hongjiang District witch in Huaihua ,Hunan province ,distance from the Yuanjiang mouth only ?m. The project is about to located in last level of basin hydropower development stairs with poor water availability.Hongjiang District has a 500 years of history with ancient Mall, formerly "small Nanjing",and the acient Mall has been included in key units to be protected. Due to the currently working on tourism development, and the developed industry with large electricity demand, electricity tension in Hongjiang District is growing.

In order to alleviate the pressure on electricity and accelerate local economic development, from 2003 onwards, Hongjiang District Municipality began to seek investment from eastern coastal areas to develop ,however, because of lack of power resources,it has had very little effect. 2004 May, Hongjiang Yuliang Bay Utilities Limited was established to begin the development for Yuliang Bay hydroelectric projects. On the one hand because of the small size of the relatively high cost of power generation units, on the other hand, because of the remote users could pay only a lower price level, the project's internal rate of return of only 8.39%, hydropower projects can not achieve the benchmark yield 10%, the economy is not very good. The project will report financial data analysis following table:

Table 2 Sensitive analysis of the proposed project

Parameters	Range	IRR（%）	Time to callback investment （years）
Generation price	+10%	+10%	9.57
	0	0	8.13
	-10%	-10%	7.08
Total investment	+10%	+10%	7.11
	0	0	8.13
	-10%	-10%	9.21

As shown in Table above, the IRR of total investment of the proposed project varies to different extents, when the above two financial indicators fluctuated within the range from -10%~10%. Assuming these three parameters to change within the range between (-10%~10%), then the outcomes of IRR sensitivities is presented in the following table. It's displayed in the Table above that the IRR of total investment doesn't exceeds the benchmark when the total investment decreases by 10%.

Thanks to the relevant preferential policies of Hongjiang District ,the IRR rise to the benchmark level, the project investors has been successful gain around 57% of the total investment of bank loans, thus the project construction preparations began.

However, in the process of construction of the project, certain unforeseen factors considerably change, which lead to the increase of investment in the project, so if there is no further financial support , the project construction cannot be carried out, not only fail to achieve its goal of power generation and the constructed part will also be abandoned. The factors leading to increased investment in the project and its impact as follows:

1. As national policy has adjusted, the actual building process, the compensation standards of resettled migrants become higher,thus cause additional investment of 150 million.
2. The site will be compatible with the development of tourism and urban planning of Hongjiang District,so the project abandoned the location with relatively good economic and geological conditions,as a result, the location of design changes caused additional investment of 695.87 million.

3. By the need to meet the development demands of the project location City, traffic problems has to be solved,thus design and construction of additional highway bridge over the dam and cross-strait road lead to additional investments of 3.3 million yuan, of which 1.5 million yuan from the government. The actual additional investment is 1.8 million.

4. The materials and labour costs rise, and the acquisition and installation of equipment increase investment by 5.35million, the changes of acquisition and installation of equipment such as metal structure increase investment by 3.81 million, resulting in total additional investment by 9.17 million.

5. To complete the project which total project works increased, extra pay for the construction and engineering technicians wage increase spending 1.20 million.

For these geological conditions, transportation, raw materials prices, land acquisition and compensation standards and Young tax increase and other reasons, led to a further increase of about investment projects 2062.864 million, representing 23% of total project investment. Seriously affected the economy of the project, and mainly due to funding reasons, the project completion period stipulated seriously lagging behind. As the face of difficulties, the project developer had to seek other financial support. Project investors have sought banks, the government and other investors for investment. However, due to increased investment in the project, its internal rate of return can not reach the benchmark yield 10% hydropower project, and therefore whether the investment or loan creditor faced more hurdles to be overcome.

Facing the difficult situation, the project construction had to be suspended. The proposed project developer had to seek for additional financing support to continue the project development.

To make certain the CDM feasibility on the proposed project, the project developer had asked for support from Local DRC and Hunan CDM Project Service Center in early 2006. Both the Local DRC and Hunan CDM Project Service Center expresses a clear attitude that the Local DRC will fully support the proposed project for the development of CDM project in order to overcome the financial difficulties. The potential CDM revenue was identified by the project developer to be a practicable financial source to increase the project investment return, and thus attracting more investments to overcome the barriers. With the expected CDM revenue support, the project developer was finally able to find necessary financial investment support. The project developer arranged to borrow 8 million RMB from the Sangzhi Rural Credit Cooperative Union (SRCCU) and most of the other financing tasks have been completed . The story of the proposed project development clearly proves that the investment barriers of the proposed project truly existed, and the CDM has played a key role in tackling these barriers.Then a conclusion can be made that considering the key parameters, the proposed project need support from CDM to make it financially attractive.

Assume a CER price of US$ 7 / tCO_2e, a 7 year crediting period, and an exchange rate of 8.11 RMB/USD, the IRR analysis results of SSHP are as follows:

Without CDM revenue	6.47%
With CDM revenue	10.58%

Table above shows the fluctuating situation of IRR of the SHP based on current status under the condition of with and without CDM revenues. Without the CDM revenue, the IRR of total investment is lower than the benchmark rate of 10%. Thus the proposed project does not look financially attractive to the investors. However, with the CDM revenue, IRR of total investment is significantly improved and exceeds the benchmark rate. Therefore, the proposed project with the CDM revenue can be considered as financially viable to the investors. The CDM revenue will enable the project to overcome the investment barrier and demonstrate the additionality of the proposed project.

(b) Technological Barrier:

Generating capacity of small hydropower stations is impacted by changes of water. Small hydroelectric power supply is generally considered not as reliable as coal-fired power plant, because the hydroelectric power production is much affected by the impact of rain and hydroelectric power generation is correspondingly reduced for water shortages in the winter season. Moreover, small size led to the relatively high unit cost. Because of the effects of economies of scale due to the relatively high efficiency of power generation, projects over 15MW are more accessible to financial support. The proposed hydroelectric project being a river-bed type and a small hydropower scale, power generation is highly dependent on water witch can make it normally generate for less than 5 months. So the relative risk is high, thus reducing the attractiveness to investors.

(c) Prevailing Practice:

It is obvious that the investment on a hydro plant is much higher than that of coal fired power plants. Thus the trend in energy investment has favored of thermal technologies which require less initial investment, shorter construction time, and a steady-going income, which implies fewer risks compared to hydroelectric plants. The current prevailing practice in China is coal, as coal is an abundant and cheap source of energy in China. As the objective of the province is to reach a "power balance", coal-fired plants will increase in excess of proportional to overall increases in capacity generation over the next few years.

The trend in energy investment has favored thermal technologies that require less initial investment and shorter lead times, which implies fewer risks compared to hydroelectric plants. Additionally, the operation of the thermal plants is not subjected to hydrologic cycles. Under free electric market conditions, thermal projects turn out to be more profitable than hydroelectric projects, even taking into account the CDM incentives. Over 28 million Chinese people, Mainly, these people living in the regions that are remote from the electricity supply grids, still have no access to electricity. In many cases, these geographical areas are rich in other sources of energy, e.g. hydropower. However, as the locals in such areas live in poverty they seldom can afford the electricity.

The hydro power resource is quite abundant in Hunan Province; the theoretic potential is about 1.532×10^7 kW according to the investigative report, but only 43.2% of these potential has been exploited by the end of 1999 (data source: http://www.hwcc.com.cn/newsdisplay/newsdisplay. asp?Id=94296), and about only 45.9% of the these hydro potential has exploited by the end of 2002 (data source: http://www.shp.com.cn/showcontent.asp?id=3648).

Summary:

From the barrier analysis above, it can be concluded that the projects are significantly distinguishable from existing power plants and clearly not the business as usual. Without the presence of the CDM and the availability of carbon financing, the projects would not have confronted the barriers elaborated above. Carbon funding will provide critical support for the projects.

The current and expected practice of predominantly relying on thermal sources and large hydro in expanding the generation capacity, combined with lack of access to finance, technical and prevailing practice barriers, clearly demonstrates that the projects are additional and therefore not the baseline scenario. The prohibitive barriers that exist in China are confirmed by the observed trend in recent capacity additions and small hydro plants' low share of the total electricity generation in the country.

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the small-scale project activity:

>>

As per the Appendix B of simplified modalities & procedures for small-scale CDM-project activities, the project boundary is "The project boundary encompasses the physical, geographical site of the renewable generation source."

Project boundary:

The project boundary is defined as the notional margin around a project within which the project's impact (in terms of carbon emission reductions) will be assessed. As referred to in Appendix B for small-scale project activities, 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. The project boundary for the baseline will include all the direct emissions, being the emissions related to the electricity produced by the facilities and power plants to be replaced by the projects. This involves emissions from displaced fossil fuel used at power plants. For the projects this includes emissions from activities that occur at the project location. The project boundary is composed of the Hydro Energy Generators, the metering equipment for and substation, and the grid which is used to transmit the generated electricity.

In line with the methodology, the only greenhouse gas accounted for in the calculation of the emission reductions is CO_2. The emissions related to production, transport and distribution of the fuel used for the power plants in the baseline are not included in the project boundary, as these do not occur at the physical and geographical site of the project. For the same reason the emissions related to the transport are also excluded from the project boundary.

The system boundary for the proposed project is defined as the Centre China Power Grid, with all the power plants in Hunan connected to it. The entire The Centre China Power Grid is considered as a single entity for estimation of baseline, considering free flow of electricity among the union territory through the Load Dispatch Centre of The Centre China Power Grid.

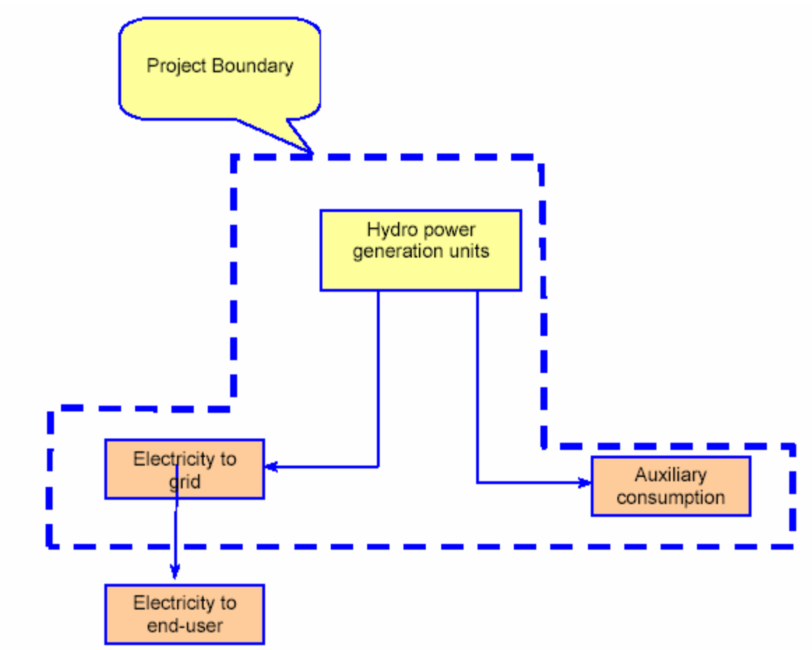

Fig3. Project boundary of J-S SHBP

B.5. Details of the baseline and its development:

>>

Date of completing the final draft of this baseline section (*DD/MM/YYYY*)

09/08/2006

Name of person/entity determining baseline:

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SECTION C. Duration of the project activity / Crediting period:

C.1. Duration of the small-scale project activity:

>>

7y-0m

C.1.1. Starting date of the small-scale project activity:

>>

01/04/2007

C.1.2. Expected operational lifetime of the small-scale project activity:

>>

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

>>

7 years× 3 = 21 years

C.2.1. Renewable crediting period:

>>

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

>>

01/04/2007

C.2.1.2. Length of the first crediting period:

>>

7y-0m

C.2.2. Fixed crediting period:

>>

C.2.2.1. Starting date:

>>

Not applicable

C.2.2.2. Length:

>>

Not applicable

SECTION D. Application of a monitoring methodology and plan:

>>

D.1. Name and reference of approved monitoring methodology applied to the small-scale project activity:

>>

Title: "Renewable electricity generation for a grid" AMS I D

Reference: Appendix B of the simplified modalities and procedures for small scale CDM project activities in the latest version 09 (28th July 2006)

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

D.2. Justification of the choice of the methodology and why it is applicable to the small-scale project activity:

>>

The monitoring methodology shall be used in conjunction with the approved baseline methodology AMS I.D -"Appendix B of the simplified modalities and procedures for small scale CDM project activities in the latest version 08",which was adopted by the proposed project in section B. The project activity meets the eligibility criteria to use simplified modalities and procedure for small-scale CDM project activities as set out in paragraph 6 (c) of decision 17/CP.7.The applicability criteria for the approved baseline methodology AMS I.D and approved monitoring methodology AMS I.D are identical and have been justified in section B.1.1.

D.3 Data to be monitored:

>>

ID number	Data type	Data variable	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (Electronic/ paper)	For how long is archived data to be kept?
1	Electricity Generated	Electricity	kWh	M	Monthly	100%	Electronic & Paper	Two years beyond Crediting period

As established in Section A.4.2 the project activity falls under Category I.D. Generation of electricity using hydro power resources leads to mitigation of GHG emissions that would have been produced by the western regional grid mix dominated by fossil fuel based power plants. In order to monitor the mitigation of GHG due to the project activity, the net electricity supplied to the grid need to be measured. The net electricity supplied to grid by the project activity multiplied by emission factor for regional grid, would form the baseline for the project activity.

D.4. Qualitative explanation of how quality control (QC) and quality assurance (QA) procedures are undertaken:

>>

The data can be very accurately measured. The modern computerized system in the SHP plants will allow electricity output to be measured accurately. The meters installed on substations (grid interconnection point) will be used to measure mentioned variables on a continuous basis. Every month these meter readings will be recorded by plant personnel, and these records will be archived for crosschecking yearly figures. The meters at the substation will be two-way meters and the records would be kept in electronic form and monthly generation data would be printed out for a back up, for the improbable event of a computer hazard. The records may be used to determine the net power wheeled to the user and determine the extent of mitigation of GHG over a period of time.

D.5. Please describe briefly the operational and management structure that the project participant(s) will implement in order to monitor emission reductions and any leakage effects generated by the project activity:

>>

The project activity essentially involves generation of electricity from hydro, the employed generators only convert hydro energy into electrical energy and do not use any other input fuel for electricity generation. Since the project activity is generation of electricity from renewable energy source i.e. hydro there are no leakage effects generated by the project activity. Thus no special ways and means are required to monitor leakage from the project activity.

The project developer will establish a specialized control centre for project monitoring. The control centre will provide the operation reports of the project activity in line with actual needs. The reports will record daily operation of the hydro turbines, including operating periods, power generation; power delivered to the grid, equipment defects, etc. The monitoring reports will be archived. The control centre will also carry out regular calibrations on the related equipment, to insure the accuracy of the monitoring data. The operation reports will reflect the calibration results as well.

D.6. Name of person/entity determining the monitoring methodology:

>>

Date of completing the final draft of this baseline section (*DD/MM/YYYY*)

09/08/2006

Name of person/entity determining baseline:

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SECTION E.: Estimation of GHG emissions by sources:

E.1. Formulae used:

>>

E.1.1 Selected formulae as provided in appendix B:

>>

The applicable project category from Appendix B i.e. Category I D does not indicate a specific formula to calculate the GHG emission reductions by sources.

E.1.2 Description of formulae when not provided in appendix B:

>>

No formula is used. Emissions by sources of GHGs due to the project activity within the project boundary are zero since hydro power is a GHG emission free source of energy.

E.1.2.1 Describe the formulae used to estimate anthropogenic emissions by sources of GHGs due to the project activity within the project boundary:

>>

This is not applicable as the renewable energy technology used is not equipment transferred from another activity. Therefore, as per the simplified procedures for SSC project activities, no leakage calculation is required.

E.1.2.2 Describe the formulae used to estimate leakage due to the project activity, where required, for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities

>>

According to Paragraph 8 of Appendix B of small-scale CDM project activity modalities, leakage calculation is only needed if the renewable energy technology equipment is transferred from another activity. The equipments of the two projects are not transferred from another activity and therefore no leakage calculation is required.

E.1.2.3 The sum of E.1.2.1 and E.1.2.2 represents the small-scale project activity emissions:

>>

The net project activity emissions are zero.

E.1.2.4 Describe the formulae used to estimate the anthropogenic emissions by sources of GHGs in the baseline using the baseline methodology for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities:

>>

The hydro power project uses the Combined Margin methodology as suggested in the Appendix B of the simplified modalities and procedures for small-scale CDM project activities.

According to ACM0002, the total baseline emissions ：

$$BE_y\ (tCO_2/yr) = EG_y * EF_y$$

Where
BE_y = Baseline emissions in year y (tCO_2).
EG_y (MWh/yr) = Electricity generated by the project in year y;
EF_y (tCO_2/MWh) = CO_2 emission factor of the CCPG

$$EF_y\ (tCO_2/MWh)=0.5*(\ EF_{OM,\ simple,\ y} + EF_{BM,y})$$

$$EF_{OM,\ simple,\ y} = (\Sigma F_{i,\ j,\ y} * COEF_{i,\ j})/\Sigma GEN_{j,\ y}$$

where
$F_{i,\ j,\ y}$ is the amount of fuel i (in a mass or volume unit) consumed by relevant power sources j in year(s) y, j refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports to the grid.

$COEF_{i,j\ y}$ is the CO_2 emission 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 year(s) y, and
$GEN_{\ j,\ y}$ is the electricity (MWh) delivered to the grid by source j.

The CO_2 emission coefficient $COEF_i$ is obtained as

$$COEF_i = NCV_i * EF_{CO_2,\ i} * OXID_i$$

where:
NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel i,
$OXID_i$ is the oxidation factor of the fuel (see page 1.29 in the 1996 Revised IPCC Guidelines for default values),
$EF_{CO_2,i}$ is the CO_2 emission factor per unit of energy of the fuel i.

The $EF_{OM,\ y}$ is estimated to be 1.1910t CO2/MWh.

The Build Margin 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:

$$EF_{BM,y} = (\Sigma\ F_{i,\ m,\ y} .COEF_{i,\ m})/\Sigma GEN_{m,y}$$

Where
$F_{i,\ m,y}$ = quantity of fuel i used in plant m (kt/yr) in year y $COEF_{i,\ m}$ = carbon emissions factor for fuel i in plant m (tCO_2/kt), taking into account the carbon content of the fuels by power sources and the percent oxidation of the fuel $GEN_{m,\ y}$ = annual generation from plant j (MWh/yr) in year y

The $EF_{BM,y}$ is estimated as 0.6829 t CO_2/MWh (with sample group m constituting most recent capacity additions to the grid comprising 20% of the system generation).

E.1.2.5 Difference between E.1.2.4 and E.1.2.3 represents the emission reductions due to the project activity during a given period:

>>
30,761.22 tCO2e emissions are annually reduced due to the project activity in the seven years crediting period.

E.2 Table providing values obtained when applying formulae above:

>>

Finally, the annual electricity generation of the proposed project is determined to 36,320 MWh and emission reductions estimated is provided in table blow:

Annual electricity generation (MWh)	34，320
Baseline emission factor (t CO_2 eq/MWh)	0.93695
Annual emission reduction (t CO_2 eq /year)	30,761.22
Emission reduction for 7 years (the first crediting period) (tones of CO_2 eq)	215,328.54
Emission reduction for 21 years (the potential crediting period) (tones of CO_2 eq)	645，985.62

SECTION F.: Environmental impacts:

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

>>
According to the Chinese DNA, CDM projects located in China have to comply with all existing environmental regulations. The project owner entrusted a third party of environment assessment institute to develop the environmental impact assessment (EIA) report during the project planning stage. A complete Environmental Impact Assessment has been approved by the local Environmental Protection Bureau. The conclusion of these reports are that on one hand the project will provide considerable energy, and improve the condition of the Hongjiang's economic development; on the other hand the environmental impacts of the hydro power project are marginal and the project has been approved for development according to all national and local regulations.

SECTION G. Stakeholders' comments:

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

>>
Stakeholders of this project include the government and non-government parties, local population, NGO's, social organisations of that region etc., who are involved in the project activity with different roles and at different stages. All the necessary clearances from the government parties have been obtained.

The project developer has sent out questionnaires to the stakeholders in the surrounding area of the YSHP project for the comments of the proposed project construction in April 2006. 32 copies of questionnaire were distributed, and 30 pieces of reply were received. The Summary of stakeholder comments collected from the interviews shows that the randomly selected interviewers covered different ages and education level near the project site, which could well represent the comments of stakeholders to the construction of the proposed project.

G.2. Summary of the comments received:

>>
Summary of survey

The profile of the participants is as follows:

- 80% were aged 20-45
- 20% were aged 46 or above
- 30% were local government employees
- 20% were local engineering employees
- 50% were villagers

The results of the survey are as follows:

- 97% knew of the project
- 87% thought that the project would benefit the local area
- 75% thought that the project would have no effect to the biodiversity environment

Most of the participants thought that the project would have a small impact on the environment. It could be learned from the survey summary that most of the stakeholders interviewed express their full support to the construction of the project. Local People expect that the project could generate local employment and help ease the power shortage situation and has no effect on the migratory pattern of the local animals nor poses any rehabilitation problems. The proposed project is also fully supported by the local government, which could be learned from the approval letter to the proposed project and the supportive approval letter on the CDM application by the local DRC.

Detail of the result will be available upon validation request.

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

>>

No negative comments have been received on the project. Moreover, the local community possesses strong positive comments on the effects that the proposed project will make on the local economy and infrastructure. There has therefore been no reason to modify the plans due to comments received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

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