CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03.1 - in effect as of: 28 July 2006

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

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Wahei Hydroelectric Project

Version 4

~~14 June 2007~~ 17 October 2007

A.2. Description of the project activity:

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The Wahei Hydroelectric Project (hereafter, the Project) is being developed by Sichuan Mabian Xianjiapuhe Power Generation Co., Ltd. (hereafter referred to as the Project Developer), a county-level private company. The purpose of the Project is to utilize the hydrological resource of the Wahei River in a diversion type hydro power scheme to generate zero carbon emission electricity for the Central China Power Grid. The project will generate Certified Emission Reductions (CERs) by displacing electricity generation from grid connected fossil fuel-fired power plants that would otherwise be generating the electricity needed.

The project is a diversion type hydro power project in the village of Wahouku, Mabian county, Leshan City, part of Sichuan Province, the People's Republic of China (hereafter referred to as the "Host Country"). Total installed capacity of the hydroelectric project will be 44 MW, consisting of two 22MW turbines. Based on annual estimated electricity delivery to the grid of 184,163 MWh, the Project is expected to reduce CO_2 emissions by an estimated 177,575 tonnes CO_2 annually.

As a renewable energy project, the Project will produce positive environmental and economic benefits and contribute to sustainable development. The specific sustainable development benefits of the Project are as following:

- Improve the local and regional economic development by providing electricity to meet increasing demand;
- To support the province's economic development, and to alleviate poverty;
- Enhances the local investment environment and therefore improves the local economy;
- Diversifies the sources of electricity generation, important for meeting a growing energy demand and for transitioning away from diesel and coal-supplied electricity generation; and
- Makes greater use of hydroelectric renewable energy generation resources for sustainable energy production.

A.3. Project participants:

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Name of Party involved (*) (host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
P.R. China (host)	Sichuan Mabian Xianjiapuhe Power Generation Co., Ltd.	No
The Netherlands	EcoSecurities Ltd	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

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

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

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The People's Republic of China (the "Host Country")

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

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Leshan City, Sichuan Province

A.4.1.3. City/Town/Community etc:

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Wahouku village, Mabian Yizu autonomous county

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

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The Project is located at the village of Wahouku, Mabian autonomic county, Leshan City, Sichuan Province, P.R. China. The site of the Project is on the Wahei River which is the main source of the Mabian River and a branch of the Minjiang River. The exact location of the project is defined using GPS coordinates 28°46'56.00"N Latitude, 103°22'50.20"E Longitude. The nearest cities are Leshan city and Chengdu city, both approximately 100km away from the project activity.

A.4.2. Category(ies) of project activity:

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According to Annex A of the Kyoto Protocol, this project fits in Sectoral Category 1, Energy Industries (renewable/non renewable).

A.4.3. Technology to be employed by the project activity:

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The Project is a diversion type hydro power project with a total installed capacity of 44MW (2 * 22MW). The Project is comprised of the following main parts: a diversion gate to divert river flow, a tunneling system and the power house where the turbines are housed. The diversion gate consists of one sluicing gate (3.4m×4.2m) and a canal system (2.86m×2.86~3.46m) with a length of 393m. The tunneling system consists of a tunnel (length 1,784m), a penstock (length of 2,368m) and a surge tank.

The diversion gate, constructed upstream on the Wahei River, diverts the water into a canal and a tunnel, which then leads to the power house intake. The diversion system includes a small holding pond but the project does not include a reservoir. As the sluicing gate is located in a steep valley, and the height of the gate is quite small, no flooding is caused by the holding pond. Through the tunnel and the penstock, a water head of 262 m is formed, taking advantage of the natural height drop of the river. The water enters into the turbine through a high pressure pipeline. After power generation, the water finally discharges into the Wahei River through the tailrace. The main technical parameters of the proposed project are shown in Table A.4.3 below.

Table A.4.3 Main technical parameters of the proposed project

		Source
Installed capacity (MW)	44	Feasibility study
Operating time yearly (hour)	4,768	Feasibility study
Expected annual power generation (effective supply to the grid) (MWh)	184,163	Feasibility study
Water head (m)	262	Feasibility study
Design flow (m^3/s)	22	Feasibility study

Preliminary constructions (e.g. road construction and pre construction preparations) started in December 2003 and actual construction of the power plant started in March 2004. The Project ~~started construction in December 2003 and~~ commenced operation in November 2006.

The Project will use state of the art, but known, technology in electricity generation and transmission. All the equipment used in the project is produced domestically and the project developer is experienced in handling and operating this kind of equipment.

A.4.4 Estimated amount of emission reductions over the chosen crediting period:

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The project will displace electricity from a relatively carbon intensive grid, with a combined margin of 0.9643 tCO_2/MWh. This project is expected to displace 184,163 MWh per year of electricity. Thus, the project will avoid 177,575 tCO_2e of emissions per year, 1,243,022 tCO_2e during the first 7 years, as shown in Table A.4.4.

Table A.4.4 Expected Annual Emission Reductions

Years	**Annual estimation of emission reductions in tonnes of CO_{2e}**
2007 September - December	59,192
2008	177,575
2009	177,575
2010	177,575
2011	177,575
2012	177,575
2013	177,575
2014 January – August	118,383
Total estimated reductions (tonnes of CO_{2e})	**1,243,022**
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_{2e})	177,575

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

A.4.5. Public funding of the project activity:

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

SECTION B. Application of a baseline and monitoring methodology

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

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1. The baseline methodology: ACM0002: “Consolidated baseline methodology for grid connected electricity generation from renewable source” Version 06, in effect as of 19 May 2006;
2. The monitoring methodology: the approved consolidated monitoring methodology ACM0002: “Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources”, Version 06 in effect as of 19 May 2006;
3. The tool for demonstration and assessment of additionality: the approved methodology of “the tool for demonstration and assessment of additionality”, Version 03, in effect as of EB 29.

More information about the methodology can be obtained at:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

B.2 Justification of the choice of the methodology and why it is applicable to the project activity:

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The methodology of ACM0002 (Version 6) is chosen and applicable to the proposed project due to the following reasons:

- The Project is a renewable electricity generation plant, in the form of a diversion type hydro power plant without a reservoir;
- The Project is a grid-connected hydropower project, which is connected with a regional power grid, Central China Power Grid. Central China Power Grid is clearly identified and information on the characteristics of this grid is publicly available;
- The proposed project is not an activity that involves switching from fossil fuels to renewable energy at the site of the project activity.

On the basis of the above reasons, the applicability criteria of the methodology stated in ACM0002 (Version 6) are met.

B.3. Description of the sources and gases included in the project boundary

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	Source	Gas	Included?	Justification / Explanation
Baseline	Grid electricity production	CO_2	Included	According to ACM0002 only CO_2 emissions from electricity generation should be accounted for.
		CH_4	Excluded	According to ACM0002
		N_2O	Excluded	According to ACM0002
Project Activity	Hydro electric electricity production	CO_2	Excluded	As there is no new reservoir associated with the project activity greenhouse gas emissions from the project do not have to be considered according to ACM0002 Version 06
		CH_4	Excluded	
		N_2O	Excluded	

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

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As the project does not modify or retrofit existing electricity generation facilities 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**	**Source**
Operating Margin Emissions factor	1.2778 tCO_2/MWh	Calculated, see Annex 3
Build Margin Emissions Factor	0.6507 tCO_2/MWh	Calculated, see Annex 3
Combined Margin Emissions Factor	0.9643 tCO_2/MWh	Calculated, see Annex 3
Generation of the project in year y (effective supply to the grid)	184,162 MWh	Feasibility study

According to the methodology, the realistic and credible alternatives available to the project participant or similar project developers that provide outputs or services comparable with the proposed CDM project activity should be identified. These alternatives are:

Alternative 1: The proposed project activity without consideration of CDM. That is, construction of a new hydroelectricity generation plan with installed capacity of 44 MW connected to the grid, but not undertaken as a CDM project activity.

Alternative 2: Construction of a thermal power plant with the same installed capacity or the same annual power output.

Alternative 3: Continuation of the current situation. That is, electricity will continue to be generated by the existing generation mix operating in the grid.

According to the full assessment of alternatives (see section B.5 Step 3 Barrier Analysis following the tool for the demonstration and assessment of additionality) alternative 3 is identified as the baseline scenario.

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 CDM project activity (assessment and demonstration of additionality):

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The following steps are used to demonstrate the additionality of the project according to the latest version of the "Tool for the demonstration and assessment of additionality" agreed by the Executive Board (Version 3, EB 29):

Step 1. Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a. Define alternatives to the project activity:

The following three alternatives are considered for the project:

Alternative 1: The proposed project activity without consideration of CDM. That is, construction of a new hydroelectricity generation plan with installed capacity of 44 MW connected to the grid, but not undertaken as a CDM project activity.

Alternative 2: Construction of a thermal power plant with the same installed capacity or the same annual power output

Alternative 3: Continuation of the current situation. That is, electricity will continue to be generated by the existing generation mix operating in the grid.

Sub-step 1b. Consistency with appropriate laws and regulations:

The Chinese power sector has undergone a transformation to a market-oriented system. Therefore investment in a power generation project is an individual power project developer's decision based on the project return and risk profile[1]. There are no laws compelling the project developer to develop hydroelectric plants, thus alternatives 1 and 3 identified are in line with all applicable laws and regulations.

[1] Source: State Council's Decision on Reforming Investment Approval Process, July 16, 2004. State Council.

The main sectoral policy relevant to this project activity is the promotion of renewable energy in China, the Renewable Energy Law of the People's Republic of China, which came into effect 1 January 2006. This Law demonstrates the Chinese Government's commitment to the development of renewable energy as part of the overall energy development strategy, and encourages grid-connected power generation from renewable sources. However, there are no direct incentives such as financial grants, higher tariffs or subsidised loans available for these types of project. In addition to that, moves to increase energy efficiency and renewable energy are set in the China's 11th Five-Year Plan, but these are a target, and the Plan is not a law[2].

According to regulations for China's electricity development industries, it is forbidden to build a thermal power station with an installed capacity lower than 135MW[3]. Therefore alternative 2 is not in line with applicable laws and regulations, and will not be considered in the assessment of the alternatives.

Step 2. Investment Analysis

Sub-step 2a: Determine appropriate analysis method

According to the "Tool for the demonstration and assessment of additionality (version 03)", three options can be applied to conduct the investment analysis. These are the simple cost analysis (Option I), the investment comparison analysis (Option II) and the benchmark analysis (Option III).

Since this project will generate financial/economic benefits other than CDM-related income, through the sale of generated electricity, Option I (Simple Cost Analysis) is not applicable.

According to the Additionality Tool, if the alternative to the CDM project activity does not include investments of comparable scale to the project, then Option III must be used.

Given that the project developer does not have alternative and comparable investment choices, benchmark analysis (Option III) is more appropriate than investment comparison analysis (Option II) for assessing the financial attractiveness of the project activity.

Sub-step 2b: Option III – Application of benchmark analysis

The likelihood of the development of this project, as opposed to the continuation of the purchase of grid electricity from the current electricity generation mix (i.e. its baseline) will be determined by comparing the project IRR (without carbon) with benchmark rates applicable to a local investor, i.e. those provided by national authorities, local banks, or investment bonds in the Host Country. With reference to *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects*[4], the financial benchmark rate

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[2] See: Point Carbon. CDM & JI Monitor: *Chinese official defends additionality of renewables in CDM.* 21 March 2007

[3] See: Announcement which strictly forbids the construction of thermal power stations with an installed capacity lower than 135MW. Published by the state council office, Guo Ban Fa Ming Dian[2002] No.6

[4] State Power Corporation of China. Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects. Beijing: China Electric Power Press, 2003.

of return (after tax) of Chinese Power Industries is to be 8% of the total Investment IRR. This benchmark is widely used as the sectoral benchmark rate on total investment for Hydro Projects in China.

Sub-step 2c: Calculation and comparison of financial indicators

The table below shows the financial analysis for the project activity without carbon finance. As shown, the project IRR (without carbon: 2.44%), is lower than the benchmark rate of return applicable which is 8% as explained in Substeb 2b. This therefore indicates that in comparison to other alternative investments, the project is not financially attractive to a rational investor.

Table B.5.1 Financial indicators of the Project

	Without carbon credits	**With carbon revenue**
Expected project IRR	2.44%	8.46%

Table B.5.2 shows the basic parameters used for the calculation of financial indicators..

Table B.5.2 Economic parameters used in the project

NAME	**DATA**	**SOURCE**
Installed capacity (MW)	44	Feasibility study
Operating time (hour)	4768	Feasibility study
Income tax (%)	33%	Feasibility study
VAT (%):	17%	Feasibility study
Project lifetime (Year)	25	Feasibility study
Tariff, excluding VAT (US$/MWh)	21.25	PPA
Total investment (US$)	30,956,000	Feasibility study
Operating costs (US$/MWh)	5.55	Feasibility study
Pre-operational costs (US$)	0 (included in total investment)	Feasibility study

Sub-step 2d: Sensitivity analysis

A sensitivity analysis was conducted using assumptions that are conservative from the point of view of analysing additionality, i.e. the ‘best-case’ conditions for the project IRR were assumed by altering the following parameters:

- Electricity tariff
- Total investment
- Operational cost

The above three parameters vary in the range of -10% - +10%. These results show that even under very favourable circumstances the Project IRR is still much lower than the benchmark IRR of 8%. Therefore we can conclude that the assumption that the project (without carbon) is not financially attractive is robust to positive parameter changes.

Table B.5.2 Different parameters affecting the project's IRR

	-10.00%	0	10.00%
Operational cost	2.80%	2.44%	2.07%
Total investment	3.32%	2.44%	1.54%
Electricity Tariff	1.07%	2.44%	3.77%

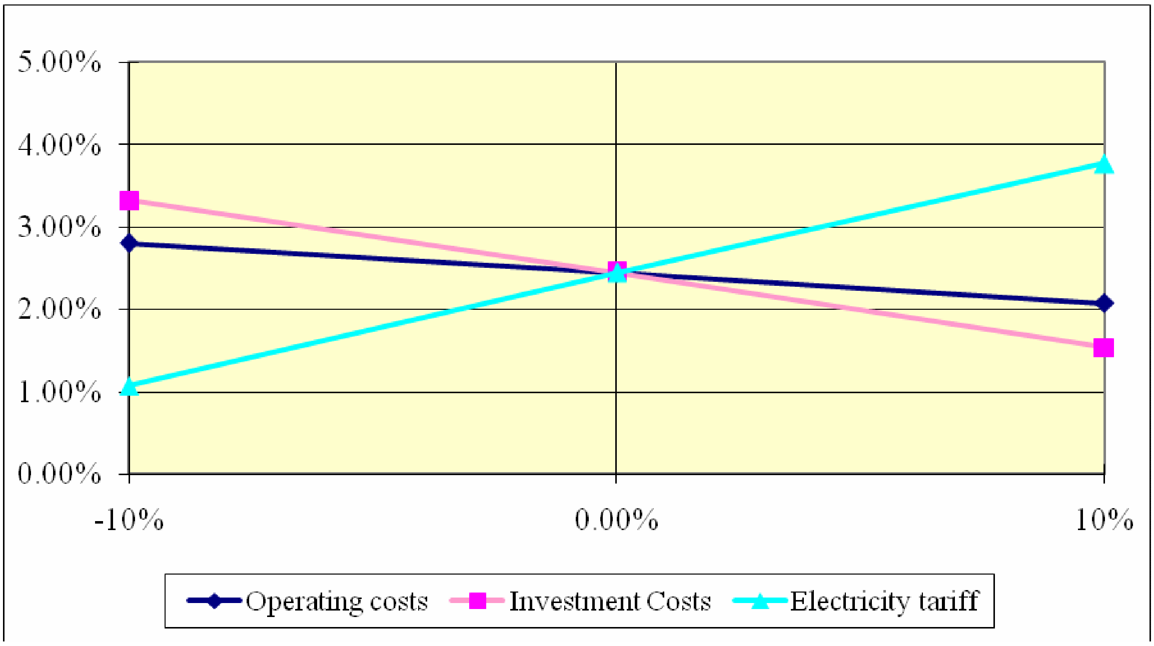

Figure: sensitivity analysis

In addition to the low IRR the project developer has to operate in a difficult financial and investment environment. Although the economy in China is expanding, the national banking authorities have introduced regulations that leave banks no other option but to ration their credit. Credit rationing effectively limits the scope of projects for which the banks are willing to lend. The national policy for awarding credit and providing loans has clearly prescribed that banks should be cautious about involvement in hydro power projects with an installed capacity lower than 50MW.[5] Therefore the

[5] See the *Guide book for the loan policy for banks by China Central Bank, 2005*

evaluation process is strict, making it difficult for the project developer to secure debt financing. Carbon finance was therefore necessary to make the project more attractive to financiers. [6]

Assessment of Alternatives:

Alternative 1: The proposed project activity without CDM. That is construction of a new hydroelectricity generation plan with installed capacity of 44 MW connected to the local grid, implemented without considering CDM revenues.

This alternative would the investment barrier outlined above

Alternative 3: Continuation of the current situation. That is electricity will continue to be generated by the existing generation mix operating in the grid.

The investment barrier above would not be faced by this alternative. Alternative 3 is therefore assumed to be the baseline scenario.

Therefore Alternative 1, construction of a new hydropower renewable energy plant, faces the largest number of barriers, and therefore is unlikely to implemented in the absence of the CDM (i.e. is not the baseline scenario).

Step 3. Barrier Analysis

The "Tool for the demonstration and assessment of additionality" (Version 03) states that project participants may choose to apply Step 2 (Investment analysis) OR Step 3 (Barrier analysis) to demonstrate the additionality of the project.

Given the low IRR of the project, Step 3 is not used to demonstrate the additionality of the proposed project.

Step 4. Common Practice Analysis

Sub-step 4a. Analyse other activities similar to the proposed activity

The development of hydropower projects greatly relies on the hydrological resources available. The existing hydropower plants similar to the proposed activity in Sichuan province (the total area of Sichuan

[6] CDM was considered in June 2003: See Feasibility Study published in June 2003 which got approved in March 2004, and the resolution of the directorate of Leshan Jianeng Co. Ltd on Oct. 27 2003. ~~Project~~ The construction of the power plant commenced in March 2004 after the approval of the Feasibility Study was received.

is 485,000 km^2 with a population of 86.42 million) (developed since ~~from~~ 2000~~-~~, installed capacity around 44MW, and not undertaken as CDM projects) are shown in table B.5.4 in the PDD.

Table B.5.4 Existing similar hydropower plants in the Sichuan region not undertaken as CDM ~~(developed since from 2000 , installed capacity around 44MW, and not undertaken as CDM projects)~~

Name of power plant	Installed Capacity (MW)	Operation date	Operating hours	Project Owner
Laifu Hydro Power station	30	2000	3453	Water Conservancy Bureau of Gao county (local government)
Fuliutan Hydro Power station	39	2001	4952	Guang'an ai zhong Gruop(state-owned)
Niujiaowa third level Hydro Power station	25	2005	6217	Sichuan Xichang Power generational Inc(stock listed company)
Shazui Hydro Power station	38	2004	4500	Sichuan Hongchang Power generation company(~~state~~local government-owned)
Dingcunba Hydro Power station	30	2000	4357	Sichuan Ya'an Power generation company(state-owned)

Data source: *Yearbook of China Water Resources 2005 and the project developer*

Sub-step 4b Discuss any similar options that are occurring

The additionality tool version 3 specifies that projects are considered similar if "they occur in the same country/region". In China a provincial level analysis of similar activities is considered to be the most appropriate, as investment conditions, and some regulatory requirements, tend to vary by province rather than by regional areas. In addition, most provinces in China comprise populations similar to, or larger than, the populations of other entire nations.

The Project is located in the Sichuan area. Table B.5.4 above shows recently developed hydropower plants with installed capacity around 44 MW in the region. There are distinctions between the proposed CDM project and ~~those~~the ones in the table above:

~~:~~

~~The table above includes Hydro Power Stations of Sichuan Province included in the 2005 Yearbook of China Water Resources.~~

2002 was a landmark year for the power industry in China as the power industry in China underwent a significant suite of reforms in[7]. First of all, under the reforms, the China State Power Corporation was diversified into five separate regional grids in 2002[8], consequently changing the tariffs and allowable amounts of electricity supplied to the grid[9]. Secondly, under the reform, there were changes to the existing electricity tariff mechanisms[10]. As a result, the investment environment of power production projects in China changed significantly in 2002.

Therefore only the Niujiaowa third level Hydro Power station and the Shazui Hydro Power station which were developed after 2002 are considered in the common practice analysis below.

Shazui Hydro Power was ~~According to the Table B.5.4, most hydropower plants were~~ built up by a company owned by~~local~~ local government ~~or state-owned companies~~, which ~~have~~ has larger capital reserves and operational capacity to allow them better (more and easier) access to project finance. State-invested organisations therefore have stronger resilience to project risk and stronger negotiating power with the grid operating company and cannot be considered similar to the proposed project.T~~In addition, t~~he tariff for example of Shazui Hydro Power is 0.288 Yuan/Kwh[11], while the tariff of the proposed project is only 0.17 Yuan/Kwh. ~~.~~
Only Niujiaowan third level hydro power station was built up by a stock listed (i.e. private) company. Nevertheless this project can not be considered similar as it located at an economically much more

[7] See “Electric Power Reform”, 2003 Yearbook of China Electric Power, Page 10-14.

[8] The first reform consisted of the reorganisation of the power companies in order to break the monopoly of the China State Power Corporation and ensure fair competition, and to separate generation from transmission. The second one consisted in the bureaucratic centralisation of the power sector through the inclusion of the State Economic and Trade Commission in the National Development and Reform Commission (NDRC), which then opened a renewable energy department under the Energy Bureau, thereby enabling the creation of coherent policies in the power sector. *Source*: Lemaa, A and Rubyb K. (2007) Between fragmented authoritarianism and policy coordination: Creating a Chinese market for wind energy, Energy Policy, 35, 3879-3890. Also see: http://english.people.com.cn/200204/12/eng20020412_93913.shtml

[9] Sections 5-7, 2003 Yearbook of China Electric Power, Page 14.

[10] Electricity tariff was made up according to local demands and grid structure and is divided into tariff of electricity to grid, transmission tariff, distribution tariff and sales tariff. Sections 17-22, 2003 Yearbook of China Electric Power, Page 11-12.

[11] http://www.newssc.org/gb/Newssc/meiti/gzb/eb/userobject10ai1285049.html?miMR6=dEhs7wJiHn&ct493=mjO-Vny5j1

attractive site where hydrological resources and local electricity demand are well matched which results in very high operating hours (6217 hours per year) and therefore better expected revenue. Compared to the existing projects described above, the proposed project has been developed by a county-level private investor and the hydrological conditions result in relatively lower operating hours of 4768 hours per year only.
Further more the total cost for Niujiaowa third level hydro power station is 91.26 million RMB[12] and the installed capacity is 25MW.
The costs per installed capacity for Niujiaowa third level power station is therefore:
91.26 million/25000kw=3,650 RMB/kw

According to the Feasibility study the total investment costs for Wahei the costs per capacity is therefore:
648 million/440000kw=5,628 RMB/kw

The unit cost for Niujiaowan third level hydro power station are therefore only 64.86% of Wahei which further clarifies that the projects can not be considered similar.

Therefore, the existing hydropower plants do not call into question the claim that the proposed project is financially unattractive as discussed in Step 2 because there essential distinctions between them.

~~***Sub-step 4b Discuss any similar options that are occurring***~~

~~As described in sub-step 4a there are no similar option occurring without CDM incentives.~~

In conclusion the proposed project is assumed to be additional according to ACM0002.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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According to the latest version of ACM0002, the Central China Power Grid is selected as the project boundary, as:

- There is guidance available from the DNA on project boundaries identifying the applicable grid as the project boundary[13].
- The Grid is the regional grid in a country with layered dispatch system like China

The Central China Power Grid is therefore determined as the project boundary.

[12] See the periodic public statement by the project developer (the stocked listed company): http://stockdata.stock.hexun.com/stock/detail.aspx?stockid=600505&title=%CB%C4%B4%A8%CE%F7%B2%FD%B5%E7%C1%A6%B9%C9%B7%DD%D3%D0%CF%DE%B9%AB%CB%BE2003%C4%EA%C4%EA%B6%C8%B1%A8%B8%E6

[13] http://cdm.ccchina.gov.cn/Website/CDM/UpFile/File1029.pdf

The baseline emissions factor (EF_y) is calculated as the average of the operating margin emissions factor and the build margin emissions factor. The data used to calculate the grid emissions factor comes from reliable and publicly accessible statistics e.g. China Energy Statistic Yearbook and China Electric Power Yearbook, as well as Chinese DNA.

The methodology will be applied using Option (a) of the Consolidated Methodology for Grid Connected Projects (Simple Operating Margin). This is because low-cost must run resources constitute less than 50% of total grid generation, (62% of electricity generated in the Central China Power Grid comes from thermal power plants in 2004, and it is counted for 62%, 63%, 64%, 66% in the previous four years from 2000-2003)[14], detailed data to apply option (b) is not available, and detailed data to apply option (c) is also unavailable.

a) *Simple OM emission factor.*
The simple Operating Margin (OM) emission factor (EFOM,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. 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

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

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

[14] China Electric Power Yearbook 2001-2005; Please refer to Annex 3 for detailed calculation.

$EF_{OM,y}$= 1.2778 tCO_2e/MWh
For the detailed information, please see the Annex 3.

b) *BM emission factor.*
To calculate the Build Margin (BM), the formulae should be the following according to the methodology:

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

Where:
$F_{i,m,y}$, $COEF_{i,m}$ and $GEN_{j,m}$ are analogous to the variables described fro 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. The sample group m consists of either the five power plants that have been built most recently, or the power plant capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. According to ACM0002, project participants should use from these two options that sample group that comprises the larger annual generation.

But due to the fact that data of power plant generation and fuel consumption is not currently available in 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.[15]

The formulae derived from the deviation of methodology could be 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 capacity(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 kind of power generation capacity (MW) in year *y* compared to that of year *y-n*;

$EF_{thermal,adv}$ is the emissions factor of thermal power generation capacity of the applicable electricity system with the efficiency level of the best commercially available technology in China. In this case, given the emissions from both oil and gas consumption in China Central Power Grid was only account 0.49% in 2004[16], and these oil and gas are not combusted directly for power generation in dedicated oil or gas power stations but predominantly used for the starting and warming up process of coal boilers, EF_{coal} using BAT is then calculated and used as a proxy of $EF_{thermal}$.

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[15] See: http://cdm.unfccc.int/UserManagement/FileStorage/6POIAMGYOEDOTKW25TA20EHEKPR4DM

[16] See: http://cdm.ccchina.gov.cn/Website/CDM/UpFile/File1051.pdf

The way of defining "*n*" is as 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 used to achieve the 20% capacity addition of the current electricity generation capacity.

The result for "*n*" should make the following equation come true:

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

From 2000 to 2004 (most recent year for which data is available), the amount of capacity additions is over 20% of the total capacity in 2004 in the Central China Power Grid. Therefore "*n*" = 4.

$EF_{BM,y}$= 0.6507 tCO_2/MWh

For the detailed information, please see the Annex 3.

c) *Combined margin emission factor.*
To calculate EF_y with the combined margin (CM), the following equation is used:

$$EF_y = \omega_{OM} \cdot EF_{OM,y} + \omega_{BM} \cdot EF\_BM_{BM,y} \quad = 0.5*1.2778+0.5*0.6507=0.9643 \qquad \textbf{(6)}$$

Where:
- EF: baseline emission factor (tCO_2e / MWh)
- ω_{OM}: Operation Margin weight, which is 0.5 by default
- $EF_{OM,y}$: Operational Margin emission factor (tCO_2e / MWh)
- ω_{BM}: Build Margin weight, which is 0.5 by default
- $EF_{BM,y}$: Build Margin emission factor (tCO_2e / MWh)
- y: a given year

Then baseline emissions (BE_y) are obtained as:

$$BE_y = EG_y * EF_y \qquad \textbf{(7)}$$

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

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

Data / Parameter:	$F_{i,j,y}$

Data unit:	tonnes, 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 (2000-2005)
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released statistic; publicly accessible and reliable data source
Any comment:	

Data / Parameter:	***Electricity generation in Central China Power Grid (CCPG)***
Data unit:	**MWh**
Description:	The electricity generation by source *j* in year *y* of each province connected to CCPG
Source of data used:	China Electric Power Yearbook
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released statistic; 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 CCPG.
Source of data used:	China Electric Power Yearbook
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released statistic; 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 a fuel *i*.
Source of data used:	China Energy Statistics Yearbook

Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official released statistic; publicly accessible and reliable data source
Any comment:	

Data / Parameter:	$EF_{CO2,j}$
Data unit:	**tC/TJ**
Description:	The CO_2 emission factor per unit of energy of the fuel *i*.
Source of data used:	Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories: workbook
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:	Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories: workbook
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
Value applied:	See Annex 3
Justification of the choice of data or	Official released statistic; publicly accessible and reliable data source

description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	**Installed Capacity**
Data unit:	MW
Description:	The installed capacity
Source of data used:	The feasibility study report
Value applied:	44
Justification of the choice of data or description of measurement methods and procedures actually applied :	This data is from the feasibility study report
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

According to ACM0002, there are no expected project emissions related to the generation of electricity, as generation is based on a renewable resource. Also, given that there is no flooded area associated with the project activity, consequently it is not necessary to calculate the power density.

The emission of the proposed project activity is zero, i.e. $PE_y + L_y$ =0.

According to ACM0002, the leakage of the proposed project is not considered. No leakage is expected. Therefore, $L_y = 0$.

Therefore: $ER_y = BE_y$

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)
GEN: Electricity supplied by the project to the grid (MWh)
EF: baseline emission factor (tCO_2e / MWh)
y: refers to a given year

$$BE_y = \omega_{OM} * EF_{OM,y} + \omega_{BM} * EF_{BM,y}$$

Where:

EF: baseline emission factor (tCO_2e / MWh)
ω_{OM}: Operation Margin weight, which is 0.5 by default
EF_OM: Operational Margin emission factor (tCO_2e / MWh)
ω_{BM}: Build Margin weight, which is 0.5 by default
EF_BM: Build Margin emission factor (tCO_2e / MWh)
y: refers to a given year

Electricity supplied annually by the project to the grid (*GEN*) = 184,163 MWh. Baseline emission factor with combined margin (*EF*) = 0.9643 tCO_2e / MWh

Therefore using the approach above, and the data shown in Annex 3, the baseline emissions will be 177,575tCO_2e/year or 1,243,022tCO_2e for the 7-year crediting period.

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

>>

Year	Estimation of project activity emissions (tonnes of CO_2 e)	Estimation of baseline emissions (tonnes of CO_2 e)	Estimation of leakage (tonnes of CO_2 e)	Estimation of emission reductions (tonnes of CO_2 e)
September-December 2007	0	59,192	0	59,192

2008	0	177,575	0	177,575
2009	0	177,575	0	177,575
2010	0	177,575	0	177,575
2011	0	177,575	0	177,575
2012	0	177,575	0	177,575
2013	0	177,575	0	177,575
January to August 2014	0	118,383	0	118,383
Total (tonnes of CO_2 e)	0	1,243,022	0	1,243,022

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

The project uses the approved monitoring methodology ACM0002 "Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources", Version 6, 19 May 2006.
All data required for verification and issuance will be kept for at least two years after the end of the crediting period or the last issuance of CERs of this project.

B.7.1 Data and parameters monitored:

Data / Parameter:	Electricity quantity (. EG_y)
Data unit:	MWh
Description:	Electricity delivered to grid
Source of data to be used:	Measured
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Estimation of annual electricity generation delivered to grid: 184,162 MWh
Description of measurement methods and procedures to be applied:	Electricity supplied to the grid by Wahei power station will be measured by meters and will be recorded on a monthly basis. For a detailed description of the measurement methods see B.7.2
QA/QC procedures to be applied:	According to national standards (see B.7.2 for the exact standard), meters will be calibrated periodically. Data measured by meters will be cross checked by

	electricity sales receipts. The meters will be read jointly by the project developer and the grid company For a detailed description of the QA/QC procedures see B.7.2
Any comment:	

B.7.2 Description of the monitoring plan:

>>

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

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

1. Monitoring organisation

Prior to the start of the crediting period, the organisation of the monitoring team will be established. 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 Manger 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.

A formal set of monitoring procedures will be established prior to the start of the crediting period. These procedures will detail the organisation, control and steps required for certain key monitoring system features, including:

a) CDM staff training
b) CDM data and record keeping arrangements
c) Data collection
d) CDM data quality control and quality assurance *
e) Equipment maintenance
f) Equipment calibration
g) Equipment failure

See Annex 4 for a description and the scope of these procedures

* These procedures are based on a preliminary agreement with the grid the grid operator and will be confirmed once the crediting period has started.

The procedures will be agreed and signed off by the Mabian Xianjiapuhe Power Generation Co., Ltd and EcoSecurities. Any changes to procedures will need to be agreed by both parties. The CDM 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.

All staff involved in the CDM project will receive some relevant training from the project consulting company laid down in training procedures agreed on by the project developer and EcoSecurities (further details of the training procedure is provided in Annex 4). Records of trained CDM staff will be retained by the Project Developer. The CDM Manager will ensure that only trained staffs are involved in the operation of the monitoring system.

2. Monitoring equipment and installation

Given the emission factor is calculated on an ex-ante basis and according to the Monitoring Methodology ACM0002, the only data to be monitored is electricity supplied to the grid by the project (detailed in B.7.1).

Metering of Electricity Supplied to the Grid

The main electricity meter for establishing the electricity delivered to the grid (detailed in B.7.1) will be installed at the input end of the transmission line. This electricity meter will be the revenue meter that measures the quantity of electricity that the project will be paid for. As this meter provides the main CDM measurement, it will be the key part of the verification process. This meter is located in the Meiziba substation.
The local grid company provides the project developer with the agreed total amount of electricity of Wahei project supplied to the grid which can be checked by the project developer with the readings of the cross check meter on site.
This will form the electricity supply figure on the receipt of sales provided to the grid company by the project developer.

To ensure maximum availability of CDM data and to introduce quality controls of the CDM data, a cross-check meter will be installed in addition to the revenue meter. This meter will be located at the generation site, measuring the electricity exported from the project. Allowing for transmission losses, the meter will provide a useful cross check of the grid company's meter.

Electricity meters should meet the relevant local standards at the time of installation. Before the installation of the meters, it should be factory calibrated by the manufacturer. The meters will be installed by either the project developer or the grid company according to the following national Chinese standard "electricity meter installation technical management code" (DL/T448-2000). Records of the meter (type, make, model and calibration documentation) will be retained in the quality control system.

Quality Assurance

The revenue meter is owned and installed by the grid company. The project developer will sign an agreement with the grid company to specify the QA procedure for measurement and calibration to ensure the measurement accuracy of the main meter. Periodic checks should be conducted according to the relevant national standard [17]. For further details on the CDM data quality control and quality assurance see the CDM Monitoring System Procedures in Annex 4.

[17] See the China national regulation of the meter checking, published by the National Technology Supervising Bureau in 1989, doc number[JJG597-89]

Within 10 days after the following circumstances, all the meters installed should be tested by an accredited monitoring inspection organisation jointly appointed by the project developer and the grid company:

a) the error of revenue and meter or the cross check meter exceeds the abnormal range specified in the national standard [JJG597-89]
b) the meter is repaired or replaced due to the faults of the meter parts

3. Data recording procedure

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

<u>Metering Electricity Delivered to the Grid (the revenue meter)</u>

Each month the grid company will take a meter reading and records this figure. The data will be provided to the project developer.

<u>Metering of Electricity Output from the Hydro Station (the Cross-Check Meter)</u>

The cross check meter will be installed, operated and maintained according to the relevant Chinese standard [JJG597-89] to enable the use of the data as a cross check or back up in the case of a failure of the main meter. The actual readings of the cross check meter are expected to show a slight variation from the revenue meter as a result of transmission losses. The difference between the readings will be recorded over time to establish the typical transmission losses and to take account of these in any situation where the cross-check meter data is used in CDM calculation (only where accurate main meter data is unavailable).

<u>Main meter failure – use of cross-check meter data</u>

If the main electricity meter is found to be faulty during its reading, data from the cross-check meter will be used in its place. In this circumstance, the electricity delivered to the grid should be calculated as follows:

a) The data from cross check meter will be used for the period, with a minor adjustment to allow for transmission losses.
b) According to the historical transmission loss rate, the electricity delivered to the grid can be calculated.

<u>Cross-check meter failure</u>

In the event of the cross-check meter failing, it will be repaired or replaced by an accredited equipment testing organisation. Maintenance records and any calibration documents will be retained by the project.

4. Data and records management

At the end of each month the monitoring data needs to be filed electronically. The electronic files need to have CD back-up or print-out. The project developer needs to keep electricity sale and purchase invoices.

All written documentation such as maps, drawings, the EIA and the Feasibility study, 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 crediting 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 study and monitoring methodology and the name of the responsible person(s)/entity(ies)

>>

The baseline study was concluded on 4/1/2007. The entity determining the baseline and participating in the project as the Carbon Advisor is EcoSecurities, listed in Annex 1 of this document.

The baseline study was prepared by: EcoSecurities., 21 Park Central, 40/41 Park End Street, Oxford, OX1 1JD, UK. Contact: Wenyi.Zhang@ecosecurities.com

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:

>>

2/11/2006 (start of real action)

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

>>

25 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:

>>

1/9/2007

C.2.1.2. Length of the first crediting period:

>>

7 years.

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>

Not applicable

C.2.2.2. Length:

>>

Not applicable

SECTION D. Environmental impacts

>>

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

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According to clauses 13 and 19 of the Environmental Evaluation Law of the People's Republic of China, the project entity must analyse the environmental impacts of project activities in China before exploiting natural resources and beginning project construction. Therefore, the project developer commissioned Sichuan Water Conservatory & Hydropower Survey and Planning Research Institution to conduct the necessary Environmental Impact Assessment (EIA). in December 2003 and the EIA report was approved by the Sichuan Environmental Protection Bureau. The Wahei Hydro Project has received all necessary permits.

The EIA states that the project will contribute to the development of the local economy and society, in line with central government's 'Go-West' economic development campaign and policies. The project will also enhance the investment environment for the local economy. Both the EIA and feasibility study note that revenue generated from electricity sales will increase local residents' living standards, improve infrastructure and therefore facilitate the improvement of the economic investment environment of the project area.

Some possible environmental impacts stated in the EIA are summarized in the following:

Impact on Water quality

During the construction stage the project may generate several waste streams. Therefore the environmental management of the project includes the following water and waste management systems: industrial waste water treatment, anthropogenic waste management system (including anti-seepage).

Concerns about small copper appearances in the excavation zone mentioned in the EIA did not prove to be worrying as no copper was found during the construction of the project.

Impact on air quality

The main air pollutants are dust and some waste gas generated during the construction and necessary blastings. The average wind speed is high at the proposed project site, which will dilute the concentration of the pollutants rapidly. Thus, air pollution impacts for the construction workers will be reduced to a minimum level.

The air pollution to the residents in the Wahouku County is dust generated from the transportation. Solutions are to be adopted to mitigate these impacts including the installation of a showering system to dampen and control dust and the speed of trucks supplying the construction site needs to be controlled.

Noise impact

Noise during the continuous construction: the distance between the proposed project location and residents is over 1 kilometre. Therefore noise will not influence the residents.

Mitigation of noise impacts from blasting and excavation works during construction: Choose equipment with low noise if possible, arrange construction time; construction activity and blastings are banned in the evenings.

Transportation during the construction: Adjust transportation car's speed while passing residential areas.

Ecological impacts

Vegetation: there will be influence on the upper vegetation during the blasting, excavation and road construction.
Impacts on wildlife: The EIA only states there is expected to be very little adverse impacts on animals.
Aquatic creatures: no rare and endangered aquatic species are found in the Wahei River, however, the number of existing aquatic creatures will decrease due to construction of the project. The measures include some compensation to fishermen.

Soil erosion impact

There is land erosion in the project area which was occurring prior to the project activity. Project construction could exacerbate this erosion for example through the movement onsite of construction-related vehicles. Through installation of effective monitoring and site reclamation (re-vegetation) additional erosion will be prevented.

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. All negative environmental impacts are subject to mitigation measures as described above.

SECTION E. Stakeholders' comments

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

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According to the requirement by the *Measures for Operation and Management of Clean DevelopmentMechanism Projects in China,* a survey on the local villagers and residents has been conducted. The local government and stakeholders were invited to submit comments on the project activity.

A one page questionnaire was distributed to be easily filled in with the following questions:

- What is their opinion of the project activity's (namely Wahei Hydropower station) impact on employment?
- What impacts do they think there will be on the local ecological environment and social life caused by the project?
- Are there any negative impacts on their livelihoods during the construction of the project?
- What is the impact on local transportation?
- What is the impact on soil erosion?
- What is the impact on local vegetation?
- What would be the overall positive influence of the construction and operation of the Project?
- What would be the overall negative influence of the construction and operation of the Project?
- What is their attitude towards the construction of the Project?
- Do they support the construction of the Project?

100 questionnaires were sent to the local officials from Wahouku County; local residents, related employees and members of the general public. The survey received 100% participation (100 questionnaires returned out of 100). The survey shows that the proposed project receives strong support from local people, 99% of people expressed their support to the Project, and hoped the Project will start operation soon. [18]

The survey was conducted by the Wahei Project Manger of Mabian Xianjiapuhe Power Generation Co in May and June 2006.

[18] The questionnaires were made available to the validator

E.2. Summary of the comments received:

>>
The stakeholder consultation processes highlighted responses in the following areas:

The majority of stakeholders expressed their supports for the proposed project. The project will utilize the hydrological resource to generate the electricity, will be helpful to develop the local economy, and will increase new job opportunities.

While most stakeholders were very positive about the project there were some concerns raised; namely:

- to protect and maintenance the ecosystems, and water quality;
- to treat the wastewater generated during the project construction and operation;
- to lessen the negative impacts of construction on vegetation, soil retention and the associated erosion.

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

>>
Referring to these concerns, the developer has adopted mitigation methods which will be monitored throughout the project construction stage:

- elimination of night construction in the fourth construction area - to mitigate noise pollution to the residents
- the wastewater was treated in the sedimentation tank and the septic tank
- regeneration of vegetation in material yard area after project construction to avoid increased soil erosion in the area.

All comments received in the context of the environmental licensing and operation permits processes have been incorporated into the project design. The documentation is available to the public on request.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

This project will not receive any public funding.

Annex 3
BASELINE INFORMATION

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

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

Fuel Type	**Unit**	**Jiangxi A**	**Henan B**	**Hubei C**	**Hunan D**	**Chongqing E**	**Sichuan F**	**Subtotal G=A+B+C+D+E+F**	**EF (tC/TJ) H**	**Oxidation Factor (%) I**	**NCV (MJ/t, kJ/m^3) J**	**CO_2 emission（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	1062.63	4679.02	1710	1113.78	398.57	1964.32	10928.32	25.80	100	20908	216150891.6
Clean Coal	10000t	2.72						2.72	25.80	100	26344	67786.3
Other washed coal	10000t	3.66	26.49			249.99		280.14	25.80	100	8363	2216299.0
Coke	10000t		1.15					1.15	29.20	100	28435	35011.1
Coke Oven Gas	10^8m^3			1.11				1.11	12.20	100	16726	83051.3
Other Coal Gas	10^8m^3		2.16					2.16	12.20	100	5227	50505.4
Crude oil	10000t		0.67	1.17			0.81	2.65	20.00	100	41816	81262.4
Diesel	10000t	1	1.34	1.08	2.19	0.51	0.51	6.63	20.20	100	42652	209447.8
Fuel Oil	10000t	0.33	0.16	0.34	0.69		1.51	3.03	21.10	100	41816	98025.5
LPG	10000t		0.02					0.02	17.20	100	50179	632.9
Refinery Gas	10000t	0.49			1.9			2.39	14.00	100	46055	56503.3
Natural Gas	10^8m^3						1.75	1.75	15.30	100	38931	382205.1
Other petroleum products	10000t							0	20.00	100	38369	0.0
other coking products	10000t							0	25.80	100	28435	0.0
Other energy	10000tce		3.38					3.38	0.00	0	0	0.0
											subtotal	219431621.6

Data source: China Energy Statistics Yearbook **2000-2002**

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

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

Data source: China Electric Power Yearbook 2003

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

Fuel Type	Unit	Jiangxi A	Henan B	Hubei C	Hunan D	Chongqing E	Sichuan F	Subtotal G=A+B+C+D+E+F	EF (tC/TJ) H	Oxidation Factor (%) I	NCV (MJ/t, kJ/m^3) J	CO_2 emission（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	1427.41	5504.94	2072.44	1646.47	769.47	2430.93	13851.66	25.80	100	20908	273971539.9
Clean Coal	10000t							0	25.80	100	26344	0.0
Other washed coal	10000t	2.03	39.63			106.12		147.78	25.80	100	8363	1169146.4
Coke	10000t				1.22			1.22	29.20	100	28435	37142.2
Coke Oven Gas	10^8m^3			0.93				0.93	12.20	100	16726	69583.5
Other Coal Gas	10^8m^3							0	12.20	100	5227	0.0
Crude oil	10000t		0.5	0.24			1.2	1.94	20.00	100	41816	59490.2
Diesel	10000t	0.52	2.54	0.69	1.21	0.77		5.73	20.20	100	42652	181015.9
Fuel Oil	10000t	0.42	0.25	2.17	0.54	0.28	1.2	4.86	21.10	100	41816	157229.0
LPG	10000t							0	17.20	100	50179	0.0
Refinery Gas	10000t	1.76	6.53		0.66			8.95	14.00	100	46055	211592.0
Natural Gas	10^8m^3					0.04	2.2	2.24	15.30	100	38931	489222.5
Other petroleum products	10000t							0	20.00	100	38369	0.0
other coking products	10000t							0	25.80	100	28435	0.0
Other energy	10000tce		11.04			16.2		27.24	0.00	0	0	0.0
											subtotal	276345961.7

Data source: China Energy Statistics Yearbook 2004

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

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

Data source: China Electric Power Yearbook 2004

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

Fuel Type	Unit	Jiangxi A	Henan B	Hubei C	Hunan D	Chongqing E	Sichuan F	Subtotal G=A+B+C+D+E+F	EF (tC/TJ) H	Oxidation Factor (%) I	NCV (MJ/t, kJ/m^3) J	CO_2 emission（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	12.2	100	16726	151138.4
Other Coal Gas	10^8m^3					2.61		2.61	12.2	100	5227	61027.3
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	14	100	50179	136884.7
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
											subtotal	346020927.1

Data source: China Energy Statistics Yearbook 2005

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

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

Data source: China Electric Power Yearbook 2005

Table A7 Operating Margin Emission Factor of Central China Power Grid

		2002	2003	2004	**OM in average**
Total CO_2 emission	tCO_2e	219431621.6	276345961.7	346020927.1	1.2778
Electricity generation	MWh	183733384.7	225987719.2	249074186.3	

Calculation of Build Margin Emission Factor for Central China Power Grid

Table A8 Calculating the relevant emission factor of thermal power stations.

		Unit	Value	Data source or Equation
A	Fuel consumption, BAT	tce/MWh	0.33666	Data source: the statistics by State Electricity Regulatory Commission (SERC) on newly built thermal plants in 10th "Five-Year Plan" period 2000-20005, and NDRC see: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2006/20061215144747182.pdf
B	Net caloric value (NCV)	GJ/tce	29.27	Data source: China Energy Statistic Yearbook
C	Carbon content for coal	tC/TJ	25.8	2006 IPCC Guidelines for National Greenhouse Gas Inventories
D	Oxidation factor	%	100	2006 IPCC Guidelines for National Greenhouse Gas Inventories
E	Emission coefficient ($COEF_{Coal}$)	tCO_2/tce	2.769	E=B*(C/1000)*D*44/12
F	Emission factor	tCO_2/MWh	**0.9322**	F=A*E

Table A9 Installed capacity in Central China Grid in 2004

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

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

Table A10 Installed capacity in Central China Grid in 2001

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

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

Table A11 Installed capacity in Central China Grid in 2000

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

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

Table A12 Build Margin Emission Factor of Central China Power Grid

	2000	New added capacity (2004-2000)	2001	2004
Total Installed capacity (MW)	68502	19884	72966	88387
Thermal power Installed capacity (MW)	39865	13880	42569	53745
Hydro power installed capacity (MW)	4604	2477	6093	7081
Total change	22.50%		17.45%	
Split of new capacity		69.80%		
Emission factor (tCO_2/MWh)	0.9322			
Buid margin emission factor (F=D*E)	**0.6507**			

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

Operating Margin Emission Factor	1.2778
Build Margin Emission Factor	0.6507
Combined Emission Factor (C=0.5*A+0.5*B)	**0.9643**

Baseline Calculation

Table A14 Generation of Central China Grid in 2000

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

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

Data source: China Electric Power Yearbook 2001

Table A15 Generation of Central China Grid in 2001

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

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

Data source: China Electric Power Yearbook 2002

Table A16 Generation of Central China Grid in 2002

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

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

Data source: China Electric Power Yearbook 2003

Table A17 Generation of Central China Grid in 2003

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

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

Data source: China Electric Power Yearbook 2004

Table A18 Generation of Central China Grid in 2004

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

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

Data source: China Electric Power Yearbook 2005

Annex 4

FURTHER DETAILS OF THE MONITORING PLAN

Table: CDM Monitoring System Procedures

Procedure name	Description	Scope
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.	This procedure should be followed by all CDM staff prior to performing any monitoring duties for the CDM project.
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.	All data and records should be managed following this procedure. All CDM staff are responsible for ensuring that any data or records are dealt with according to this procedure.
Data collection	This procedure will outline the steps to collect the data from the main grid company electricity meter and the cross check meter (on site).	The procedure for the data collection of the revenue meter should be agreed on by the grid company and the project developer
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 cross checks of the two electricity meters, and checks of the electricity figures on the receipts. All records will be checked for completeness.	The CDM Manager is responsible for ensuring that QA is carried out on all data.
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.	This procedure should be followed by all CDM staff involved in internal audits.
Electricity meter check	This procedure outlines the steps to provide regular and preventative check to the main electricity meter and the cross-check electricity meter.	This procedure should be followed by all staff involved in checking and maintaining the on site electricity meter. The revenue meter will be sealed by the project

		developer and the grid company jointly. One party cannot unseal or modify the electricity meter in the absence of the other party.
Equipment failure	This procedure details the process of data collection in the case that a problem with any meter occurs.	This procedure should be agreed on by the grid company and the project developer.
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 calibration of the electricity meters will be conducted by a suitable company according to the relevant standards. The CDM Manager is responsible for organising the calibration and ensuring that records are retained.

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

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