CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

SECTION A. General description of project activity

A.1. Title of the project activity:

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The title of the project: Xiaojin County Zhongmachang Hydropower Project
Version of the document: Version 01
Date of the document: 26/11/2007

A.2. Description of the project activity:

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Xiaojin County Zhongmachang Hydropower Project (hereafter referred to as "the Project") is designed to construct a 20 MW hydropower project located on Wori River in Xiaojin County, Aba Zang & Qiang Autonomous Prefecture, Sichuan Province, P. R. China. The Project mainly includes construction of a detention weir, a water intake system, a 20MW powerhouse, a step-up station and one set of 110 kV transmission lines. It is expected to generate an annual output of 113,628 MWh and provide on-grid power supply of 108,742 MWh to be connected to Sichuan Grid, and subsequently to Central China Power Grid (CCPG).

Thermal power is the major power source of CCPG. The electricity generated by the proposed project will displace equivalent amount of power supply from the carbon intensive CCPG by making use of clean and renewable energy, and thus generating great amount of anthropogenic GHGs emission reductions. It is estimated that the Project will achieve 105,972 tCO_2e GHGs reductions per annum. The Project provides a combination of positive social, economic and environmental development benefits as follows:

- To supply clean and reliable electricity to alleviate local power shortage;
- To create new job opportunities: 835 temporary positions at most will be provided during the construction phase, and 50 permanent staffs needed during the operation phase;
- To protect local forest and the ecosystem by substituting for firewood with a clean and renewable power source; and
- To contribute to poverty alleviation in Xiaojin County which is a state-level poverty-hit region and to improve the living standard of local minorities.

These social, economic and environmental benefits emphasis on the important sustainable benefits of the proposed CDM activity to the country and region, and further contribute to the National Western Development Strategy.

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)
People's Republic of China (host)	Xiaojin County Xinghua Water Resource and Hydropower Development Co., Ltd	No
Japan	Mitsubishi Corporation	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.		

A.4. Technical description of the project activity:

A.4.1. Location of the 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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Sichuan Province

A.4.1.3. City/Town/Community etc:

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Xiaojin County, Aba Zang & Qiang Autonomous Prefecture

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 on Wori River in Xiaojin County, Aba Zang & Qiang Autonomous Prefecture, Sichuan Province, P. R. China. It is about 25 km form Xiaojin County centre. Figure 1~3 show the geographical location of the project.

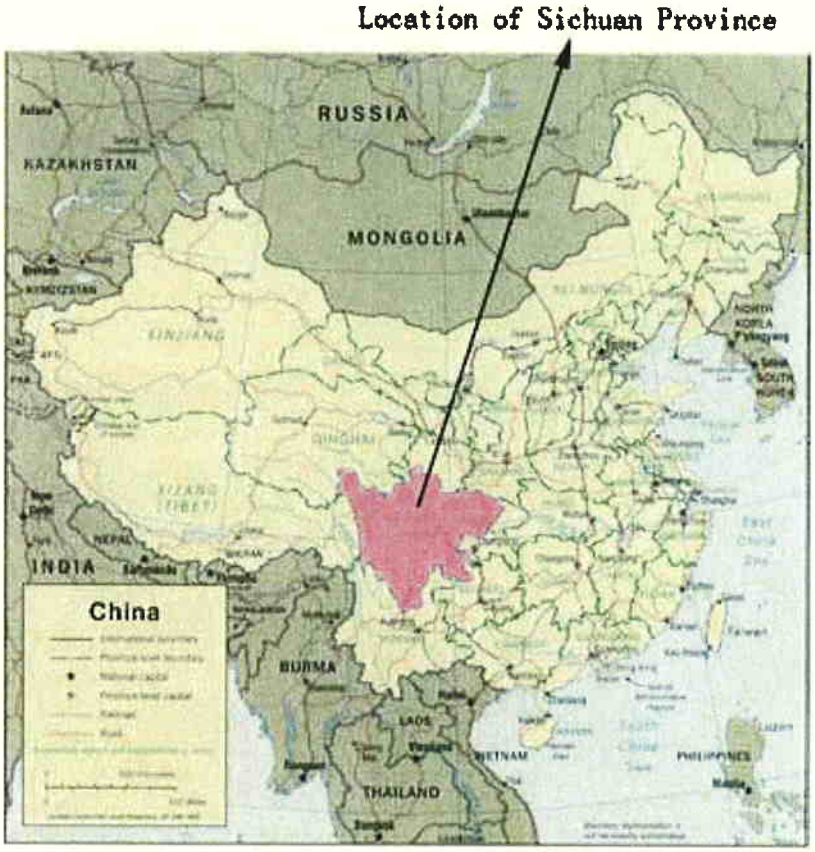

Figure 1: Location of Sichuan Province

Figure 2: Location of Aba Zang & Qiang Autonomous Reiron

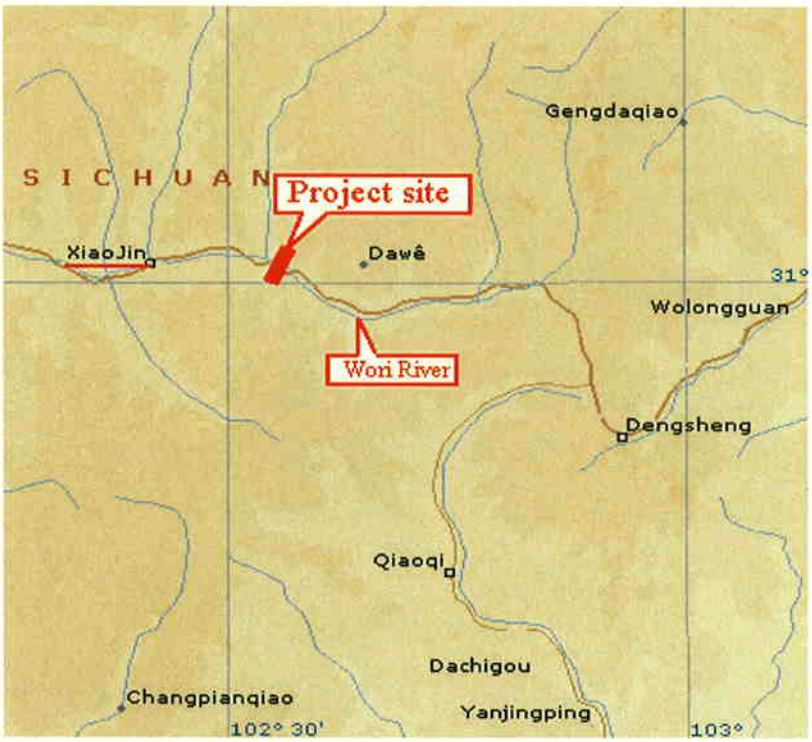

Figure 3: Location of the Project site

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

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The project activity falls into:
Sectoral Scope Number: 1. Energy Industry

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

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Based on the preliminary design, the Project includes construction of the following components:

- A detention weir consists of 5 flushing sluices and 2 water intake sluices to create a non-regulating water pool with normal water level of 2594.50 m to facilitate the water intake;
- A water intake system mainly consists of a silting basin, a 3625.01-m-long power intake tunnel, a fore bay and a 263.376-m-long penstock to create a rated water fall of 102 m and designed intake flow of 25 m^3/s;
- A 20 MW powerhouse and a step-up station. The housed hydraulic turbine-generator units are 2 HLA630-LJ-120 Francis turbines and 2 SF10-8/2860 generators with installed capacity of 10 MW, respectively:

Table 1: Parameters of the housed turbines and generators

Equipment	Parameters	
Turbines	Type	HLA630-LJ-120
	Employed units	2
	Rated Output	10.84 MW
	Rated Water Head	102 m
	Rated Water Flow	11.5 m^3/s,
	Rated Speed	600 r/min
Generators	Type	SF10-8/2860
	Employed units	2
	Rated Capacity	10 MW
	Rated Voltage	10.5 kV

- One set of 110 kV transmission lines lined up to Rilong Substation of Central China Power Grid.

All the selected equipments are produced domestically without technology transfer.

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

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The project chooses 7×3-year renewable crediting period. It is estimated that the Project will achieve GHGs emission reductions of 105,972 tCO_2e per annum, resulting in a total mitigation of 741,809 tCO_2e throughout the first crediting period specified as follows:

Years	Annual estimation of emission reductions in tonnes of CO_2e
01/05/2008~30/04/2009	105,972
01/05/2009~30/04/2010	105,972
01/05/2010~30/04/2011	105,972
01/05/2011~30/04/2012	105,972
01/05/2012~30/04/2013	105,972
01/05/2013~30/04/2014	105,972
01/05/2014~30/04/2015	105,972
Total estimated reductions (tonnes of CO_2e)	741,809
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	105,972

A.4.5. Public funding of the project activity:.

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No public funding from Annex I Country is provided for the Project.

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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The project applies:

ACM0002: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002/Version 06, Sectoral Scope: 1, 19 May 2006);

ACM0002: "Consolidated monitoring methodology for grid-connected electricity generation from renewable sources." (ACM0002/ Version 06, Sectoral Scope: 1, 19 May 2006); and

Version 03 of the Tool for demonstration and assessment of additionality.

Please refer to UNFCCC website for the methodologies mentioned above:
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 Project is a grid-connected renewable power generation activity and meets all the conditions stated in the methodology ACM0002 as the following:

- The Project is a newly constructed power project employing renewable power source of hydropower;
- The Project is not an activity that involves switching from fossil fuels to renewable energy at the project site; and
- The geographic and system boundaries for the relevant electricity grid (CCPG) which the Project is connected with can be clearly identified and information on the characteristics of the grid is available.

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

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	Source	Gas	Included?	Justification / Explanation
Baseline	Electricity generation in baseline (South China Power Grid)	CO_2	Yes	Main emission source.
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
Project Activity	Emission from reservoir of the Project (inside the project boundary)	CO_2	No	Grid-connected electricity generation from renewable energy.
		CH_4	No	Grid-connected electricity generation from renewable energy.
		N_2O	No	Grid-connected electricity generation from renewable energy.

The project boundary of the Project is represented by CCPG. CCPG includes integral parts of Sichuan Grid, Henan Grid, Hubei Grid, Hunan Grid, Jiangxi Grid and Chongqing Grid. There is clearly defined spatial and geographical extent of the power plants and transmission system, and all the electricity can be

dispatched without significant transmission constraints. Moreover, geographical boundary of CCPG is also clearly defined as a regional grid according to the "Explain of confirming baseline emission factors of regional power grids in China" issued by China's DNA. Therefore, CCPG is considered as the grid boundary for the Project for determining the build margin (BM) and operating margin (OM) emission factors. Figure 4 below shows the structure of CCPG:

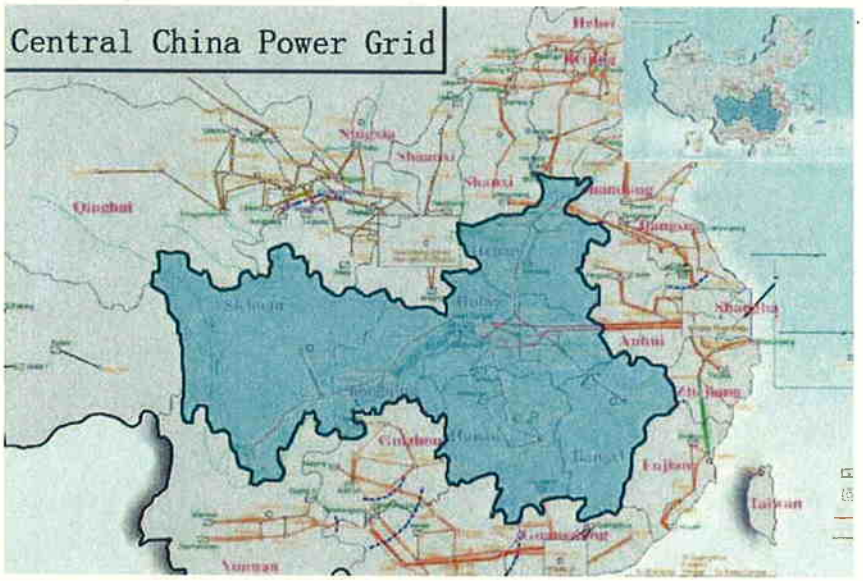

Figure 4: Structure of Central China Power Grid

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

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In the absence of the Project, the possible alternatives which comprise the baseline scenario would be as follows:

1) Construction of a new coal-fired power plant with equivalent output connected to CCPG;

2) Construction of a new power plant using other renewable power sources with equivalent output;

3) The Project activity undertaken without being registered as a CDM project activity; and

4) Provision of equivalent amount of annual power supply by CCPG which the Project is connected with.

For alternative 1), according to current laws and regulations, construction of coal-fired power plants with installed capacity below 135 MW, if without special permission, are strictly prohibited in large layered grids[1]. Therefore, alternative 1) is not in compliance with current regulation requirements and is not credible and realistic.

[1] Notice on Strictly Prohibiting the Installation of Fuel-fired Generation with the Capacity of 135 MW or below issued by the General Office of the State Council, decree no. 2002-6.

For alternative 2), the development costs of other renewable power sources are higher than that of hydropower mainly attribute to dependence on imported equipments and immature technologies. The generation cost for small-scale hydropower project in China is similar with the conventional thermal power plants[1], which is around RMB 0.19 yuan/kWh[2]. The generation costs of wind power and solar power are around RMB 0.4~0.6 yuan/kWh, and RMB 3.5 yuan/kWh[4], respectively. The generation cost for biomass power generation project is also as much as 1.5 times higher than the thermal power plants[5]. Therefore, alternative 2) "Construction of a new power plant using other renewable power sources with equivalent output" seems not a suitable alternative.

For alternative 3), as demonstrated in Step 2 Investment analysis in B.5., the Project activity is not financially attractive if without CDM revenue. So alternative 3) is not credible and realistic, and should not be considered as the baseline scenario either.

Alternative 4) "Provision of equivalent amount of annual power supply by CCPG which the Project is connected with" complies with current laws and regulations and is financially feasible. Therefore, alternative 4) is the only credible and feasible baseline scenario for the Project.

As a result, the baseline scenario for the Project is represented by provision of equivalent amount of annual power supply by the CCPG which is dominated by thermal power.

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): >>

The following steps are used to demonstrate the additionality of the Project according to the last version of *Tool for the demonstration and assessment of additionality (version 3)* as issued in Annex 5 of the 29th meeting of the Executive Board (EB-29).

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

This step is used to define realistic and credible alternatives to the project activity that can be (part of) the baseline scenario through the following sub-steps:

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

The available alternatives that would supply equivalent amount of electricity in the absence of the proposed CDM project activity are to include:

1) Construction of a new coal-fired power plant with equivalent output connected to CCPG;

2) Construction of a new power plant using other renewable power sources with equivalent output; as analyzed in B.4 demonstrated above, since development costs of other renewable power plants are higher than hydroelectric ones, this option is not considered to be a feasible alternative;

3) The Project activity undertaken without being registered as a CDM project activity; and

[1] http://www1.cfi.net.cn/newspage.aspx?id=20070611000970&AspxAutoDetectCookieSupport=1

[2] http://www.ica.gov.cn/code/hygc/hygc2004/03/1701.htm

4) Provision of equivalent amount of annual power supply by the CCPG which the Project is connected with.

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

This section identifies realistic and credible alternatives to the project activity based on all applicable mandatory legal and regulatory requirements.

According to Chinese regulation rules, coal-fired power plants with a capacity of 135 MW or less, if without special permission, are prohibited in large layered grids, such as provincial grids[1]. Generally, the annual operation hours of coal-fired power plants would be 1.5 times of the hydroelectric ones. If generating the same annual electricity, the installed capacity of a coal-fired power plant should be much lower than that of a hydropower plant. Therefore, alternative 1) is not consistent with current mandatory laws and regulations, and should be eliminated from further consideration.

Step 2. Investment analysis

This step is used to determine whether the Project activity is economically or financially less attractive than other remaining alternatives, identified in Step 1, without the revenue from the sale of certified emission reductions (CERs). To conduct the investment analysis, the following sub-steps are involved:

Sub-step 2a. Determine appropriate analysis method

Three analysis methods demonstrated in *Tool for the demonstration and assessment of additionality (version 3)* are available to conduct the investment analysis:

Option I: Simple cost analysis
Option II: Investment comparison analysis
Option III: Benchmark analysis

The simple cost analysis method (Option I) is not appropriate because the Project will get the revenues not only from the CDM but also from the electricity sales. The investment comparison analysis is also not applicable, as the baseline scenario of the Project is not a similar investment project, the project owner has no investment options to compare with. So investment comparison analysis method (Option II) is neither appropriate. As a result, Option III- Apply benchmark analysis is chosen to demonstrate and assess the additionality, since the data on the total investment FIRR of Chinese power industry is available.

Sub-step 2b – Option III. Apply benchmark analysis

According to *Economic evaluation code for small hydropower projects* (SL 16-95), the benchmark of FIRR for small hydropower project in China is at 10% (after tax), only those projects whose FIRR equals or exceeds the benchmark will be identified to be financially acceptable, which is widely used for power project investment evaluation in China. Therefore, this benchmark is currently used for financial appraisal of this project.

[1] Notice on Strictly Prohibiting the Installation of Fuel-fired Generation with the Capacity of 135 MW or below issued by the General Office of the State Council, decree no. 2002-6.

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

1) Critical techno-economic parameters and assumptions

The critical techno-economic parameters and assumptions of the Project for calculation of financial indicators are presented below:

Installed capacity	20 MW
Annual output	113,628 MWh
On-grid power supply	108,742 MWh
Construction period	3 years
Operation period	20 years
Total investment	207.26 million Yuan
Bus-bar tariff	0.288 yuan/kWh (VAT excluded)
Value added tax	6%
Income tax	25%
Urban Construction and maintenance tax	5%
Educational surtax	3%

2) Calculation and comparison of FIRR of the Project activity and the financial benchmark

In accordance with Option III, if the Project activity has a less favourable indicator than the benchmark, then the Project cannot be considered as financially attractive.

Table 2 below shows the FIRR on total investment of the Project activity without CDM revenue. Without CDM revenue, the project FIRR on total investment of 7.92% falls behind the benchmark of 10%, indicating that the Project is not financially attractive.

Sub-step 2d. Sensitivity analysis

The purpose of this step is to exam whether the conclusion regarding the financial attractiveness is robust to reasonable variations of the critical assumptions.

The following parameters are selected to be the critical assumptions fluctuating in the range of -10%~10%:

1) O&M cost;
2) Bus-bar tariff; and
3) Total investment.

Table 2 and Figure 5 below show the fluctuating situation of FIRR of the Project with reasonable variations in the critical assumptions. It is shown that the FIRR will never exceed the benchmark of 10% even if the bus-bar tariff increased or the O&M cost or the total investment decreased favourably. Therefore, the sensitivity analysis strongly and consistently supports the conclusion that the Project activity is unlikely to be financially attractive.