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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Langxiang 30MW Hydro Power Project in Guizhou Province China.
Version: 5.0
Date: 24/06/2008

Revision history

Version number	Date	Reason
Version 1.0	Dec, 2006	Revised PDD for GSP.
Version 2.0	Oct, 2007	Revised according to NDRC's suggestions and resolution of corrective action and clarification requests from DOE
Version 3.0	Dec, 2007	Revised according to DOE's review
Version 4.0	May, 2008	Revised according to DOE's final opinions
Version: 5.0	June, 2008	Only revise the starting date of crediting period as per DOE's requirement

A.2. Description of the project activity:

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Langxiang 30MW Hydro Power Project is located on Dagou River in Langxiang Village, Laocun Town Libo County of Qiannan Buyi & Miao Autonomous District, Guizhou Province China. This project will build the dam and hydropower tunnel to generate the electricity. The construction tasks of the proposed project include building the barrage, the intake power tunnel, a pressure adjustment well, the pressure pipeline and the power plant etc. The water flux for electricity generation is 102m^3/s. The surface area at the full reservoir level of the proposed project will be 0.259 km^2, thus the power density of the project will be 115.8 W/m^2.The total installed capacity is 30MW (2*15MW) with annual operation time of 4420 hours, and the annual electricity generation is 132,500 MWh(the annual grid-connected electricity generation is 118,060MWh). The electricity will supply Qiannan District grid and finally connect to China Southern Power Grid[①].

Electricity generated by the proposed project will displace part of the electricity generated by CSPG which is dominated by fossil fuel-fired power plants, and thus greenhouse gas (GHG) emission reductions could be achieved. The estimated annual GHG emission reductions are 99,566 tCO_2e.

As a renewable hydro power project, the proposed project will produce positive environmental and economic benefits and contribute to the local sustainable development through following aspects:

1. To be in accordance with Chinese national energy policy and the Western Development Strategy, the proposed project will alleviate power shortage in south China and will boost the social and economic development of local minority areas.

[①] *Feasibility Study Report of Langxiang Hydropower Plant.* [2003.04 Survey Design Institute For Water Source and Hydropower Guizhou Province]

2. To displace part of the electricity from fuel-fired power plants in CSPG, and thus will avoid environmental pollution caused by coal burning.

3. To create new job opportunities for the local people: temporary job opportunities will be available during the construction period and 40 permanent job positions will be available during the operation period. All these will increase the income of local governments and people as well as improve the local poor condition.

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)	Libo Lidu Hydro Power Development Co.Ltd. (owner)	No
Japan	Eco Asset Inc.(buyer)	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.		

The details of participation are shown in annex 1

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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P.R. China (host)

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

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Guizhou Province

A.4.1.3. City/Town/Community etc:

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Laocun Town Libo County of Qiannan Buyi & Miao minority Autonomous District

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 proposed project is located in Libo County Qiannan Buyi & Miao Autonomous District, in the south of Guizhou Province. The proposed project is 3 km away from Langxiang Village Laocun Town and 209 km away from Duyun City. The geographical coordinates of the dam are 107°48′00′ E and 25°10′30″N, and the geographical coordinates of the powerhouse are 107°48′30″ E and 25°10′54″N. Figure 1 below shows the location of the proposed project.

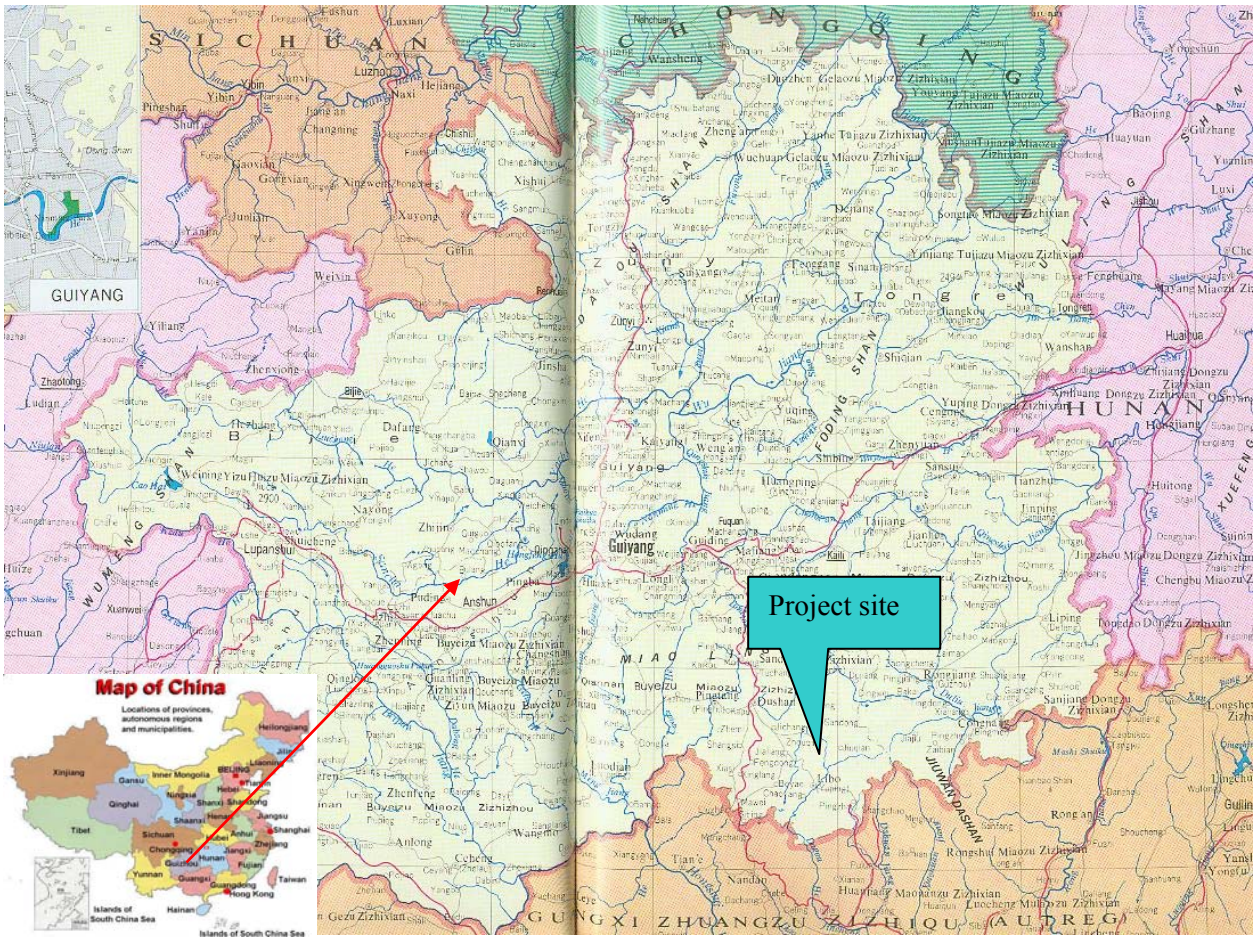

Fig. 1 Location of the Proposed Project

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

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The project falls into:
Sectoral Scope 1: energy industries (renewable sources)

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

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The proposed project is a hydropower plant with installed capacity of 30MW (2×15MW). The main

construction works include barrage, water discharge construction, hydropower tunnel, power house, booster substation and electricity transmission lines etc. The height of the dam is 48.55 m. The length of the tunnel is 1,241.55 m long with a diameter of 6 m. The end of the hydropower tunnel is diverged into the two sub-tunnels, that can lead the water to flow into the power plant and drive the turbines. The generated electricity is delivered to 110 kV substation in Libo County through 110 kV electricity transmission line, and finally delivered to the CSPG. All the technology and equipment are domestic, thus the technology transfer is not involved. Table 1 below shows the design features and characteristics of the project.

Table 1 Design features & characteristics of the project[①]

Turbine	Quantity	2
	Model	HLA551c-LJ-245
	Rated rotate speed	214.3 rpm
	Rated water head	35.9 m
	Rated flow rate	48.5 m3/s
	Manufacturer	Tianfa heavy hydro-electric equipment manufacture CO. Ltd. In Tianjin city China
Generator	Quantity	2
	Model	SF15-28/5500
	Single capacity	15 MW
	Rated voltage	10.5 kV
	Manufacturer	Tianfa heavy hydro-electric equipment manufacture CO. Ltd. In Tianjin city China
Main transformer	Model	SF9-20000/110
	Manufacturer	Transformer Co., Ltd of Chongqing Bolian

The professional technicians and engineers have trained the hydropower plant staffs on the monitoring procedures, operation regulation, maintenance procedures and other required knowledge regarding the hydropower plant before the start of operation of the project. Furthermore, there will be regular training courses regarding monitoring and operation for plant staffs during operation period.

Table 2 Time schedule of the proposed project

No.	Date	Event
1.	5th September, 2003	The Environmental Impact Assessment report was approved by the Guizhou province environmental bureau. (Qianhuanhan [2003] No. 152)
2.	3rd November, 2003	The Feasibility Study Report was approved by Guizhou province Development and Plan Commission.(Qianjinongjing [2003] No. 1107)
3.	17th December, 2003	The first loan with amount of 110 million RMB was approved by ICBC Guizhou branch. (Gongyinqianxinshen[2003] No.1126)

① Data are derived from *Feasibility Study Report of Langxiang Hydropower Plant*[2003.04 Survey Design Institute For Water Source and Hydropower Guizhou Province] and Purchase Contract of Turbines and Generators

4.	1st March, 2004	The licence of starting construction was approved by the supervising engineer (the Changjiang Water Resources Commission Supervise Centre Langxiang Project Supervise Station)
5.	30th December,2005	The supervising engineer (the Changjiang Water Resources Commission Supervise Centre Langxiang Project Supervise Station) made a report that the total investment would increase very much, and the increase would cause the project financially unattractive.
6.	6th January, 2006	The project owner's board decision to apply for CDM.
7.	10th January, 2006	The request to local DRC for CDM.
8.	12th January, 2006	The CDM consultation contract was signed by the project owner and consultant (the Guizhou Zhongshui Hengyuan project management and consulting Co. Ltd).
9.	13th January, 2006	The CDM request was approved by local DRC.
10.	27th February, 2006	After the capital of 12.17 million RMB was reinvested by the project owner, the second loan with the amount of 25.5 million RMB was approved by ICBC Guizhou branch, (Gongyinqianshenpi [2006]No. 65)
11.	April, 2006	Commissioning
12.	17th August, 2006	The Memorandum of Understanding about the CERs was signed by the project owner and the buyer (Eco Asset Inc.).
13.	November, 2006	The request (including the PDD) was delivered to the NDRC for the LoA.
14.	30th December, 2006	Validation on site.
15.	17th January, 2007	Get the LoA of China.

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

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The ex-ante estimated amount of emission reductions over the first crediting period of the proposed project is listed in Table 3 below:

Table 3 Ex-ante estimation of emission reductions over the first crediting period

Years	Annual estimation of emission reductions in (tCO_2e)
15/09/2008-14/09/2009	99,566
15/09/2009-14/09/2010	99,566
15/09/2010-14/09/2011	99,566
15/09/2011-14/09/2012	99,566
15/09/2012-14/09/2013	99,566

15/09/2013-14/09/2014	99,566
15/09/2014-14/09/2015	99,566
Total estimated reductions (tones of CO_2e)	696,962
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tones of CO_2e)	99,566

A.4.5. Public funding of the project activity:

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There is no public funding involved in this proposed 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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Title of the approved baseline methodology: ACM0002-Consolidated baseline methodology for grid-connected electricity generation from renewable sources (Version 06, 19 May 2006)

Title of the approved monitoring methodology: ACM0002-Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources (Version 06, 19 May 2006)

Reference: Tool for the demonstration and assessment of additionality (Version 03, 16 February 2007)

Please click following link for more information about the methodology and reference:
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 ACM0002 is applicable for the proposed project, and the proposed project meets all applicability conditions of the methodology ACM0002 as follows:

1. The proposed project is a new built hydropower project by using water resources for power generation. The electricity generated by the proposed project will be connected to CSPG, so it is a grid-connected electricity generation project from renewable sources.

2. The power density of the proposed project is 115.8 W/ m^2, which is greater than 4W/m^2.

3. The proposed project does not involve switching from fossil fuels to renewable energy at the site of the project activity.

4. The geographic and system boundaries for the CSPG can be clearly identified and information and data 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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According to methodology ACM0002, the project boundary for new hydropower project includes the physical site of the plant as well as the reservoir area. The spatial extent of the project boundary includes the project power the project site and all power plants connected physically to the electricity system that the proposed project is connected to. For this project, the delineation of grid boundaries is used as provided by the DNA of P.R. China. The generated electricity of the project will be delivered to CSPG, which covers Guangdong Province, Guangxi Province, Yunnan Province and Guizhou Province[①]. The main emission sources and type of GHGs in project boundary are listed in Table 4 below:

[①] Chinese DNA's Guideline of emission factors of Chinese grids

Table 4 Sources and gases in project boundary

	Source	Gas	Included?	Justification/Explanation
Baseline	Fuel-fired Power Plants in CSPG	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded according to ACM0002.
		N_2O	Excluded	Excluded according to ACM0002.
Project Activity	The proposed project	CO_2	Excluded	Excluded according to ACM0002.
		CH_4	Excluded	The project power density is 115.8 W/m^2, which is greater than 10 W/m^2. The CH_4 emissions should be Excluded
		N_2O	Excluded	Excluded according to ACM0002.

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 proposed project, the possible alternatives to the proposed project would be as follow:

1) The proposed project activity not undertaken as CDM project activity;

2) Construction of a fossil fuel-fired power plant with equivalent amount of installed capacity or annual electricity output;

3) Construction of an alternative renewable power plant with equivalent annual electricity generation;

4) Provision of equivalent amount of annual power output by the grid (China Southern Power Grid) where the proposed project is connected to.

As for alternative 1), the proposed project will generate clean power with renewable water resources and cause the emission reduction by displacing equivalent power generation from CSPG. However, the project can not be implemented due to the weak financial indicator, which will be analyzed in details in Section B.4.

As for alternative 2), the installed capacity of the proposed project is 30MW. For the average annual utilization hours of the fossil fuel plants are 5,633[①] in China, which are larger than the average annual utilization of hydropower plants. Thus, the installed capacity of the fossil fuel-fired plants with equivalent annual electricity generation to the project will be smaller than 30 MW. However, according to the current laws and regulations in China, the thermal power plants with installed capacity of 135 MW or below are prohibited for construction within grid connected areas[②]. From the above analysis, scenario 2) is not feasible as a realistic and credible alternative scenario.

As for alternative 3), the alternative is to construct renewable power plants, which can generate equivalent electricity annually as the project. However, those kinds of renewable power plants, such as photovoltaics,

[①] <National Statistics Express of Power Industry in 2006>, China Electricity Council

[②] General Office of the State Council [Decree No. 2002-6]: <Notice on Strictly Prohibiting the Construction of Thermal Power Plants with Installed Capacity of 135 MW or Below>

tidal/wave, wind, geothermal and renewable biomass etc., are strongly depended on climate and natural resources. They can not provide equivalent power supply quality and services as hydropower plants. There is not enough such kind of renewable resources at project site[①]. Furthermore, limited by technology development and high costs, constructing an alternative renewable power plant is not financially attractive compared to the proposed project.

Therefore, the alternative 3 is not a possible baseline scenario.

As for alternative 4), under the current relevant laws and regulations in Chinese power market, the existing capacity and newly capacity addition of China Southern Power Grid meet the requirements of the national laws and regulations, and economically viable. So Provision of equivalent amount of annual power output by the grid (China Southern Power Grid) where the proposed project is connected to is an economically viable alternative. Furthermore, as for the proportion of several kinds of electricity generation technologies in the China Southern Power Grid, the electricity generated by the fossil fuel fired power plants respectively takes up 67.67%, 68.38%, 68.94%, 71.99% and 69.58% of the total electricity generation from year 2001 to 2005[②]. Thus it can be seen that CSPG gives priority to fossil fuel fired power plants and such situation did not change in the past few years. So the electricity shortage in China Southern Power Grid will be satisfied by newly built fossil fuel-fired power plants and intensified operation of existing fossil fuel-fired plants.

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): >>

According to "Tool for the demonstration and assessment of additionality(Version 03, 16 February 2007)", the additionality of the project is demonstrated and assessed through the following steps:

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

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

There are 4 realistic and credible baseline scenario alternatives identified for the project:

1) The proposed project activity not undertaken as CDM project activity;

2) Construction of a fossil fuel-fired power plant with equivalent amount of installed capacity or annual electricity output;

3) Construction of an alternative renewable power plant with equivalent annual electricity generation;

4) Provision of equivalent amount of annual power output by the grid (China Southern Power Grid) where the proposed project is connected to.

As described in Section B.4, the only realistic and credible alternative is alternative 4)- Provision of

[①] Refer to: http://hi.baidu.com/girl546/blog/item/f2cc13240a604832c995592c.html; http://www.35kv.cn/Electricity/taiyangnengfadian/20060929226.html

[②] Date source: *China Electric Power Yearbook 2002, 2003, 2004, 2005, 2006*

equivalent amount of annual power output by the grid (China Southern Power Grid) where the proposed project is connected to.

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

The alternative 1), alternative 3) and alternative 4) described in Section B.4 above are in compliance with all current applicable law and regulations in China. The alternative 2) is not in compliance with mandatory laws and regulations in China. Thus the proposed project is not the only one that complies with current regulations and laws.

Step 2. Investment analysis

The following sub-steps are used for determining whether the proposed project activity is the economically or financially less attractive than other alternatives without the revenue from the sale of certified emission reductions (CERs).

Sub-step 2a. Determine appropriate analysis method

According to "Tool for the demonstration and assessment of additionality", there are three analysis methods recommended, including simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III).

Option I: Simple cost analysis. This analysis method can be used if the project activity produces no economic benefits other than CDM related income. However, this option is not applicable to the project because the project activity generates the revenue from the sale of generated electricity.

Option II: Investment comparison analysis. This analysis method can be only used if the alternatives to the project are similar investment projects. However, this option is not applicable to the project because the alternative to the proposed project is equivalent annual electricity supplied by CSPG, which is irrelevant for the project owners to make business decision.

Option III: Benchmark analysis. According to *Economic Evaluation Code for Small Hydropower Projects*[①] (SL16-95) issued by Water Resources Ministry of P. R. China, the financial benchmark internal rate of return (after tax) of total investment for Chinese small hydropower projects is 10%. Thus, the benchmark analysis is applicable to the project.

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

The proposed project is accordance with the *Economic Evaluation Code for Small Hydropower Projects* (SL16-95) issued by Ministry of Water Resources of People's Republic of China. The installed capacity of the proposed project is below 50MW, the county which the project is sited in falls into the national poorly off county (refer to : http://www.gz.xinhuanet.com/zfpd/2007-10/23/content_11478802.htm), most local people lives depending on farming, and the project site is very far from the capital of Guizhou province. There lives lots of minority much more than the Han nationality, and the local economy is very poor. Therefore the project site falls into hydropower rural areas.

[①] http://apps.lib.whu.edu.cn/12/test/gfbz/2/j/xsdpj.html

According to the rule SL16-95, the benchmark of internal rate of return (IRR) of total investment for Chinese small scale hydropower project is 10% (after tax), which is used widely in hydropower projects in China.

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

The main assumptions for the investment analysis are shown in Table 5 below:

Table 5 Basic parameters for financial evaluation

Parameter	Unit	Value	Data source
Installed capacity	MW	30	Page 14-2 of Feasibility Design Report（FDR）
Annual grid-connected electricity generation	MWh	118060	Page 14-2 of FDR
Fixed assets investment	Million Yuan	172.72	Page 14-1 of FDR and Page 4 of the report of increasing investment
Electricity tariff (VAT Incl.)	RMB￥/kWh	0.215	Fagaijiage [2004] No. 1037[①]
Valued-added tax (VAT)	/	6%	Page 14-2 of FDR
Town building maintenance tax (based on VAT)	/	5%	Page 14-2 of FDR
Surtax for education (based on VAT)	/	3%	Page 14-2 of FDR
Income tax	/	33%	Page 14-2 of FDR
Annual O&M costs	Million yuan	3.505	Page 14-2 of FDR

The IRR with and without the CERs revenue are listed in table 6 below. Without CERs revenue, the project IRR is 8.40%, much lower than the benchmark IRR, so the proposed project is financially unacceptable. With CERs revenue, the project IRR is improved to 13.15%. Therefore, CERs revenue can improve the financial attractiveness of the proposed project.

Table 6 Comparison of financial indicators with and without CERs revenue

Item	Without CERs revenue	Benchmark IRR	With CERs revenue
Project IRR	8.40%	10%	13.15%

Sub-step 2d. Sensitivity analysis

The sensitivity analysis is used to show whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions. For the project, four parameters are selected as sensitive factors to check out the financial attractiveness, the sensitivity analysis is shown in Table 7 below:

Table 7 Sensitivity analysis

[①] Fagaijiage [2004] No. 1037 is a document of electricity tariff which is issued by Chinese DNA.

Change scope / Critical assumption	-95.5%	-14.2%	-10%	-5%	+5%	+10%	+14.1%
Fixed assets investment	\	10.00%	9.53%	8.94%	7.89%	7.42%	\
Annual grid-connected electricity generation	\	\	7.22%	7.81%	8.97%	9.54%	10.00%
Electricity tariff	\	\	7.22%	7.81%	8.97%	9.54%	10.00%
Annual O&M costs	10.00%	\	8.57%	8.48%	8.31%	8.23%	\

Assuming the above four factors vary in different range, the IRR of the project (without the income from CERs sales) varies to different extents, as shown in Table 7.

As for Annual grid-connected electricity generation, only the electricity increases by 14.1 %, the IRR can reach 10%.The electricity of the Project is based on long series of hydrology data (1961~2001)[①], the hydrological condition and hydrological analysis. It was shown that the water flux of Dagou River was relatively stable in the last decades. The value of 118,060 MWh is optimisation through considering a lot of aspects and parameters, and the actual electricity during operation could hardly exceed this value. So it is impossible for the electricity to increase by 14.1%. Therefore the proposed project is always lack of financial attractiveness within the reasonable range of electricity.

As for tariff, only when the tariff increases by 14.1%, the IRR of total investment reaches the benchmark 10%. The NDRC holds the control right of the electricity tariff, and it seems that the raising of the tariff is almost impossible because it may bring about some undesirable effects, such as the soaring of the price, an unstable society, etc. Any unlicensed markup will be punished by the NDRC[②]. In addition, since the *China Power System Reform Program* was issued by the State Council on Feb.10th, 2002[③], all the hydro power entities have faced the fierce market competition, so there is little possibility for the tariff rising and then the IRR arising from the sales revenue variation will hardly go up and exceed 10%. According to *the electricity tariff provisional stipulation* documentation issued by NDRC in 2005[④], the electricity tariff is determined by the *society average cost* and *appropriate profit*, which could not change generally. Once the electricity tariff about the proposed project is confirmed, it will be fixed in a long period except the change of the *society average cost*.

As for the proposed project, the true tariff confirmed in May 2006 is 0.2184 RMB/kwh[⑤], which is increasing only 1.58% based on the calculated tariff 0.215 RMB/kwh. Therefore, the tariff for the proposed project is not likely to be increased to 14.1%. Hence within the reasonable range of the tariff, the proposed project is always lack of financial attractiveness.

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① P2-8 in the FSR.
② file number: Fagaijiajian [2003]1152,
http://www.chinacourt.org/flwk/show.php?file_id=88740&key=%B5%E7%BC%DB
③ file number: Guofa [2002]5
http://www.china5e.com/laws/index2.htm?id=200608080001
④ file number Fagaijiage [2005] 514
http://www.chinacourt.org/flwk/show.php?file_id=100966&key=%B5%E7%BC%DB

⑤ The sale electricity agreement.

As for total static investment, only when it decreases 14.2%, the IRR can reach the benchmark of 10%. In recent years, the price of the building materials, the income of the staff, and the expense for the land compensation are greatly increasing. And the most important thing is that the total static investment (including the increased investment) had actually occurred and could not decrease at all. So it is impossible for the total investment to decrease and the additionality of the proposed project is obviously existed.

As for annual O&M cost, it can be seen in table 7 that the impact of the annual O&M cost is relatively slight, and even when the annual O&M cost decrease by 95.5%, (which seems impossible because as mentioned above the materials and the income of the staff are increasing) the IRR of the proposed project only reaches 10.00%. Accordingly the proposed project always lacks financial attractiveness within the reasonable range of annual O&M cost.
To conclude, without the income from CERs sales, the project is not financially viable and the project owner would not like to construct the proposed project. However, CDM can greatly improve the IRR of the proposed project.

The Feasibility Design Report (FDR) of the proposed project was completed in April 2003, In the chapter entitled "Economic Assessment" of the FDR, the IRR is 11%. Therefore the project was much more financially attractive, and the commercial bank would provide a loan with the amount of 110 million RMB to the project owner on 17th December 2003①. .
On 1st March 2004, the construction of the proposed project started. In the process of construction, with the increasing of the price of building materials and the expense for the land compensation and with the design alteration and other factors, the total investment was sharply increasing. At the end of the year 2005, the Supervising Engineer made a report to the project owner that the static total investment had already risen to at least about 45.01 million RMB, and then the static total investment amounted to at least 172.72 million RMB. According to the report of the Supervising Engineer, the calculated IRR of the proposed project was greatly dropped down and below the benchmark 10%. And the proposed project was at that time suspended and not financially attractive. In order to reduce the investment risk, the project owner board decided to implement CDM project on 6th January 2006②. Later on the project owner made a request to the local DRC on 10th January 2006 and soon got the CDM approval on 13th January 2006③, the project owner was encouraged greatly and reinvested capital with the amount of 12.17 million RMB④, accordingly the commercial bank provided the second loan⑤ with the amount of 25.5 million RMB on 27th February 2006 which made the proposed project continue smoothly.
After the decision to carry out CDM, the project owner found out a consultant and soon the CDM development was entrusted to a professional consultant on 12th January 2006⑥. With the help of the consultant, the *Memorandum of Understanding about the CERs* was signed by the project owner and the

① The approval of ICBC Guizhou branch. (Gongyinqianxinshen[2003] No.1126)

② The board decision made by the project owner to carry out CDM.

③ The request made by the project owner and the approval about CDM by the Local DRC.

④ The approval of ICBC Guizhou branch, (Gongyinqianshenpi [2006]No. 65)

⑤ The approval of ICBC Guizhou branch, (Gongyinqianshenpi [2006]No. 65)

⑥ The Letter of Authorization.

buyer (Eco Asset Inc.) on 17th August 2006[①], and the request for LoA of China was delivered to the NDRC in November 2006, finally the project owner got the LoA on 27th January 2007. Meanwhile, the Validation on site was implemented by the TUV-SUD on 30th December 2006.

To conclude, CDM was serious considered by the project owner after the emergence of the financial barrier, and before the reinvestment of the project.

Step 3. Barrier analysis

It is unnecessary to apply for the barrier analysis according to the corresponding *Tool for the demonstration and assessment of additionality.*

Sub-step 3a. Identify barriers that would prevent the implementation of type of the proposed project activity:

Unnecessary.

Sub-step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):

Unnecessary.

Step 4. Common practice analysis

Common practice analysis is a credibility check to complement the investment analysis. The common practice analysis is identified and discussed through the following sub-steps:

Sub-step 4a. Analyze other activities similar to the proposed project activity:

According to *China Hydro Electric Project Classification Standard* which claims that the projects with the installed capacity(0.5MW-50MW)[②] falls into the small scale hydropower ones and *small scale CDM project methodology for grid-connected electricity generation from renewable sources* which claims that the projects with the installed capacity >15MW falls into the large scale hydropower ones, the hydropower plant with the installed capacity(15MW-50MW) is adopted to make the common practice analysis, Detailed information lists in table 8[③]. (Note:project name and installed capacity information are from China Water Resources Year Book, other information are from follow links.

Table 8 Hydropower Project with capacity between 15MW to 50MW in Guizhou Province

No.	Project name	Installed capacity (MW)	Largest Shareholder	Background	Operation Time

[①] the *Memorandum of Understanding*

[②] *Almanac of Chinese Water Pow*er, Volume 10, Page 141: Projects with capacity of 0.5MW~50MW are defined as small hydropower projects.

[③] China Water Resources Year Book 2006, P576

1	Tianbianzai Hydropower Plant	25	Local gov	State-own	2000
http://www.gzwater.com/newslist.asp?siteId=209 http://www.chinarein.com/qkhc/detail.asp?id=3128 http://218.201.221.168/WSsamples/jcms_files/jcms1/web1/site/art/2006/10/30/art_38855.html					
2	Yutang Hydropower Plant	37.5	China Huadian corporation	State-own	2005
http://zxqyb.stock.cnfol.com/051114/127,1339,1536862,00.shtml					
3	Baishuihe Ⅱ Hydropower Plant	34	joint-stock company	joint-stock company	2000
http://www.chinavalue.net/Blog/TagEntry.aspx?TagID=41390					
4	Zhongshanbao Hydropower Plant	30	joint-stock company	owned joint-stock company	2001
http://www.qxnz.com/Article_Show.asp?ArticleID=6497					
5	Guanjiao Hydropower Plant	48	Local water conservancy bureau	State-own	1992
http://www.china5e.com/dissertation/water/20040210140840.html					
6	Daqikong Hydropower Plant	48	Local gov	State-own	1992
http://info.energy.hc360.com/2005/03/1815369669.shtml					

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

According to above information, we can clearly identify 4 out of above 6 projects having the background of state-own character, and they usually have strong background in capital access and capacity of resisting uncertainty risks. The remaining two projects, Baishuihe Ⅱ and Zhongshanbao were all in operation before 2002, and have the advantage of electricity tariff (Refer to *China Power System Reform Program* issued by State Council on 10/02/2002, file number:GUOFA[2002]5) than the proposed project. Therefore be comparable with all above projects, the proposed project is significantly different from above similar options and not a common practice.

To summarize, the Project passed all criteria of the *Tool for the Demonstration and Assessment of Additionality*. It is economically unfeasible without CDM revenues. Therefore, the Project is adequately additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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Project Emissions

The proposed project is a new small scale hydropower station, the power density is 115.8 W/m^2, greater than 10 W/m^2, thus PE_y=0

Baseline Emissions

According to baseline methodology ACM0002, the baseline emissions are the CO_2 emissions from the equivalent electricity generation in CSPG that are displaced by the project activity. According to baseline methodology ACM0002, the baseline emission factor (EF_y) is calculated as a Combined Margin (CM), which is consisting of the weighted average of Operating Margin (OM) emission factor and Build Margin (BM) factor by utilizing an ex-ante 3 years data vintage for the CSPG. The data used for calculation are from an official source (where available) and publicly available. The calculation processes are as follows:

Step 1. Calculating the Operating Margin emission factor （$EF_{OM,y}$）;
Step 2. Calculating the Build Margin emission factor （$EF_{BM,y}$）;
Step 3. Calculating the baseline emission factor （EF_y）.

Step 1: Calculate the Operating Margin emission factor(s) ($EF_{OM,y}$)

According to baseline methodology ACM0002, there are four methods for calculating the $EF_{OM,y}$:

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch Data Analysis OM, or
(d) Average OM

Method (c) should be the first methodological choice. However, this method requires the detailed dispatch data of the CSPG, which is confidential information and is not available to be obtained by public. Thus, method (c) is not applicable. Due to the same reasons, the method (b) is not applicable.

Method (a) can be used where low-cost/must run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term normals for hydroelectricity production. It can be found from Table 9 that installed capacity of low-cost/must run resources constitute less than 50% of CSPG during year 2001 to 2005. Thus, method (a) is applicable to calculate $EF_{OM,y}$. And method (d) can only be used where low-cost/must run resources constitute more than 50% of total grid generation, therefore, method (d) is not applicable to calculate $EF_{OM,y}$.

Table 9 Constitution of low-cost/must run resources in CSPG during year 2001～2005[①]

Year	2001	2002	2003	2004	2005
Percentage (%)	34.27	32.33	31.62	31.06	28.01

[①] *China Electric Power Yearbook 2002～2006*

Due to the detailed data on the individual power plants connected to the power grid is not available, therefore information by type of generating source are used for OM calculation. According to baseline methodology ACM0002, the $EF_{OM,y}$ is calculated by utilizing an *ex-ante* 3 years data vintage for CSPG, the formula as follow:

$$EF_{OM,simple,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{j} GEN_{j,y}} \qquad (2)$$

Where:

$F_{i,j,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources *j* in year (s) *y*;
j refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports to the grid;
$COEF_{i,j,y}$ is the CO_2 emission coefficient of fuel *i* (tCO_2 / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources *j* and the percent oxidation of the fuel in year (s) *y*; and
$GEN_{j,y}$ is the electricity (MWh) delivered to the grid by power sources *j*. The data is not available in *China Electric Power Yearbook,* so the $GEN_{j,y}$ is calculated as follow:

$$GEN_{j,y} = \textit{Electricity generation of power plants in CSPG} \times (1 - \textit{Internal use rate of power plants}) \qquad (3)$$

The CO_2 emission coefficient $COEF_i$ is obtained as:

$$COEF_i = NCV_i \cdot EF_{CO2,i} \cdot OXID_i \qquad (4)$$

Where:

NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel *i*;
$OXID_i$ is the the oxidation factor of the fuel;
$EF_{CO2,i}$ is the CO_2 emission factor per unit of energy of the fuel *i*.

According to the deviation approach[①] agreed by the 22nd CDM EB meeting for OM and BM calculation for Chinese power grids, if the detailed data at the power plant level of the grids, such as power generation quantity, internal use rate of power plants, fuel types, fuel consumption and fuel emission factors, etc., are not publicly available for the $EF_{OM,y}$ calculation, then as an alternative, the statistical data on aggregated power generation quantity, the internal use rate of power plants and fuel consumption which publicly available by the fuel types *i* and by province *j* covered by the power grid, can be used. So, the average power generation efficiencies (gce/kWh) and average emission factors of fuel *i* can be used. The fuel *i* based aggregated power generation and the related fuel consumption data are publicly available in *China Electric Power Yearbook* and *China Energy Statistical Yearbook*. Thus, the data quoted from these two kinds of yearbooks are used for $EF_{OM,y}$ calculation.

① http://cdm.unfccc.int/User/Management/FileStorage/AM_CLAR_QEJWJEF3CFBP1OZAK6V5YXPQKK7WYJ

At the same time, according to ACM0002, the Simple OM can be calculated using either of the two following data vintages for years(s) *y*:

- (*ex-ante*) the full generation-weighted average for the most recent 3 years for which data are available at the time of PDD submission, if or,
- the year in which project generation occurs, if $EF_{OM,y}$ is updated based on *ex-post* monitoring.

There are power imports from the Central China Power Grid (CCPG) to CSPG, thus the imports are taken into account when calculates the OM.

$EF_{OM,y}$ is calculated according to the statistics information of recent 3 years (from 2003 to 2005), the data are the latest and available at the time of this PDD submission, the detailed calculations are shown in Table A2-Table A7 of Annex 3.

Step 2: Calculating the Build Margin emission factor ($EF_{BM,y}$)

According to baseline methodology ACM0002, the Build Margin emission factor ($EF_{BM,y}$) is calculated by utilizing an *ex-ante* 3 years data vintage for CSPG, the formulae as follow:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m,y}}{\sum_{m} GEN_{m,y}} \qquad (5)$$

Where：

$F_{i,m,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by plants *m* in year (s) *y*;
$COEF_{i,m,y}$ is the CO_2 emission coefficient of fuel *i* (tCO_2 / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by plants *m* and the percent oxidation of the fuel in year (s) *y*;
$GEN_{m,y}$ is the electricity (MWh) delivered to the grid by plants *m*. It equals to power generation minus power plants self power consumption.

ACM0002 provides two following options to calculate BM:

1) Calculate the BM emission factor $EF_{BM,y}$ *ex-ante* based on the most recent information available on plants already built for sample group *m* at the time of PDD submission.

2) For the first crediting period, the BM emission factor $EF_{BM,y}$ must be updated annually ex-post for the year in which actual project generation and associated emissions reductions occur. For subsequent crediting periods, $EF_{BM,y}$ should be calculated ex-ante, as described in option 1) above.

Option 1) is chosen by project participants to calculate $EF_{BM,y}$ for this project, and can not be changed during the crediting period.

For the sample group *m*, it includes two options:

1) The five power plants that have been built most recently, or

2) 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.

The project participants should use from these two options that sample group that comprises the larger annual generation.

Because of the same reasons as the data unavailability at the power plant level in China, the 22nd CDM EB meeting agreed the following deviation[①] approaches for $EF_{BM,y}$ calculation:

1) Use the efficiency level of the most advanced commercialized technologies of provincial/regional or national grid of China, as a conservative proxy, for fuel *i* consumption estimation to estimate the $EF_{BM,y}$.

2) Use of capacity additions during last several years for estimating the $EF_{BM,y}$ i.e. the capacity addition over last several years, whichever results in a capacity addition that is closest to 20% of total installed capacity.

3) Use of installed capacity to replace annual power generation to estimate weights.

Due to the difficulty of separating the coal-fired, gas-fired or oil-fired installed capacity from the total thermal installed capacity, the $EF_{BM,y}$ will be calculated as:

1) Based on the most recent years energy balance of the CSPG, calculating the proportions of CO_2 emissions from the coal-fired, oil-fired and gas-fired power plants in total CO_2 emissions of thermal power plants;

2) Based on the most advanced commercialized technologies which applied by the coal-fired, oil-fired and gas-fired power plants, calculating the emission factor of thermal power plants in CSPG. This approach is more conservative as it assumes all recently built plants have the fuel efficiency as that of the most advanced commercialized technologies;

3) Calculating the $EF_{BM,y}$ through emission factor of thermal power plants times the percentage share of thermal power plants installed capacity addition within all recently built installed capacity. The proper year is selected so that it is the closest time when the last 20% of installed capacity was built.

The above calculation approach has been used by several recently registered China projects. The BM in this PDD is calculated as following sub-steps.

Sub-Step 2a: Calculating the percentages of CO_2 emissions from the coal-fired, gas-fired and oil-fired power plants in CO_2 emissions from total thermal power plants

$$\lambda_{Gas} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad \lambda_{Oil} = \frac{\sum_{i \in OIL, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \quad \lambda_{Gas} = \frac{\sum_{i \in GAS, j} F_{i,j,y} \times COEF_{i,j}}{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}} \qquad (6)$$

[①] http://cdm.unfccc.int/User/Management/FileStorage/AM_CLAR_QEJWJEF3CFBP1OZAK6V5YXPQKK7WYJ

Where:

λ_{Gas}, λ_{Oil} and λ_{Coal} are respectively the percentages of CO_2 emissions from the gas-fired, oil-fired, coal-fired power plants in CO_2 emissions from total thermal power plants;
$F_{i,j,y}$ is the amount of fuel i (tce) consumed by the power sources province j in year y;
$COEF_{i,j}$ is the CO_2 emission coefficient (tCO_2/tce) of fuel i, taking into account the carbon content of the fuels used by the grid and the percent oxidation of the fuel in year y.

Sub-Step 2b: Calculating the fuel-fired emission factor ($EF_{Thermal}$)

$$EF_{Thermal} = \lambda_{coal} \times EF_{coal,adv} + \lambda_{oil} \times EF_{oil,adv} + \lambda_{gasl} \times EF_{gas,adv} \qquad (7)$$

Where:

$EF_{Thermal}$ is the emission factor of thermal power plants;
$EF_{Coal,Adv}$, $EF_{Oil,Adv}$ and $EF_{Gas,Adv}$ are corresponding to the emission factors of coal, oil and gas, which are applied by the most advanced commercialized technologies.

Sub-Step 2c: Calculating the Build Margin (BM) emission factor ($EF_{BM,y}$)

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} \times EF_{Thermal} \qquad (8)$$

Where:

$EF_{BM,y}$ is the Build Margin (BM) emission factor with advanced commercialized technologies for year y;
CAP_{Total} is the installed capacity of all recently built power plants;
$CAP_{Thermal}$ is the newly installed capacity of recently built thermal power plants;
$EF_{Thermal}$ is the emission factor of thermal power plants.

$EF_{BM,y}$ is calculated according to the latest and available data at the time of this PDD submission, the detailed calculations are shown in Table A8-Table A11 of Annex 3.

Step 3: Calculating the baseline emission factor (EF_y)

According to baseline methodology ACM0002, baseline emission factor EF_y is calculated as the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$):

$$EF_y = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y} \qquad (9)$$

Where:

The weighs w_{OM} and w_{BM}, by default, are 50% (i.e., w_{OM}= w_{BM}= 0.5), and $EF_{OM,y}$ and $EF_{BM,y}$ are calculated as described in Steps 1 and 2 above and are expressed in tCO_2e/MWh.

The EF_y applied in this PDD is fixed for a crediting period and may be revised at the renewal of the crediting period.

According to ACM0002, the baseline emissions should be calculated as:

$$BE_y=EG_y \cdot EF_y \quad (10)$$

Where:

EG_y is electricity supplied by the project activity to the grid in year *y*, in MWh;
EF_y is baseline emission factor in year y, in tCO_2e/MWh.

Leakage

According to baseline methodology ACM0002, there is no need for the project to consider leakage (L_y).

Emission Reductions

The annual emission reduction (ER_y) of the project is the difference between baseline emission and project activity emission. The final GHG emission reduction is calculated as follows:

$$ER_y\ (tCO_2e/yr) = BE_y - PE_y - L_y \quad (11)$$

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

Data / Parameter:	NCV_i
Data unit:	kJ/kg or kJ/m^3 or TJ/tce
Description:	The net calorific value (energy content) per mass or volume unit of fuel *i*
Source of data used:	The values are derived from *China Energy Statistical Yearbook 2006*.
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	

Data / Parameter:	$OXID_i$
Data unit:	/
Description:	Oxidation factor of the fuel *i*
Source of data used:	*Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	100%
Justification of the choice of data or description of measurement methods	No specific local value available, adopt the IPCC default value.

and procedures actually applied :	
Any comment:	

Data / Parameter:	$F_{i,j,y}$
Data unit:	10^4 t, 10^8 m^3
Description:	The quantity of fuel *i* (in a mass or volume unit) consumed by the relevant provinces *j* in year(s) *y*
Source of data used:	*China Energy Statistical Yearbook 2004-2006*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	

Data / Parameter:	*Electricity generation of power plants in CSPG*
Data unit:	MWh
Description:	The electricity generated by province *j* in CSPG in year *y*.
Source of data used:	*China Electric Power Yearbook 2004-2006*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	

Data / Parameter:	*Electricity imported from Central China Power Grid*
Data unit:	MWh
Description:	The electricity imported from Central China Power Grid in year *y*.
Source of data used:	Chinese DNA's Guideline of emission factors of Chinese grids
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	

Data / Parameter:	*Internal use rate of power plant*
Data unit:	%

Description:	The internal power consumption rate of power plants in province *j* in CSPG in year *y*.
Source of data used:	*China Electric Power Yearbook 2004-2006*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	

Data / Parameter:	$EF_{CO2, i}$
Data unit:	tCO_2/TJ
Description:	The CO_2 emission factor per unit of fuel i
Source of data used:	*Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	No specific local value available, adopt the IPCC default value.
Any comment:	

Data / Parameter:	$CAP_{i, j, y}$
Data unit:	MW
Description:	Installed capacities of power plant category *i* of province *j* in years *y*.
Source of data used:	*China Electric Power Yearbook 2001-2006*
Value applied:	See Annex 3 for details.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.

Data / Parameter:	$GENE_{best,coal,}$
Data unit:	/
Description:	The power supply efficiency of most advanced commercialized coal-fired power plants
Source of data used:	Chinese DNA's Guideline of emission factors of Chinese grids
Value applied:	35.82%
Justification of the choice of data or description of	Data used are from Chinese authorities.

measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	$GENE_{best,oil/gas}$
Data unit:	/
Description:	The power supply efficiency of most advanced commercialized oil-fired power plants and gas-fired power plants
Source of data used:	Chinese DNA's Guideline of emission factors of Chinese grids
Value applied:	47.67%
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used are from Chinese authorities.
Any comment:	

Data / Parameter:	Surface Area
Data unit:	km^2
Description:	Surface area at the full reservoir level
Source of data to be used:	Feasibility Study Report of the proposed project
Value of data	0.259
Description of measurement methods and procedures to be applied:	The data was measured by professional design institute.
QA/QC procedures to be applied:	According to ACM0002, the data is needed to be monitored only one time before the operation.
Any comment:	The data measured by professional design institute is reliable and creditable.

B.6.3 Ex-ante calculation of emission reductions:

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Project Emissions

The proposed project is a new small scale hydropower station, the power density is 115.8 W/m^2, greater than 10 W/m^2. According to baseline methodology ACM0002, it is not needed to calculate project emissions, $PE_y = 0$

Baseline Emissions

According to formulae (1)-(8) in section B.6.1, the calculation results of EF_{OM}, EF_{BM} and EF_y are listed in Table 10, the detailed calculation processes are shown in Annex 3.

Table 10 EF_{OM}, EF_{BM} and EF_y of CSPG (tCO₂e/MWh)[①]

EF_{OM}	EF_{BM}	EF_y
1.0119	0.6748	0.84335

According to formula (9) in section B.6.1, the annual baseline emissions (BE_y) is calculated as follow:

$$BE_y = 118060 \times 0.84335 = 99{,}566 \text{ tCO}_2\text{e/yr}$$

Leakage

According to baseline methodology ACM0002, $L_y = 0$

Emission Reductions

According to formula (11) in section B.6.1, the annual emission reductions (ER_y) is calculated as follow:

$$ER_y \text{ (tCO}_2\text{e/yr)} = 99566 - 0 - 0 = 99566 \text{ tCO}_2\text{e/yr}$$

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

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The summary of the ex-ante estimation of emission reductions are listed in Table 11 below:

Table 11 Summary of the ex-ante estimation of emission reductions

Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
15/09/2008-14/09/2009	0	99,566	0	99,566
15/09/2009-14/09/2010	0	99,566	0	99,566
15/09/2010-14/09/2011	0	99,566	0	99,566
15/09/2011-14/09/2012	0	99,566	0	99,566
15/09/2012-14/09/2013	0	99,566	0	99,566
15/09/2013-14/09/2014	0	99,566	0	99,566
15/09/2014-14/09/2015	0	99,566	0	99,566
Total (tonnes of CO_2e)	0	696,962	0	696,962

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

[①] Refer to:The latest emission factor calculated by the NDRC published at 09/08/2007,interenet address: http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1364.pdf

B.7.1 Data and parameters monitored:

Data / Parameter:	$EG_{export, y}$
Data unit:	MWh
Description:	Annual Electricity delivered to power grid.
Source of data to be used:	Feasibility Study Report of the proposed project
Value of data applied for the purpose of calculating expected emission reductions in section B.5	118,060
Description of measurement methods and procedures to be applied:	Data will be recorded monthly and by automation measurement computer continuously. Date measured by ammeters will be crosschecked by electricity sales receipt. Data will be kept for 2 years following the end of the crediting period in electronic and paper format. The proportion of data to be monitored is 100%.
QA/QC procedures to be applied:	The precision of this data is high. The electricity delivered to power grid will be monitored and recorded by power grid company who is in charge of measuring and recording the data. The data will be double checked by electricity sales receipts. The accuracy of the ammeter is 0.5s. The data will be also checked through a Backup Meter. The ammeter will be calibrated by a qualified party every year.
Any comment:	The accuracy of the data is high.

Data / Parameter:	$EG_{import, y}$
Data unit:	MWh
Description:	Annual Electricity imported from power grid.
Source of data to be used:	The electricity is purchased from power grid by the proposed project.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	Data will be recorded monthly and by automation measurement computer continuously. Data will be kept for 2 years following the end of the crediting period in electronic and paper format. The proportion of data to be monitored is 100%.
QA/QC procedures to be applied:	The precision of this data is high. The electricity imported from power grid will be monitored and recorded by power grid company who is in charge of measuring and recording the data. The accuracy of the ammeter is 0.5s. The data will be also checked through a Backup Meter. The ammeter will be calibrated by a qualified party every year.
Any comment:	The accuracy of the data is high.

B.7.2 Description of the monitoring plan:

>>

1. Purpose of the monitoring plan and the data that need be monitored

Monitoring plan is the key part of this CDM project and the purpose of it is to accurately monitor and record both the expected power generation(effective supply to CSPG) and the external power consumption(The electricity delivered from CSPG during the equipment maintaining period), which are the basic data sources for the calculation of the GHG emission reductions. The monitored parameter is also including the ecological flow.

2. The organizational structure of monitoring

The project owner will appoint one staff take the full responsibility for the implementation of the monitoring plan. The responsible staff will be supported by the Technical Department and the Financial Department of the proposed project. Please refer to Figure 2 for detailed operation and management structure.

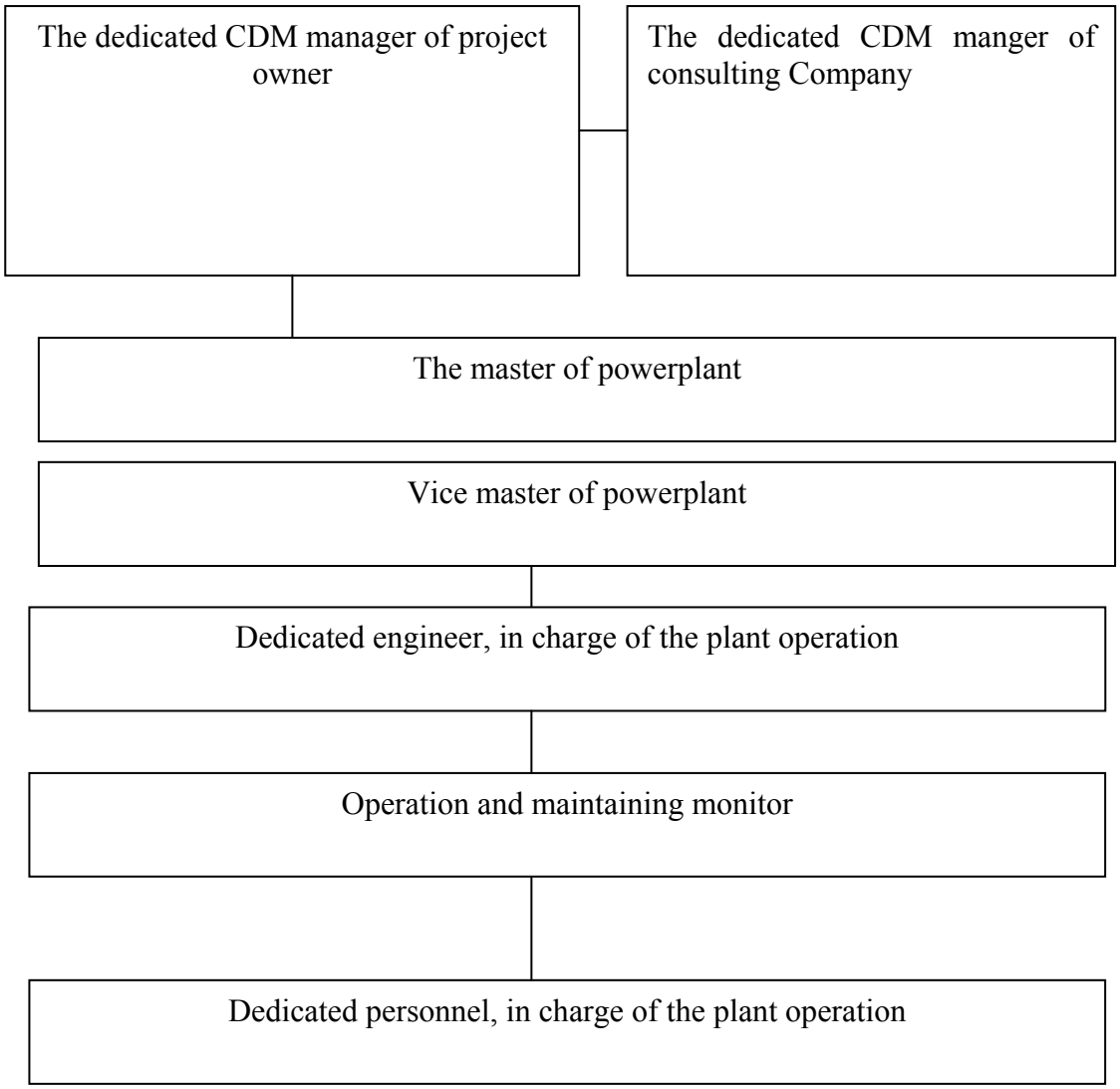

Fig.2 Monitoring Structure

3. Staff and the post duty

3.1 Dedicated personnel, in charge of the plant operation

The duty of the dedicated personnel is to operate and maintain the equipment, and what's more, he/she is also in charge of the recording, collection and checkage of the date, which includes the expected power generation (effective supply to CSPG), the external power consumption (electricity delivered from CSPG during the equipment maintaining period) and the ecological flow.

3.2 Operating and maintaining monitor

- Supervise the dedicated personnel to operate and maintain the equipment correctly;
- Preside over the collection and checkage of the date

3.3 Dedicated engineer, in charge of the plant operation

- Carry out the company's standards and regulations;
- Supervise and organize his/her underlings to operate and maintain the equipment correctly;
- fulfill the safety in production and economic and technical norms
- Preside over the checkage, collection and reporting of the data

3.4 Vice master of powerplant

Under the direction of the station master, to be responsible for operation, maintaining, experiment, technological renovation and various administration, to totally complete various working plans, and organize and arrange various assignments of the Hydro Power Station; to be in charge of checking the monitor data of the generated power amount and supplied power amount of CDM project.

3.5 master of powerplant

Under the leadership of Lidu company, to be responsible for safe and civilized production management, administration and spiritual civilization process comprehensively; to establish various work plans and to totally organize and arrange various assignments of the Hydro Power Station.

3.6 The dedicated CDM manager of project owner

To be responsible for collecting and checking the monitor data of generated power amount and supplied power amount, gathering electric quantity invoices, and reporting a duplicate copy to the dedicated CDM manager of consulting company.

3.7 The dedicated CDM manager of consulting Company

To be responsible for gathering collected data of the grid-connected and grid-unconnected electric quantity of each CDM project and the copy of electric quantity invoices, to calculate net generated power amount (i.e. generated power amount minus supplied power amount) after checking without any error, and then CO_2 emission reductions can be calculated according to the relevant CO_2 emission factor and be reported to DOE (Designated Operational Entity) to evaluate.

4. Quality assurance and quality control procedures

Installation, Measurement and Calibration of the ammeters

The monitoring equipments are equipments to measure the electricity output to the grid and the captive electricity. The electric energy metering should be equipped according the requirements of the *Technical Administrative Code of Electric Energy Metering* (DL/T448-2000). Before the operation of the proposed project, the project owner and the power grid corporation should examine the electric energy metering according to the *Technical Administrative Code of Electric Energy Metering* (DL/T448-2000).

Several ammeters are installed by the project owner at the following locations:

A the export place of each generator,

B the low –pressure outline of each main transformer,

C the export place of the power plant transfer pipeline, and

D the transformer substation of CSPG as pass-meter.

Through these ammeters and the pass meter, the electricity generation by each generator, the electricity because of line loss, the captive electricity and the back-up electricity can be all monitored. The net feed-in electricity to the gird can be checked with the pass meter.

And the data should be cross-checked against relevant electricity sales receipts and/or records from the grid for quality control. Since the data required to be monitored is consist with the data required during project operation by the project owner and the grid company, the Parallel Operation Agreement and the Power Purchase Agreement between these two parties can be used as guidance on data collection and documentation.

Two series of measurement and monitoring equipments will be installed in the transformer substation, one as the main equipment and the other as standby. The pass meter should meet the standard of national I type measurement reaching 0.5S of the precision.

Calibration of Meters & Metering should be implemented according to national standards and rules. The calibration of meters & metering of the proposed project is implemented by Guizhou Electrical Test Institute. And all the calibration records should be documented and maintained by the project owner for DOE's verification.

Training, Data Collection and Monitoring Report

Some technicians come from electric power colleges. The others come from old power stations. The formal training has been hold before their duty. Before the formal operation of the proposed project, the personal in charge of CDM will organize the relevant personals to participate the CDM training. The period of the training will at least last 3 working days.

At the end of each month, the monitoring data of that month should be archived electronically. E-documents should have disc backups be printed out. The project owner should also keep the copy of electricity sales/purchase receipts. Written documents such as paper-based maps, diagrams and environmental assessments will be used in addition to the monitoring plan to check the information. In order to facilitate auditors' reference of relevant literature relating to verification of the emission reductions of the proposed project, the index of the project materials and monitoring results should be provided. All paper-based information and data shall be stored by the technology department of the project owner and all the materials shall have copies for backup. And all data will be kept until 2 years after the end of the total credit period of the proposed project.

The project owner is preparing the monitoring procedures and calibration and measurement manual which will be implemented during the operation of the proposed project. After the proposed project is registered and begins its operation, the monitoring report should be submitted at the end of every year for the verification of DOE. The report should cover the monitoring of grid-connected power generation, check report, report on calculation of the emission reductions and records of monitoring instrument repair and calibration, etc.

Emergency preparedness & Reconstruction of data & Troubleshooting

When finding the abnormal conditions or problems of the devices by either of the sell-purchase sides, they should inform the other side and the metering organization which is ratified by two sides immediately in order to solve the problems jointly and reach the normal condition. Normally, the final electricity amount should in accordance with the trading stoichiometric point data of the primary meter; when something abnormal appeared in the primary meter, then it should in accordance with the data of the assistant meter; if both meters of the trading stoichiometric point data appears abnormal, the data should in accordance with the primary meter of the other side or the assistant meter if the primary meter of the other side has something wrong. For other abnormal conditions, on the base of sufficient negotiation, the two sides can work out of the electric amount according to the records of voltage loss and timing which can be found in certain equipment during the abnormal period.
According to *The Langxiang power station operation criterion.* The proposed project activity shall guarantee the minimal ecological flow of 0.26m^3/s. There is a drainage hole under the surface of the lowest water level, which design flux is about 0.26 m^3/s. The drainage hole is always in a open status and the operational staffer inspect every day to know whether it is in normal condition or not, once the hole is walled up it will be dredged at once.

5 Calculation of the Net electricity supplied to the grid by the proposed project

$$EG_y = E_{pp\_feed\_in,y} - E_{pp\_buy\_from\_grid,y}$$

Where:

EG_y is the Net electricity supplied by the proposed project to the grid in year *y*, in MWh, it is used to calculate the emission reduction of CO_2;

$E_{pp\_feed\_in,y}$ is the electricity feed-in to the grid of the Proposed Project，the readings of electricity is from Pass-meter, and the receipt of sales will be used for double check and reference.

$E_{pp\_buy\_from\_grid,y}$ is the electricity bought from the grid in year *y*, in MWh, ， the readings of electricity is from Pass-meter, and the receipt of sales will be used for double check and reference.

Moreover, the project owner have established monitoring handbook, more information please refer to the monitoring handbook.

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 monitoring study of the proposed projects activity was completed on 16/09/2007. Name of person/entity determining monitoring methodology:

He Junyuan, Guizhou Hengyuan Project Management and consulting Co., Ltd. Email: lg13308598009@126.com;

Ma Yajun, Guizhou Hengyuan Project Management and consulting Co., Ltd. Email: yakin.ma@vip.163.com;

Guizhou Hengyuan Project Management and consulting Co.Ltd is not the project participants.

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:

>>
01/03/2004 (Starting date of construction)

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

>>
30 years and 0 month

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:

>>
15/09/2008 or after the date of registration whatever is later.

C.2.1.2. Length of the first crediting period:

>>
7 years and 0 month

C.2.2. Fixed crediting period:

Not applicable

C.2.2.1. Starting date:

>>

C.2.2.2. Length:

>>

SECTION D. Environmental impacts

>>

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

>>

The Environmental Impact Assessment (EIA) for this project was carried out by Guizhou Province Hydro Power Design Institute, which is a grade B environment impact assessment entity certified by the District Environmental Protection Administration. The EIA report was approved by Guizhou Province Environmental Protection Bureau on 5th September 2003(Qinhuanhan [2003] No. 152).

The contents of Langxiang EIA approval

Construction projects should focus on the following tasks:

1. The project owner should attach great importance to environmental protection, make efforts of the environmental protection and soil as well as water conservation during the construction and operation period.

The project owner should seriously implement environmental protection measures, special soil and water conservation plans and environmental protection requirements in EIA report and its approvals.

2. The soil and stone material pack area should be arranged separately; the materials should be piled up centralized. Timely reclamation of abandoned dumping sites and also prevents dumping wastes into river. Prevent environmental problems triggered by soil erosion and geological disasters.

3. Strengthen the protection of the water environment. The wastewater produced in the construction and operation period should be treated before discharge. The treatment scale must meet the highest demands of production and increase the water reuse rates and the actually discharge can be applied to agricultural irrigation. According to the assessment, after construction, the Langxiang reservoir will be employed as drinking water source. It suggests that during the operation period the domestic sewage shouldn't discharge into the reservoir even if it reaches the emission standard after biochemical treatment.

Before the water storage of reservoir, the environmental protection measures should be strictly enforced to strengthen the protection of water quality and reservoir management. In order to keep water function and guarantee the water resources demands for downstream. The project owner should prevent water pollution after the reservoir storage,

4. Make a good job of noise control and prevention, and strictly control the construction of time.

5. The project owner should implement the environmental protection, supervision and monitoring plan. The construction party should implement detailed measures of environmental protection in line with the related requirements, carry out the environmental protection measures, and also implement the environmental protection investment. At the same time, environmental engineering supervision costs should be listed in the environmental protection investment budget specifically.

6. The solid waste should be treated and transport to landfill timely and properly. It is necessary to beautify and afforesting the ambient of power plant.

7. The project owner should strictly abide by "three simultaneousness" regulation. The construction party should strengthen environmental management, establish environmental protection management agencies and implement job responsibility system. The construction party should also periodically report to

environmental department and the local environmental protection bureau about the implementation of environmental protection measures during every steps of the project, and also accept the supervision and inspection from environmental protection department.

The project should not be put into operation until environmental department's on-site inspection and permission. The trial operation period will last three months, the construction parties are required to apply for environmental protection checks according to relevant procedures. The standard of total pollutants discharge should be approved and handed out by Libo Environment Protect Bureau; every construct party should abide by it and strictly implement the related regulations. Libo Environment Protect Bureau takes charge of the daily supervision.

8. The project implements national environmental quality standards and pollutant discharge standards as follows:

"Ambient Air Quality Standard" (GB3095-1996) II;
"Surface Water Quality of the Environment" (GB3838-2002) III;
"Standards for Irrigation Water Quality" (GB5084-92);
"Standards for Noise in Urban Districts" (GB3096-1993) II;
"Comprehensive Sewage Discharge Standards" (GB8978-98) I;
"Emission Standard of Air Pollutants" (GB16297-96) II;
"The Standard of Noise Limits of Construction Site" (GB12523-90);
"Industrial enterprise Factory Boundary Noise Standard" (GB12348-90) II.

As mentioned above, the environmental impact of the project during the construction period is short, and measures will also be taken to minimize the negative environmental impacts. The environmental impact during the operation period is negligible.

The project as a clean renewable energy project can reduce greenhouse gas emissions and also reduce the environmental pollution caused by coal consumption. It has positive influence on the local ecological environment; especially after the project is put into operation the ecological restoration measures can improve the local ecological environment.

According to *The Langxiang power station operation criterion.* The proposed project activity shall guarantee the minimal ecological flow of 0.26m^3/s. There is a drainage hole under the surface of the lowest water level, which design flux is about 0.26 m^3/s. The drainage hole is always in a open status and the operational staffer inspect every day to know whether it is in normal condition or not, once the hole is walled up it will be dredged at once.

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:

>>

Both of the host Party and the project owners regard that the proposed project will not bring significant impacts on the environment. After the completion of the project construction, the project will be put into operation only after the inspection and acceptance of local environmental protection department.

SECTION E. Stakeholders' comments

>>

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

>>

In order to consult the public's opinions and suggestions about the proposed project, the project owner held a symposium with local government and local residents to consult the stakeholders in January 2006. And the project owner distributed 31 copies of questionnaires through local government to consult the stakeholders' opinions about construction and operation of the proposed project in March 2006. The geological area of stakeholders' consultation involved Laocun Town, Libo County.

Furthermore the project owner published the *Suggestion Consultation of Langxiang Hydropower Plant CDM Project* on *Qiannan Daily* on 8 January, 2007.

The detailed public consulting results are shown in section E2.

E.2. Summary of the comments received:

>>

1. Content of the Public Participation Survey

The project owner distributed 31questionnaires to stakeholders, and 29 questionnaires returned. The occupation, education level and age of the individual investigated are shown in Table 12:

Table 12 Summary of stakeholders

Item	Category	Quantity
Nationality	Han	6
	Miao	19
	Other	4
Education level	University	18
	Senior school	3
	Junior school	6
	Elementary school	2
Age	18~30	3
	31~50	19
	Above 50	7

The feedbacks of the questionnaires are as follow:

Table 13 Summary of questionnaires

No.	Item	Attitudes	Numbers(person)
1	Do you know the proposed project?	Yes	20
		A little	9

		No	0
2	What's your attitude to the proposed project?	Support	24
		Unconcern	5
		Disagree	0
3	Would you like to participate the construction and operation works of the proposed project?	Yes	13
		Unconcern	15
		No	1
4	What benefits will be brought by the proposed project?	Economy development	27
		Power supply improvement	1
		Tourism promotion	7
5	What will be the restriction factor to the proposed project?	Land submergence	29
		Resettlement	0
		Ecology	0
6	Is there any big industrial plant near reservoir area discharging waste water which leads to water pollution?	Yes	0
		No	27
		Unknown	2
7	What is the most acceptable approach for resettlement?	Resettlement	7
		Rearrange farm land in nearby place	9
		Fully compensation in one time	13
8	Would you like to resettle if the proposed project have to occupy you farm land?	Yes	28
		Depending on the resettlement conditions	1
		No	0
9	Do you accept the resettlers to your village?	Yes	21
		No	8
		Unconcern	0
10	What is the impact brought by the proposed project to local wild life?	No impact	5
		A little	24
		Big impact	0
11	What is main impact of the proposed project to environment?	Ecology	12
		Water	14
		Others	3
12	What do you think the proposed project to the environment?	Positive	25
		No change	4
		Negative	0
13	What is the impact of the proposed project to local economy?	Positive	29
		No impact	0
		Negative	0
14	What is the biggest impact brought by the proposed project?	Economy development	28
		Revenue increase of local residents	1
		Power supply improvement	1

15	What do you more concern?	Environment	13
		Economy	14
		Both of environment and economy	2
16	What do you think the gain and lose brought by the proposed project?	Gain is bigger than lose	29
		Gain is equal to lose	0
		Lose is bigger than gain	0

The result of questionnaire shows that almost 100% of the stakeholders support the construction of the proposed project, the stakeholders think that the advantages of construction of the power plant is bigger than the disadvantages, the stakeholders think the proposed project would improve the environment impact. Therefore, the local people support the construction of the proposed project, and they figured out that the power plant had positive incentive for local economy development. They had a positive and optimistic attitude for the environmental impacts brought by the proposed project. The consulted persons hope that the project operate as soon as possible in order to improve local economic development, incomes and social benefits.

There is no opinion received after publication the information of the proposed project on *Qiannan Daily*.

For stakeholders consultation symposium, the stakeholders all expressed their support to the proposed project. However, the stakeholders suggest the project owner to minimize the environment impact and lower the investment.

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

>>

There no negative comments to the proposed project.

The stakeholders have no negative comments to the proposed project and they are very supportive to the construction of the proposed project. The proposed project is also supported by local government.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Project owner

Organization:	Libo Lidu Hydro Power Development Co.Ltd.
Street/P.O.Box:	No.1 Zhangjiang West Road in Libo County of Qiannan Buyi & Miao Autonomous District
Building:	
City:	Libo County
State/Region:	Guizhou Province
Postfix/ZIP:	558400
Country:	People 's Republic of China
Telephone:	0854-8753473
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E-Mail:	dj8925@gmail.com
URL:	
Represented by:	Deng Jun
Title:	The office director
Salutation:	
Last Name:	Deng
Middle Name:	
First Name:	Jun
Department:	The Office
Mobile:	13985078925
Direct FAX:	0854-8753477
Direct tel:	0854-8753473
Personal E-Mail:	dj8925@gmail.com

CERs Purchaser

Organization:	Eco Asset Inc.
Street/P.O.Box:	Minami-Aoyama, Minato-ku Tokyo
Building:	Minami-Aoyama NK Building 6F 1-10-4
City:	Tokyo
State/Region:	
Postfix/ZIP:	107-0062
Country:	Japan
Telephone:	+03-5771-6288
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E-Mail:	aoki@ecoasset.jp
URL:	
Represented by:	Koji Aoki
Title:	
Salutation:	Mr
Last Name:	Aoki
Middle Name:	
First Name:	Koji
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Direct FAX:	+03-5771-6289
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding is involved in this project activity.

Annex 3

BASELINE INFORMATION

The installed capacity, fuel consumption data used for OM and BM calculation are derived from <China Energy Statistical Yearbook>, <China Electric Power Yearbook>.

The low calorific value, CO_2 emission factor and oxidation factor of fuels are listed in Table A1 below.

Table A1 Low calorific values, CO_2 emission factors and oxidation factors of fuels

Fuel	Low Calorific Value	Emission Factor (tC/TJ)	Oxidation Factor
Raw Coal	20908 kJ/kg	25.8	100%
Cleaned Coal	26344 kJ/kg	25.8	100%
Other Washed Coal	8363 kJ/kg	25.8	100%
Coke	28435 kJ/kg	25.8	100%
Crude Oil	41816 kJ/kg	20.0	100%
Gasoline	43070 kJ/kg	18.9	100%
Diesel Oil	42652 kJ/kg	20.2	100%
Fuel Oil	41816 kJ/kg	21.1	100%
Natural Gas	38931 kJ/m^3	15.3	100%
Coke Oven Gas	16726 kJ/m^3	12.1	100%
Other Gas	5227 kJ/m^3	12.1	100%
LPG	50179 kJ/kg	17.2	100%
Refinery Dry Gas	46055 kJ/kg	18.2	100%

Data Source:

The net calorific values are quoted from <China Energy Statistical Yearbook 2006>, Page 287.

The emission factors and oxidation factors are quoted from <Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories >, Table 1.4, Page 1.24, Chapter 1, Volume 2.

Step 1: Calculating the Operating Margin emission factor ($EF_{OM,y}$)

Table A2 Simple OM Emission Factors Calculation of CSPG for Year 2003

Fuel	Unit	Guangdong	Guangxi	Guizhou	Yunnan	Total	EF	Oxidation	Average Low Calorific Value	CO_2 Emission (tCO_2e)
							(tC/TJ)	(%)	(MJ/t,km3)	K=G*H*I*J*44/12/10000 (for mass unit)
		A	B	C	D	G=A+B+C+D	H	I	J	K=G*H*I*J*44/12/1000 (for volumn unit)
Raw Coal	10^4 t	4491.79	831.84	2169.11	1405.27	8898.01	25.8	100	20908	175993455.05
Cleaned Coal	10^4 t	0.05				0.05	25.8	100	26344	1246.07
Other Washed Coal	10^4 t			36.38	20.37	56.75	25.8	100	8363	448971.84
Coke	10^4 t				0.5	0.5	25.8	100	28435	13449.76
Coke Oven Gas	10^8 m^3				0.04	0.04	12.1	100	16726	2968.31
Other Gas	10^8 m^3	3.21			11.27	14.48	12.1	100	5227	335797.81
Crude Oil	10^4 t	6.85				6.85	20	100	41816	210055.71
Gasoline	10^4 t	0.02				0.02	18.9	100	43070	596.95
Diesel Oil	10^4 t	31.9			0.76	32.66	20.2	100	42652	1031759.27
Fuel Oil	10^4 t	627.22	0.3			627.52	21.1	100	41816	20301304.48
LPG	10^4 t					0	17.2	100	50179	0.00
Refinery Gas	10^4 t	2.85				2.85	18.2	100	46055	87592.00
Natural Gas	10^8 m^3					0	15.3	100	38931	0.00
Other Petroleum Products	10^4 t	11.35				11.35	20	100	38369	319357.98
									Subtotal	**198746555.23**
Electricity imported from CCPG		Average emission factor of CCPG		CO_2 emission of imported electricity						
K		L		M=K*L					**Total=M+Subtotal**	**198755406.84**
11100 MWh		0.79744 tCO2e/MWh		8851.58 tCO_2e						

Data Source: *China Energy Statistical Yearbook 2004*, Chinese DNA's Guideline of emission factors of Chinese grids

Table A3 Fuel-fired Electricity Generation of CSPG for Year 2003

Item	Electricity Generation (10^8 kWh)	Electricity Generation (MWh)	Auxiliary Power Ratio (%)	Supplied Electricity (MWh)
Guangdong	1433.51	143351000	5.50	135466695
Guangxi	170.79	17079000	8.43	15639240.3
Guizhou	432.95	43295000	7.40	40091170
Yunnan	190.55	19055000	8.01	17528694.5
Electricity imported from CCPG	/	11100	/	11100
Total				**208736899.8**

Data Source: *China Electric Power Yearbook 2004,* Chinese DNA's Guideline of emission factors of Chinese grids

According to Table A2, the total CO_2 emissions of CSPG is **198755406.84**tCO_2e in year 2003. According to Table A3, the total supplied electricity of CSPG is 208736899.8 MWh. According to formula (2) in section B.6.1, the $EF_{OM, Simple, 2003}$ is **0.952181464**tCO_2e/MWh.

Table A4 Simple OM Emission Factors Calculation of CSPG for Year 2004

Fuel	Unit	Guangdong	Guangxi	Guizhou	Yunnan	Total	EF	Oxidation	Average Low Calorific Value	CO_2 Emission (tCO_2e)
							(tC/TJ)	(%)	(MJ/t,km3)	K=G*H*I*J*44/12/10000 (for mass unit)
		A	B	C	D	G=A+B+C+D	H	I	J	K=G*H*I*J*44/12/1000 (for volumn unit)
Raw Coal	10^4 t	6017.7	1305	2643.9	1751.28	11717.88	25.8	100	20908	231767573.55
Cleaned Coal	10^4 t	0.21				0.21	25.8	100	26344	5233.50
Other Washed Coal	10^4 t					0	25.8	100	8363	0.00
Coke	10^4 t					0	25.8	100	28435	0.00
Coke Oven Gas	10^8 m^3					0	12.1	100	16726	0.00
Other Gas	10^8 m^3	2.58				2.58	12.1	100	5227	59831.38
Crude Oil	10^4 t	16.89				16.89	20	100	41816	517932.98
Gasoline	10^4 t					0	18.9	100	43070	0.00
Diesel Oil	10^4 t	48.88			1.83	50.71	20.2	100	42652	1601975.28
Fuel Oil	10^4 t	957.71				957.71	21.1	100	41816	30983494.25
LPG	10^4 t					0	17.2	100	50179	0.00
Refinery Gas	10^4 t	2.86				2.86	18.2	100	46055	87899.34
Natural Gas	10^8 m^3	0.48				0.48	15.3	100	38931	104833.40
Other Petroleum Products	10^4 t	1.66				1.66	20	100	38369	46707.86
									Subtotal	**265175481.54**
Electricity imported from CCPG		Average emission factor of CCPG		CO_2 emission of imported electricity						
K		L		M=K*L					**Total=M+Subtotal**	**274226116.64**
10951240 MWh		0.82644843tCO2e/MWh		9050634 tCO_2e						

Data Source: *China Energy Statistical Yearbook 2005,* Chinese DNA's Guideline of emission factors of Chinese grids

Table A5 Fuel-fired Electricity Generation of CSPG for Year 2004

Item	Electricity Generation	Electricity Generation	Auxiliary Power Ratio	Supplied Electricity
	(10^8 kWh)	(MWh)	(%)	(MWh)
Guangdong	1693.89	169389000	5.42	160208116.2
Guangxi	201.43	20143000	8.33	18465088.1
Guizhou	497.2	49720000	7.06	46209768
Yunnan	243.22	24322000	7.56	22483256.8
Electricity imported from CCPG	/	10951240	/	10951240
Total				**258317469.1**

Data Source: *China Electric Power Yearbook 2005*, Chinese DNA's Guideline of emission factors of Chinese grids

According to Table A4, the total CO_2 emissions of CSPG is 274226116.64 tCO2e in year 2004. According to Table A5, the total supplied electricity of CSPG is 258317469.1 MWh. According to formula (2) in section B.6.1, the $EF_{OM,\,Simple,2004}$ is 1.061585643tCO2e/MWh.

Table A6 Simple OM Emission Factors Calculation of CSPG for Year 2005

Fuel	Unit	Guangdong	Guangxi	Guizhou	Yunnan	Total	EF	Oxidation	Average Low Calorific Value	CO_2 Emission (tCO_2e)
							(tC/TJ)	(%)	(MJ/t,km3)	K=G*H*I*J*44/12/10000 (for mass unit)
		A	B	C	D	G=A+B+C+D	H	I	J	K=G*H*I*J*44/12/1000 (for volumn unit)
Raw Coal	10^4 t	6696.47	1435	3212.31	1975.55	13319.33	25.8	100	20908	263442601.85
Cleaned Coal	10^4 t				0.15	0.15	25.8	100	26344	3738.21
Other Washed Coal	10^4 t			10.39	33.88	44.27	25.8	100	8363	350237.59
Coke	10^4 t	4.79			8.05	12.84	25.8	100	28435	345389.71
Coke Oven Gas	10^8 m^3				0.79	0.79	12.1	100	16726	58624.07
Other Gas	10^8 m^3	1.87			15.96	17.83	12.1	100	5227	413485.84
Crude Oil	10^4 t	10.91				10.91	20	100	41816	334555.88
Gasoline	10^4 t	0.68				0.68	18.9	100	43070	20296.31
Diesel Oil	10^4 t	31.96	2.02		1.81	35.79	20.2	100	42652	1130638.84
Fuel Oil	10^4 t	887.21				887.21	21.1	100	41816	28702703.26
LPG	10^4 t					0	17.2	100	50179	0.00
Refinery Gas	10^4 t	4.92				4.92	18.2	100	46055	151211.46
Natural Gas	10^8 m^3	0.93				0.93	15.3	100	38931	203114.71
Other Petroleum Products	10^4 t	1.7				1.7	20	100	38369	47833.35
									Subtotal	**295204431.07**
Electricity imported from CCPG		Average emission factor of CCPG		CO_2 emission of imported electricity						
K		L		M=K*L					**Total=M+Subtotal**	**369521974.54**
96363000		0.771224884tCO2e/MWh		74317543 tCO_2e						

Data Source: *China Energy Statistical Yearbook 2006*, Chinese DNA's Guideline of emission factors of Chinese grids

Table A7 Fuel-fired Electricity Generation of CSPG for Year 2005

Item	Electricity Generation	Electricity Generation	Auxiliary Power Ratio	Supplied Electricity
	(10^8 kWh)	(MWh)	(%)	(MWh)
Guangdong	1764.53	176453000	5.58	166606922.6
Guangxi	250.23	25023000	7.95	23033671.5
Guizhou	584.3	58430000	7.34	54141238
Yunnan	272.81	27281000	6.94	25387698.6
Electricity imported from CCPG	/	96363000	/	96363000
Total				**365532530.7**

Data Source: *China Electric Power Yearbook 2006*, Chinese DNA's Guideline of emission factors of Chinese grids

According to Table A6, the total CO2 emissions of CSPG is 369521974.54 tCO2e in year 2005. According to Table A7, the total supplied electricity of CSPG is 365532530.7MWh. According to formula (2) in section B.6.1, the $EF_{OM,Simple,2005}$, is 1.01091406 tCO2e/MWh.

The Operating Margin (OM) emission factor is the weighted average emission factors of year 2003-2005, as follow:

$$EF_{OM} = 1.0119 tCO_2e/MWh$$

Step 2: Calculating the Build Margin emission factor ($EF_{BM,y}$)

Sub-Step 2a: Calculating of percentages of CO_2 emissions from the coal-fired, gas-fired and oil-fired power plants in total fuel-fired CO_2 emissions

Table A8 Percentages of CO_2 emissions from the coal-fired, gas-fired and oil-fired power plants in total fuel-fired CO_2 emissions

		Guangdong	Guangxi	Guizhou	Yunnan	Total	Average Low Calorific Value	Emission Factor	Oxidation	CO_2 Emission
								(tC/TJ)		(tCO_2e)
Fuel	**Unit**	**A**	**B**	**C**	**D**	**G=A+B+C+D**	**H**	**I**	**J**	**K=G*H*I*J*44/12/100**
Raw Coal	10^4 t	6696.47	1435	3212.31	1975.55	13319.33	20908 kJ/kg	25.8	100%	263442601.85
Cleaned Coal	10^4 t				0.15	0.15	26344 kJ/kg	25.8	100%	3738.21
Other Washed Coal	10^4 t			10.39	33.88	44.27	8363 kJ/kg	25.8	100%	350237.59
Coke	10^4 t	4.79			8.05	12.84	28435 kJ/kg	25.8	100%	345,390
Subtotal										**264,141,967**
Crude Oil	10^4 t	10.91				10.91	41816 kJ/kg	20	100%	334555.88
Gasoline	10^4 t	0.68				0.68	43070 kJ/kg	18.9	100%	20296.31
Diesel Oil	10^4 t	31.96	2.02		1.81	35.79	42652 kJ/kg	20.2	100%	1130638.84
Fuel Oil	10^4 t	887.21				887.21	41816 kJ/kg	21.1	100%	28702703.26
Other Petroleum Products	10^4 t	1.7				1.7	38369 kJ/kg	20	100%	47833.35
Subtotal										**30236023**
Natural Gas	10^7 m^3	9.3				9.3	38931 kJ/m^3	15.3	100%	203114.71
Coke Oven Gas	10^7 m^3				7.9	7.9	16726 kJ/m^3	12.1	100%	58624.07
Other Gas	10^7 m^3	18.7			159.6	178.3	5227 kJ/m^3	12.1	100%	413485.84
LPG	10^4 t					0	50179 kJ/kg	17.2	100%	0.00
Refinery Gas	10^4 t	4.92				4.92	46055 kJ/kg	18.2	100%	151211
Subtotal										**826,436**
Total										**295,204,431**

Data Source: *China Energy Statistical Yearbook 2006*

According to Table A8 and formula (6) in section B.6.1, the percentages of CO_2 emissions from the coal-fired, oil-fired and gas-fired power plants in total fuel-fired CO_2 emissions are calculated as:

$$\lambda_{Coal} = 89.49\%,\ \lambda_{Oil} = 10.24\%,\ \lambda_{Gas} = 0.28\%$$

Sub-Step 2b: Calculating the fuel-fired emission factor ($EF_{Thermal}$)

The most advanced commercialized technologies for coal-fired power plants in China are domestic 600 MW sub-critical generators, with the standard coal consumption of power supply of 343.33 gce/kWh. For gas-fired and oil-fired power plants in China, the most advanced commercialized technologies are 200 MW combined cycle generators. The standard coal consumption (equivalent) for power supply of oil-fired and gas-fired power plants are 258 gce/kWh.

Parameters used for calculating fuel-fired emission factor are shown in Table A9 below:

Table A9 Parameters used for calculating fuel-fired emission factor

	Parameter	Efficiency of Power Suppy	Emission Factor of Fuel (tc/TJ)	Oxidation Factor	Emission Factor (tCO2/MWh)
		A	B	C	D=3.6/A/1000*B*C*44/12
Coar-fired Power Plant	$EF_{Coal,Adv}$	35.82%	25.8	100%	0.9508
Gas-fired Power Plant	$EF_{Gas,Adv}$	47.67%	15.3	100%	0.4237
Oil-fired Power Plant	$EF_{Oil,Adv}$	47.67%	21.1	100%	0.5843

According to Table A9 and formula (7) in section B.6.1, the $EF_{Thermal}$ is 0.9117 tCO_2e/MWh

Sub-Step 2c: Calculating the Build Margin (BM) emission factor ($EF_{BM,y}$)

Table A10 Installed Capacities of CSPG

Installed Capacity	Unit	2002	2003	2004	2005
Fuel-fired	MW	35969.2	40444.1	46659.7	54507
Hydro	MW	22921	25409.3	27580.1	30347.1
Nuclear	MW	2790	3780	3780	3780
Wind & Others	MW	76.8	83.4	83.4	83.4
Total	MW	**61757.0**	**69716.8**	**78103.2**	**88717.5**

Data Source: <China Electric Power Yearbook 2003-2006>

Table A11 Newly Added Installed Capacity from Year 2000-2005

	2002	2003	2004	2005	Newly capacity additions from 2003-2005
Fuel-fired (MW)	35969.2	40444.1	46659.7	54507	14062.9
Hydro (MW)	22921	25409.3	27580.1	30347.1	4937.8
Nuclear (MW)	2790	3780	3780	3780	0
Wind & Others (MW)	76.8	83.4	83.4	83.4	0
Total（MW）	61757	69716.8	78103.2	88717.5	1900.7
Percentage of newly installed capacity to 2005	30.39%	21.42%	11.96%	0.00%	
Percentage of newly added fuel-fired plants		74.01%			

It can be concluded from Table A11 that capacity additions from year 2003 to 2005 is closer to 20% of the total additions and it is obvious the capacity additions during year 2003 to 2005 are larger than the capacity of five plants, so year 2003 and 2005 are chosen to calculate the BM emission factor of CSPG.

According to Table A11 and formula (8) in section B.6.1, the EF_{BM} is calculated as:

$$EF_{BM} = 0.6748 \text{ tCO}_2\text{e/MWh}$$

Step 3: Calculating the baseline emission factor (EF_y)

According to formula (9) in section B.6.1, the baseline emission factor of CSPG is calculated as:

$$EF_y = 0.84335 \text{ tCO}_2\text{e/MWh}$$

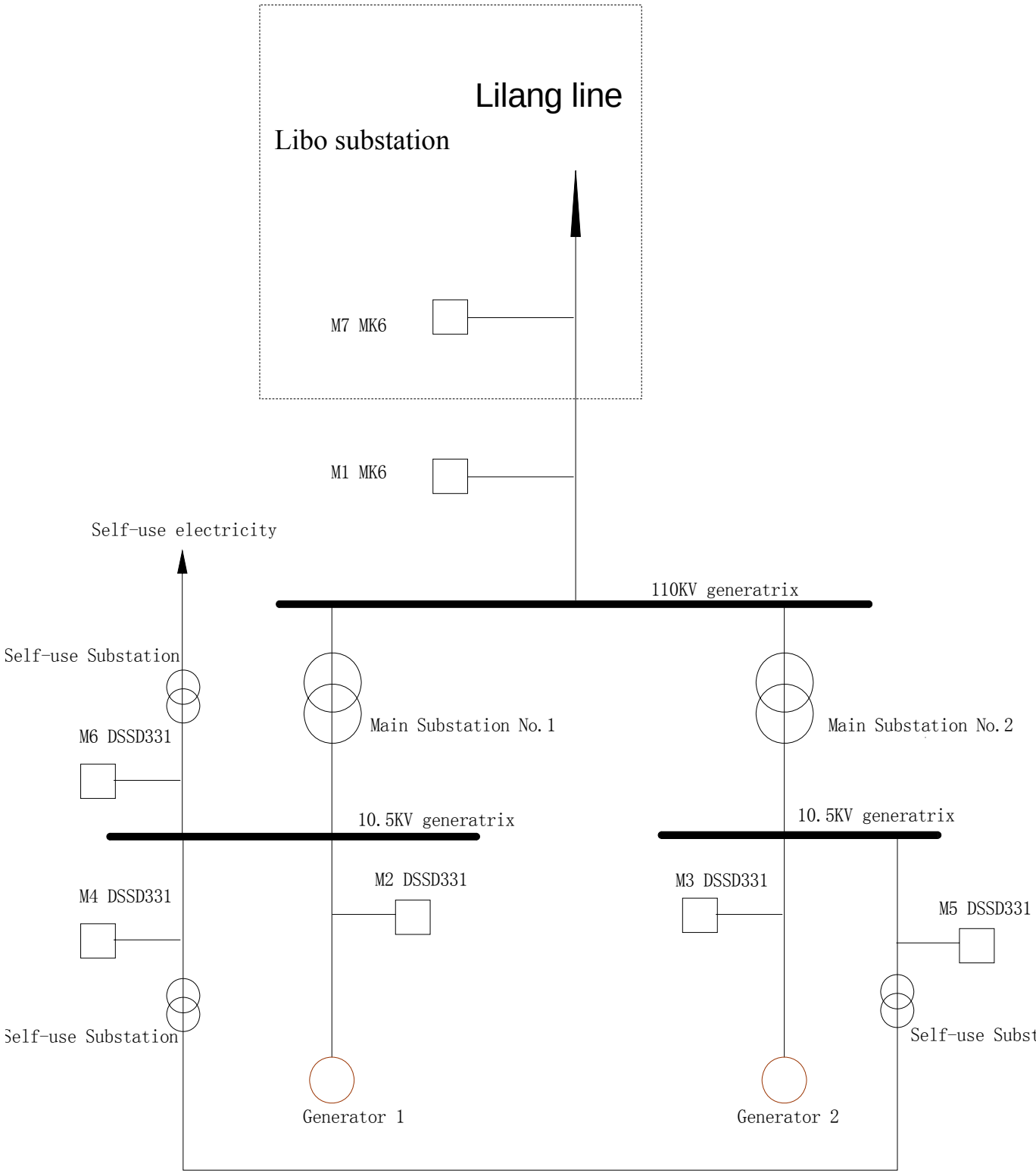
The EF_y applied in this PDD is fixed for a crediting period and may be revised at the renewal of the crediting period.

Annex 4

MONITORING INFORMATION

The meter' type , parameter and recording frequency.

Meter	Type	Manage	Electronic Recording frequency	Record handed frequency	Gathering frequency	emending organization emending period	Precision	Save method	Remark
M1，	MK6	gird company	the computer monitorsat the same time ,record every hour	Every day	Every month	County gird company every year	0.5s	Electronic recording and handed, Data will be kept for 2 years following the end of the crediting period	Positive and reverse direction computation
M2,M3	DSSD331	Owner	the computer monitorsat the same time ,record every hour	Every day	Every month	County gird company every year	0.5	Electronic recording and handed, Data will be kept for 2 years following the end of the crediting period	Positive and reverse direction computation
M4,M5, M6	DSSD331	Owner	the computer monitorsat the same time ,record every hour	Every day	Every month	County gird company every year	0.5	Electronic recording and handed, Data will be kept for 2 years following the end of the crediting period	Positive and reverse direction computation
M7	MK6	gird company		Every day	Every month	County gird company every year	0.5s	Electronic recording and handed, Data will be kept for 2 years following the end of the crediting period	Positive and reverse direction computation



Langxiang' layout diagram