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

CONTENTS

Annexes

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	31st May 2007	• The PDD has been revised according to the DOE's request

SECTION A. General description of small-scale project activity

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

Yangjiawan 9MW Hydro Power Project in Guizhou Province, China

The version 3.0 PDD was completed on 31st May 2007.

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

Yangjiawan 9MW Hydro Power Project in Guizhou Province China is a run-of-river hydro power plant sited on Xishui River in Shibao Town, Chishui City in Guizhou Province with the installed capacity 9MW.The hinge of the power plant includes the gravity dam with the height of 14.77m, the diversion tunnels with the length of 1,650m and the power plant. There are 2 turbines and 2 generators with the respective type of HLA551-LJ-122 and SF4500-14/3250. The electricity generated by the proposed project will be connected to Guizhou Province Power Gird, finally to China Southern Power Grid. The annual electricity generation is 38,200MWh, and the annual feed-in electricity to the grid is 35,920MWh[1].

Electricity generated by the proposed project will displace part of the electricity generated by China Southern Power Grid 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 27,958tCO_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:

- To be consistent with China's national energy policy and the Western Development Strategy, will alleviate power shortage in the local areas, will improve the local poor condition and advance the standard of living of local people.
- To displace part of the electricity from coal-fired power plants, and thus will avoid environmental pollution caused by coal consumption.
- To create new job opportunities for the local people. In the construction period, the rural labour force can be arranged.15 long-term job opportunities will be provided in the operation period.
- After the operation of the proposed project, the local people can make good use of electricity instead of biomass, especially firewood, which can reduce the destroying to local vegetation and protect the environment.

A.3. Project participants:

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

1 Refer to The Preliminary Design Report of Yangjiawan Hydro Power Project.

		(Yes/No)
P.R.China (host)	Chishui Zhongshui Hydro Power Development Co.Ltd. (project owner)	No
England	ICECAP Carbon Portfolio Limited(buyer)	No

The detailed information of participants is included in Annex 1.

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

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

A.4.1.1. Host Party(ies):

People's Republic of China

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

Guizhou Province

A.4.1.3. City/Town/Community etc:

Shibao Town, Chishui City

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

The proposed project is sited on Xishui River in Shibao Town Chishui City of Guizhou Province. The geographical coordinates are east longitude 106°11'38'' and north latitude28°29'56''.Figure 1 shows the location of the proposed project.

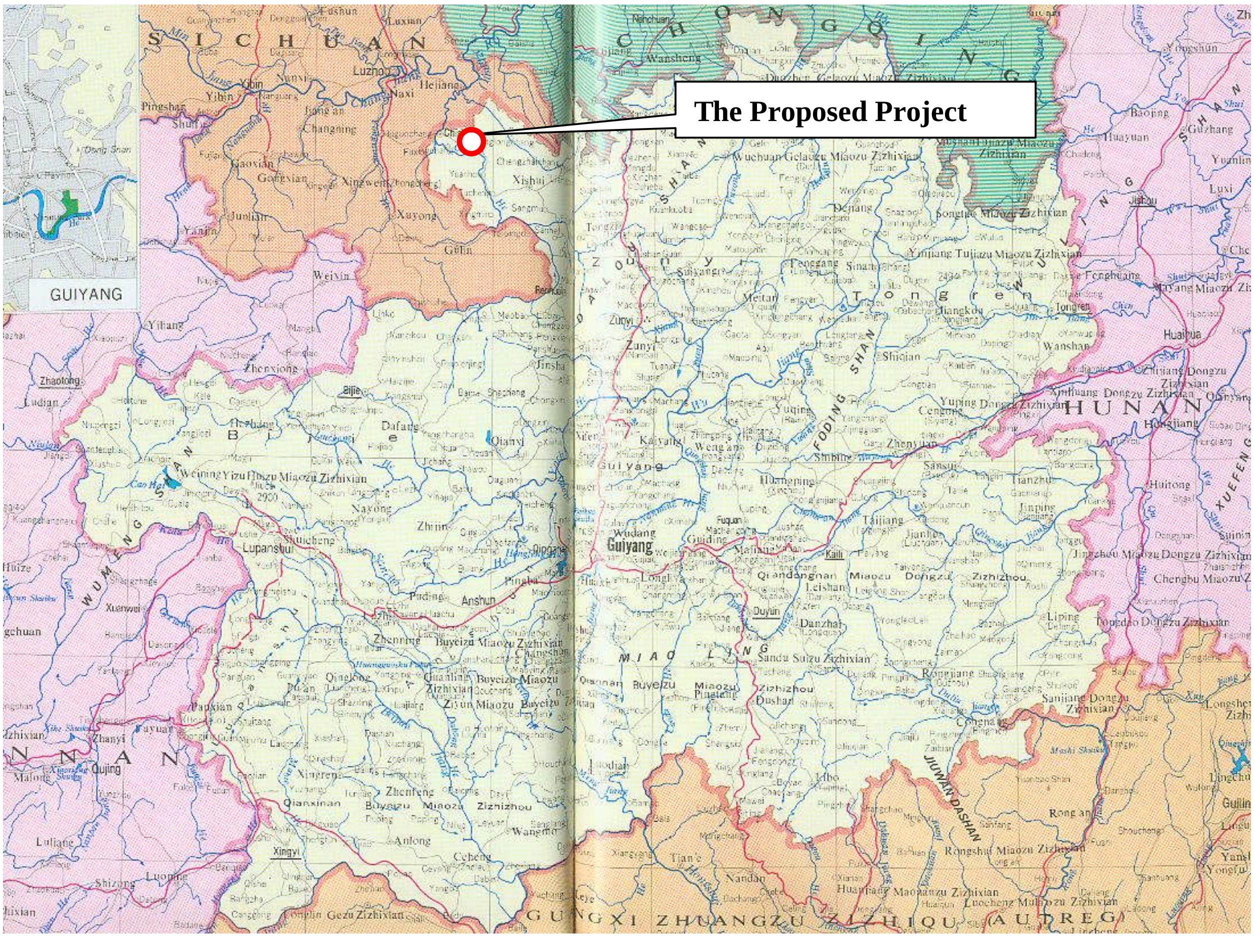

Figure 1. Geographical Location of the Proposed Project

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

According to Appendix B of the simplified procedures for small-scale activities, the type and category of the proposed project is as follows: Type I - *Renewable Energy Project*; Category I.D. - *Grid Connected Renewable Electricity Generation*. The proposed project activity falls into the Category I.D. based on the following reasons:

- The proposed project makes good use of the water head to generate the electricity with the installed capacity 9MW, less than 15MW, and accords with the eligibility of the small-scale CDM activities;
- After the operation of the proposed project, the electricity will connect to the China Southern Power Grid, which gives priority to fossil fuel fired power plants;

The proposed project adopts the hydro power generation technology as follows. The proposed project is the run-of-river hydro power project. The constructions include the dam, the intake power tunnel, the pressure pipelines and the equipments. The height of the gravity dam is 14.77m and the normal water level is 390.6m.The length of the diversion tunnels is 1,650m.The collocation type of the pressure pipelines is “one pipeline, one machine”, with the diameter of 3m and the length of 85m.The flux used for power generation is 25.1m^3/s, and the weighted average water head is 43.2m.The installed capacity of the proposed project is 9MW(2*4.5MW).The type of the turbines is HLA551-LJ-122,and the type of the generator is SF4500-14/3250. These equipments are domestic. In terms of the connection power system, the 35KV pipelines with the length of 12km will be adopted to connect to 35KV generatrix of Guandu 110KV Transformer Substation.

The main contracts for the construction of the proposed project have already been signed and equipments have been purchased. The first generator has been started to generate electricity in 13th Nov, 2006. The second generator will be installed completely before the end of 31st January, 2007.

The technology adopted by the proposed project is national technology, so the technology transfer is not involved in the proposed project.

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

The estimated annual emission reductions of the proposed project are 27,958tCO_2e. The renewable crediting period of 7 years*3 is chosen. In the first crediting period from 1st Sep, 2007 to 31st Aug, 2014, the total emission reductions are estimated to be195,706 tCO_2e.

Year	Annual emission reductions(tCO2e)
1st .Sep, 2007~31st .Aug, 2008	27,958
1st .Sep, 2008~31st .Aug, 2009	27,958
1st .Sep, 2009~31st .Aug, 2010	27,958
1st .Sep, 2010~31st .Aug, 2011	27,958
1st .Sep, 2011~31st .Aug, 2012	27,958
1st .Sep, 2012~31st .Aug, 2013	27,958
1st .Sep, 2013~31st .Aug, 2014	27,958
Total emission reductions (tCO_2e)	195,706
The length of the crediting period （Year）	7
Annual emission reductions in the crediting period(tCO_2e)	27,958

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

No official development assistant (ODA) from Annex I Parties is involved in the proposed project.

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

The project participants confirm that the proposed project is not a debundled component of a larger project activity. There is no registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

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

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:

The methodology applied for the proposed project is the approved methodology for small-scale CDM project- "AMS-I.D. Grid connected renewable electricity generation" (version 10). For more information regarding the methodology, please refer to the link: http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html.

Furthermore, the ACM0002 (version 6) "Consolidated baseline and monitoring methodology for grid-connected electricity generation from renewable sources" is also adopted. For more information regarding the methodology, please refer to the link:

http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html.

B.2 Justification of the choice of the project methodology

The methodology AMS-I.D. is applicable to renewable energy generation units that supply electricity to an electricity grid, which is the case for the proposed project. Moreover, the size of the proposed project is 9MW, which is well within the limit of 15 MW stipulated by the chosen (small-scale) methodology. The proposed project qualifies as a small-scale project activity and the capacity will remain within the limits of small-scale project activity types during every year of the crediting period. Therefore, the methodology AMS-I.D. is applicable to the proposed project.

B.3. Description of the project boundary

Based on the methodology AMS-I.D., the project boundary encompasses the physical, geographical site of the renewable generation source. The electricity displaced by the proposed project should be the electricity generated by Guizhou Power Grid, which is a part of China Southern Power Grid. According to the guideline published on December.15, 2006 by China DNA[2], the geographical range of China Southern Power Grid includes Guangdong Power Grid, Guangxi Power Grid, Yunnan Power Grid and Guizhou Power Grid. Therefore, the spatial scope of the project boundary covers all power plants physically connected into China Southern Power Grid.

B.4. Description of baseline and its development:

According to the methodology AMS-I.D., the baseline emission is the kWh produced by the renewable generating unit multiplied by an emission coefficient. The emission coefficient is calculated according to method (a) selected from the methodology AMS-I.D.(version 10) as: (a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the approved methodology ACM0002. The concrete calculation formulae are shown in section B.6.1.

The baseline boundary of the proposed project is China Southern Power Grid, so the boundary when calculating the baseline Operating Margin emission factor and the Build Margin emission factor is set within China Southern Power Grid. In all, the GHG emission reductions of the proposed project are

2 http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/2006/2006121591135575.pdf

based on the emission factor and the electricity supplied to the power grid. The calculation tables and parameters required are shown in annex 3.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity
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Additionality of the proposed project is demonstrated based on the requirement of Appendix A to the *Simplified Modalities and Procedures for Small-scale CDM Project Activities*.

The additionality of the proposed project will be demonstrated from investment analysis.

According to "Economic evaluation code for small hydropower projects" (SL 16-95) issued by Ministry of Water Resources, the benchmark FIRR on total investment for hydro power projects is 10%.

Based on the important parameters of the proposed project, the IRR change of the proposed project with CDM and without CDM is calculated. The main parameters are as follows.

Table1 Main parameters for the calculation of financial indicators

Item	Unit	Value
Installed capacity	MW	9
The total static investment	Million Yuan	55.00
Annual O&M cost	Million Yuan	0.64
Annual grid-connected electricity generation	GWh/year	35.92
Electricity Tariff (Excluding VAT)	Yuan/kWh	0.213
Value Added Tax (VAT)	%	6
Town building maintenance tax	%	3
Surcharge for education	%	1
Income tax	%	33
Expected CERs Price	EUR/tCO_2e	8
Project life time	Year	25
CERs crediting time	year	7*3

The FIRRs with and without the income from CERs sale are listed in table 2 below. Without the income from CERs, the FIRR of the proposed project is 8.38%, lower than the benchmark FIRR set in SL 16-95, so the proposed project is financially unacceptable. With the income from CERs, the FIRR is increased to 12.37%, financially acceptable.

Table2 Comparison of financial indicators with and without income from CERs

Item	Unit	Without the income from CERs	Benchmark rate	With the income from CERS
FIRR of total investment	%	8.38	10	12.37

The sensitive analysis is done in the following. Assuming the three factors such as total static investment, annual operation and maintenance cost and annual sales from electricity vary in the range of -10% ~+10%, whether the proposed project is all the same unattractive without CDM. The influence of the three factors on FIRR of the project (without CDM) is shown in Figure 2.

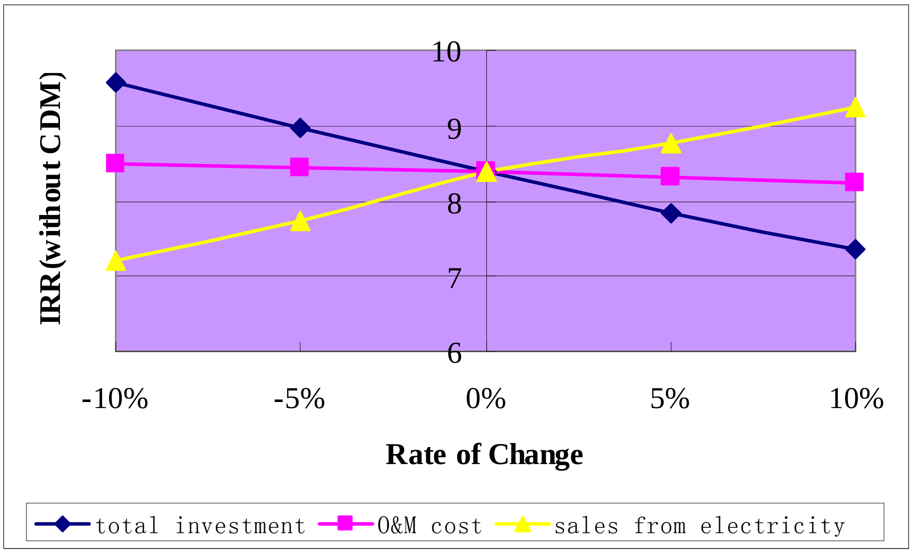

Figure 2 Sensitivity analysis of the proposed project

From the above figure 2, it can be shown that IRR can be decreased with the increase of total investment and O&M cost, and can be increased with the raising of sales from electricity. Furthermore, if the IRR is needed to achieve 10%, the total investment may be decreased by more than 10%, but the proposed project has been in construction and has broken the budgetary estimate because of increase of the material price, so it is impossible of decrease 10% of total investment. Or the O&M cost may be decreased by more than 10%, but the related factors of O&M cost is relatively fixed, so it is impossible of decrease 10% of O&M cost. Or the sales from electricity may be increased by more than 10%, but the tariff is fixed through PPA and the electricity generation is relatively fixed, so it is impossible of increase 10% of the sales from electricity. Therefore, it is impossible for the three factors to change so much. Therefore, when the above three factors vary in the range of -10%-+10%, the proposed project has no attractiveness, still less than benchmark IRR 10%.

Based on the above investment analysis, without CDM, the proposed project is not attractive below the benchmark of commercial operation. Moreover, the project are independently invested, constructed and operated by private enterprises who assume a relatively high risk in investment, technology, and plant management, which needs CDM support.

Furthermore, if the proposed project can be registrated as CDM projects, the CDM revenues can improve the poor financial index of the proposed project, make the project more financial attractive, reduce the pressure from long-term investment needed by the proposed project and cash flow risks, and reduce the risks of low bus-bar tariff and unstable electricity generation. If the proposed project can't be registrated as CDM project, it is difficult to conquer the barriers and the project is not feasible. In absence of CDM, the emission reductions generated by the proposed project can't come true.

In conclusion, the proposed project is additional and can reduce the greenhouse gas emission, not (part of) the baseline scenario.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

The emission coefficient is calculated according to method (a) provided by the methodology AMS-I.D. (version 10) as: (a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the approved methodology ACM0002. According to the approved methodology ACM0002, baseline emission factors of operating margin ($EF_{OM,y}$) and build margin ($EF_{BM,y}$) were determined ex-ante based on the data of China Southern Power Grid, which include installed capacity, electricity output and consumption of different types of fuels of all plants. The baseline emission factor (EF_y) is calculated as a combined margin (CM) of $EF_{OM,y}$ and $EF_{BM,y}$.

Step 1. Calculate the Operating Margin Emission Factor(s) ($EF_{OM,y}$)

According to ACM0002, four alternatives could be used to calculate the OM: (a) Simple OM, (b) Simple adjusted OM, or (c) Dispatch Data Analysis OM, or (d) Average OM.

For the proposed project, the simple Operating Margin emission factor was chosen based on the following two reasons:

1) In China, the State Grid Corporation runs the interregional dispatch system and each regional grid corporation runs the intraregional dispatch system. The dispatch information is regarded as business secrets and not available to the public.
2) In the most recent 5 years (2000-2004), the proportions of low-cost/must run resources in the total electricity output in China Southern Power Grid were 34.3%, 32.3%, 31.6%, 31.1% and 28.0%, respectively, much less than 50%,.

As a result, the simple OM method may be used.

The Simple OM emission factor is calculated as the generation-weighted average emissions per electricity unit (tCO_2e/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants:

$$EF_{OM,y} = \frac{\sum_{i,j} F_{i,j,y} \times COEF_{i,j}}{\sum_{j} GEN_{j,y}} \quad (1)$$

Where $F_{i,j,y}$ is the amount of fuel *i* consumed (ton for solid and liquid fuel, m^3 for gas fuel) by relevant power sources *j* in years *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/t for solid and liquid fuel, tCO_2/m^3 for gas fuel), taking into account the carbon content of the fuels used by relevant power sources *j* and the percent oxidation of the fuel in years *y*, and

$GEN_{j,y}$ is the electricity (MWh) delivered to the grid by source *j*. In the China Electric Power Year Book and other data resources, only generation data is available. The generation from source *j* can be translated into electricity delivered to the grid by source *j* by the following formulation:

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

Where $G_{j,y}$ is the amount of generation (in MWh) by source *j* in year *y*;

$e_{j,y}$ is the rate of plant self consumption of source *j* in year *y*.

The CO_2 emission coefficient of fuel type *i* $COEF_i$ is obtained as

$$COEF_i = NCV_i \times EF_{CO_2,i} \times OXID_i \quad (3)$$

Where:

NCV_i is the net calorific value per ton or m^3 of a fuel *i* (TJ/tce, TJ/m^3).

$OXID_i$ is the oxidation factor of the fuel *i*.

$EF_{CO2,i}$ is the CO_2 emission factor per TJ of fuel type *i* (tCO_2/TJ).

According to the methodology ACM0002, the Simple OM emission factor is ex-ante calculated as electricity-to-the-grid weighted average in the China Southern Power Grid during the most recent 3 years (2002-2004), and will be fixed in the first crediting period.

Based on the formula (1), formula (2) and formula (3) and the publication by Chinese DNA[3], the result of OM emission factor in China Southern Power Grid can be calculated.

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

According to ACM0002, the BM is calculated as the generation-weighted average emission factor of a sample of power plants *m*, as follows:

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

Where:

$F_{i,m,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by plant *m* in year *y*;

$COEF_{i,m}$ is the CO_2 emission coefficient (tCO_2e / a mass or volume unit) of fuel *i*, taking into account the carbon content of the fuels used by plant *m* and the percent oxidation of the fuel in year *y*;

$GEN_{m,y}$ is the electricity (MWh) delivered to the grid by plant *m in year y*.

The methodology provides two options for the BM calculation :1) Ex-ante calculation based on the available data in the recent three years when the PDD submission; 2) Ex-post update BM according to the actual generated electricity and emission reductions in the first crediting period, and in other crediting period the ex-ante calculation like the first choice can be adopted.

The result of BM emission factor in this project is based on the first choice: ex-ante calculation and the update for the emission factor are not needed.

Because some data can't be available, the BM calculation in this PDD adopts the modifications methods agreed by the CDM EB[4]. First, calculate the newly added installed capacity and the various component

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3 http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1052.xls

4 the clarifications for some proposed projects in China adopting the approved methodology AM0005 and AMS-I.D to calculate the build margin emission factor.

technologies, then calculation of the weight of newly added installed capacity of each power generation technology. Finally the commercial and efficient level of each power generation technology is adopted to calculate BM emission factor.

Because the generating capacity of the coal-fired, oil-fired and gas-fired technology can not be separated from the existing statistical data, the BM calculation in this PDD adopts the following method: First, use the available data in the energy balance tables on the most recent year, then calculate the proportion of CO_2 emissions from solid, liquid and gaseous fuels corresponding to the total emissions of CO_2 emissions; Second, the proportion used as the weight, based on the emission factors of the optimal efficient and commercial technologies, calculate the emission factor of the thermal power in each grid. Finally, this thermal emission factor is multiplied by the proportion of thermal power added capacity in the additional 20% capacity. The result is BM emission factor.

Concrete steps and the formula for BM are as follows:

Sub-step1: Calculation of the proportion of CO2 emissions from solid, liquid and gaseous fuels corresponding to the total emissions of CO2 emissions.

$$\lambda_{Coal} = \frac{\sum_{i=Coal,j} F_{i,j,y} * COEF_{i,j}}{\sum_{i,j} F_{i,j,y} * COEF_{i,j}} \qquad (5)$$

$$\lambda_{Oil} = \frac{\sum_{i=Oil,j} F_{i,j,y} * COEF_{i,j}}{\sum_{i,j} F_{i,j,y} * COEF_{i,j}} \qquad (6)$$

$$\lambda_{Gas} = \frac{\sum_{i=Gas,j} F_{i,j,y} * COEF_{i,j}}{\sum_{i,j} F_{i,j,y} * COEF_{i,j}} \qquad (7)$$

Where:

$F_{i,m,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by plant *m* in year *y*;

$COEF_{i,m}$ is the CO_2 emission coefficient (tCO_2e / a mass or volume unit) of fuel *i*, taking into account the carbon content of the fuels used by plant *m* and the percent oxidation of the fuel in year *y*;

Coal, Oil and Gas is the feet for solid fuels, liquid fuels and gas fuels.

Sub-step2: Cacluation the emission factor of thermal power.

$$EF_{Thermal} = \lambda_{Coal} * EF_{Coal,Adv} + \lambda_{Oil} * EF_{Oil,Adv} + \lambda_{Gas} * EF_{Gas,Adv} \qquad (8)$$

$EF_{Coal,Adv}$、$EF_{Oil,Adv}$、$EF_{Gas,Adv}$ represent the emission factors of the optimal efficient and commercial coal-fired, oil-fueled and gas-fueled technologies.

Sub-step 3: Calculation of BM in the grid.

$$EF_{BM,y} = \frac{CAP_{Thermal}}{CAP_{Total}} * EF_{Thermal} \quad (9)$$

Where:

CAP_{Total} is the total added installed capacity;

$CAP_{Thermal}$ is the total added installed capacity for thermal power.

The key parameters used to calculate BM emission factor include: the low calorific value of each fuel, the oxidation rate, the potential emission factors and the efficiency of various power generation technologies. Please refer to the selection of these values in annex 3 and DNA report for China Southern Power Grid.

According to the statistic investigation for the new thermal power projects which were newly built during 10th Five-Year Plan period by China's State Electricity Regulatory Commission, among the newly built thermal power projects during 2000-2005, the installed capacity per turbine of 600 MW and above accounts for 21%, the capacity per turbine of 300MW accounting for 60%, and the single capacity for the remaining turbines is less than 300 MW. In 2004 the capacity of all the newly built large and medium-sized thermal power projects comes to 34 GW, of which there are 11 series of 600MW sets, accounted for 20% weak among newly added generating capacity in the large and medium-sized thermal power projects. Summarizing the above analysis, the optimal efficiency of the commercialization of the coal fuelled technology is determined as 600 MW domestic sub critical units. The weighted average for power supply coal consumption of 11 sets newly built 600 MW is chosen as the commercial and optimal technical efficiency. The supply coal consumption of domestic sub critical 600 MW power plants is estimated to be 336.66gce/kWh, equivalent to the efficiency of power supply with 36.53%.

The commercial technology of gas turbine power plants (including oil-fueled and gas-fueled) with the optimal efficiency is 200 MW combined cycle (equivalent to the level of GE 9E unit).According to the relevant statistics for gas turbine power plants in 2004, the maximum practical efficiency of the gas turbine power plants is chosen as a approximate estimation for the commercial optimal efficiency. The coal consumption of the gas turbine power plants (converted by heat value) is estimated to be 268.13 gce/kWh, equivalent to the efficiency of power supply 45.87%.

Based on the above calculation principle for BM, basic data and parameter, China DNA NDRC established the Report on Determination of Baseline Grid Emission Factor at http://cdm.ccchina.gov.cn. The BM for China Southern Power Grid can be calculated.

The concrete calculation process please sees annex 3 and the Report on Determination of Baseline Grid Emission Factor at http://cdm.ccchina.gov.cn. [5]

Step 3 Calculate the baseline emission factor EF_y

The baseline emission factor is the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$):

$$EF_y = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y} \quad (10)$$

Where the weight w_{OM} and w_{BM} by default, are 50%. The proposed project adopts the default weight.

5 http://cdm.ccchina.gov.cn/WebSite/CDM/UpFile/File1051.pdf.

Step 4 Calculate the baseline emissions (BE_y) and emission reductions (ER_y)

The annual baseline emissions (BE_y), as the product of the baseline emissions factor (EF_y) calculated in Step 3 and the electricity supplied by the project activity to the grid (EG_y), are as below:

$$BE_y = EG_y \times EF_y \qquad (11)$$

The emission reductions ER_y by the project activity during a given year y are the difference among baseline emissions (BE_y), project emissions (PE_y) and emissions due to leakage (L_y). According to AMS-I.D, the proposed project is a renewable hydro power project, therefore the project emissions may not be considered. At the same time, the energy generating equipment is not transferred from another activity and the existing equipment is not transferred to another activity, so leakage is not to be considered. So both the project emissions and leakage emissions are zero, $PE_y+L_y=0$. So the emission reductions ER_y is as follows:

$$ER_y = BE_y - PE_y - L_y = EG_y \times EF_y \qquad (12)$$

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

As described above, the emission factor of China Southern Power Grid in this PDD adopts the Report on Determination of Baseline Grid Emission Factor by China DNA NDRC. The related data and parameters in this report used to calculate the emission factor of China Southern Power Grid are shown in the following tables.

Data / Parameter:	NCV_i
Data unit:	MJ/t, or MJ/Km^3
Description:	the net calorific value per mass or volume unit of a fuel *i*
Source of data used:	China Energy Statistical Yearbook
Value applied:	The concrete value for each fuel please sees the Report on Determination of Baseline Grid Emission Factor by China DNA NDRC at http://cdm.ccchina.gov.cn and annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the latest version of ACM0002, the proposed project uses the national values
Any comment:	Reasonable

Data / Parameter:	$OXID_i$
Data unit:	%
Description:	the oxidation factor of the fuel i
Source of data used:	Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook
Value applied:	The concrete value for each fuel please sees the Report on Determination of Baseline Grid Emission Factor by China DNA NDRC at http://cdm.ccchina.gov.cn and annex 3.
Justification of the choice of data or description of	According to the latest version of ACM0002, the proposed project uses the IPCC default values.

measurement methods and procedures actually applied :	.
Any comment:	Reasonable

Data / Parameter:	$EF_{CO2,i}$
Data unit:	tC/TJ(which can be converted to tCO_2e/TJ)
Description:	the CO_2 emission factor per unit of energy of the fuel *i*
Source of data used:	Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook
Value applied:	The concrete value for each fuel please sees the Report on Determination of Baseline Grid Emission Factor by China DNA NDRC at http://cdm.ccchina.gov.cn and annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the latest version of ACM0002, the proposed project uses the IPCC default values.
Any comment:	Reasonable

Data / Parameter:	$F_{i,j,y}$
Data unit:	a mass or volume unit of the fuel i
Description:	the amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources *j* in year(s) *y*
Source of data used:	China Energy Statistical Yearbook
Value applied:	As for the amount of fuel i consumed by Guangdong Province, Yunnan Province, Guizhou Province and Guangxi Zhuang Autonomous Region of China Southern Power Grid in year 2002, 2003 and 2004, please sees the Report on Determination of Baseline Grid Emission Factor by China DNA NDRC at http://cdm.ccchina.gov.cn and annex 3.
Justification of the choice of data or description of measurement methods and procedures actually applied :	This kind of data accords with the latest version of ACM0002.
Any comment:	Accurate

Data / Parameter:	$G_{j,y}$
Data unit:	MWh
Description:	the electricity (MWh) generation by source *j*
Source of data used:	China Electric Power Yearbook
Value applied:	The electricity generation by Guangdong Province, Yunnan Province, Guizhou Province and Guangxi Zhuang Autonomous Region of China Southern Power Grid in year 2002, 2003 and 2004 please sees the Report on

	Determination of Baseline Grid Emission Factor by China DNA NDRC at http://cdm.ccchina.gov.cn.
Justification of the choice of data or description of measurement methods and procedures actually applied :	This kind of data accords with the latest version of ACM0002.
Any comment:	Reasonable

Data / Parameter:	$e_{j,y}$
Data unit:	%
Description:	the rate of electricity self-consumption by source *j*
Source of data used:	China Electric Power Yearbook
Value applied:	the rate of electricity self-consumption by source *j* in Guangdong Province, Yunnan Province, Guizhou Province and Guangxi Zhuang Autonomous Region of China Southern Power Grid in year 2002, 2003 and 2004 please sees the Report on Determination of Baseline Grid Emission Factor by China DNA NDRC at http://cdm.ccchina.gov.cn.
Justification of the choice of data or description of measurement methods and procedures actually applied :	This kind of data accords with the latest version of ACM0002.
Any comment:	Reasonable

Data / Parameter:	$CAP_{y,j}$
Data unit:	MW
Description:	The installed capacity of every kind of electricity generation (such as thermal power, hydro power, nuclear power, wind power and other energy sources etc.) of China Southern Power Grid in the recent years. And to find the change of capacity additions in the China Southern Power Grid in the past few years.
Source of data used:	China Electric Power Yearbook
Value applied:	For the detailed information please see the Report on Determination of Baseline Grid Emission Factor by China DNA NDRC at http://cdm.ccchina.gov.cn.
Justification of the choice of data or description of measurement methods and procedures actually applied :	This kind of data accords with the latest version of ACM0002 and the clarifications for some proposed projects in China adopting the approved methodology AM0005 and AMS-I.D to calculate the build margin emission factor.
Any comment:	Reasonable

Data / Parameter:	$GENE_{best,coal}$

Data unit:	%
Description:	The maximized efficiency of coal-fired power supply
Source of data used:	China's DNA : Report on Determination of Baseline Grid Emission Factor
Value applied:	36.53%
Justification of the choice of data or description of measurement methods and procedures actually applied :	Specific national value
Any comment:	

Data / Parameter:	$GENE_{best,oil\ /\ gas}$
Data unit:	%
Description:	The maximized efficiency of oil and gas-fired power supply
Source of data used:	China's DNA : Report on Determination of Baseline Grid Emission Factor
Value applied:	45.87%
Justification of the choice of data or description of measurement methods and procedures actually applied :	Specific national value
Any comment:	

Data / Parameter:	EF_{OM}
Data unit:	tCO_2e/ MWh
Description:	OM emission factor ,the weighted average emission factor of power plants excluding the low operating cost/must run power plants, ex-ante calculation.
Source of data used:	Please see the Report on Determination of Baseline Grid Emission Factor by China DNA NDRC at http://cdm.ccchina.gov.cn.
Value applied:	0.9853
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to ACM0002
Any comment:	Reasonable

Data / Parameter:	EF_{BM}
Data unit:	tCO_2e/ MWh
Description:	BM emission factor, the weighted average emission factor of the 20% most recent power plants built, ex-ante calculation.
Source of data used:	Please see the Report on Determination of Baseline Grid Emission Factor by China DNA NDRC at http://cdm.ccchina.gov.cn.

Value applied:	0.5714
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to ACM0002
Any comment:	Reasonable

B.6.3 Ex-ante calculation of emission reductions:

The emission reductions (ER_y) by the project activity are the difference among baseline emissions (BE_y), project emissions (PE_y) and leakage emissions (L_y), as follows: $ER_y=BE_y-PE_y-L_y$.

According to AMS-I.D, the proposed project is a renewable hydro power project, therefore the project emissions may not be considered. At the same time, the energy generating equipment is not transferred from another activity and the existing equipment is not transferred to another activity, so leakage is not to be considered. So both the project emissions and leakage emissions are zero, $PE_y+L_y=0$.

Based on the formula in section B.6.1, the results of baseline combined margin emission factor of China Southern Power Grid are as follows:

- $EF_{OM,y}$: 0.9853 tCO_2e/MWh;
- $EF_{BM,y}$: 0.5714 tCO_2e/MWh;
- EF_y: 0.77835 tCO_2e/MWh.

The annual grid-connected power generation is estimated to be 35,920 MWh. So the estimated annual baseline emission of the proposed project is:

$BE_y = EG_y \times EF_y = 27{,}958\ tCO_2e$.

So, $ER_y = BE_y-PE_y-L_y = EG_y \times EF_y = 27{,}958 tCO_2e$.

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

The proposed project adopts the renewable crediting period of 7*3 years. The first crediting period is from 1st, Sep, 2007 to 31st, Aug, 2014. Emission reductions in the first crediting period are estimated as the following table.

Year	Estimation of project activity emission (tCO_2e)	Estimation of baseline emission (tCO_2e)	Estimation of Leakage emission (tCO_2e)	Estimation of emission reductions (tCO_2e)
1st .Sep, 2007~31st .Aug, 2008	0	27,958	0	27,958
1st .Sep, 2008~31st .Aug, 2009	0	27,958	0	27,958
1st .Sep, 2009~31st .Aug, 2010	0	27,958	0	27,958
1st .Sep, 2010~31st .Aug, 2011	0	27,958	0	27,958
1st .Sep, 2011~31st .Aug, 2012	0	27,958	0	27,958
1st .Sep, 2012~31st .Aug, 2013	0	27,958	0	27,958
1st .Sep, 2013~31st .Aug, 2014	0	27,958	0	27,958
Total	0	195,706	0	195,706

(tCO_2e)				

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

The proposed project adopts the en-ante calculation of emission factor of the grid, so only the electricity supplied to the grid generated by the proposed hydropower plants($EG_{PJ\ to\ Grid,\ y}$) and the captive electricity bought from the power grid($EG_{Grid\ to\ PJ,\ y}$) need be monitored in the crediting period.

B.7.1 Data and parameters monitored:

(Copy this table for each data and parameter)

Data / Parameter:	$EG_{PJ\ to\ Grid,\ y}$
Data unit:	MWh
Description:	Electricity supplied to the grid by the proposed project
Source of data to be used:	The ammeter data
Value of data applied for the purpose of calculating expected emission reductions in section B.5	（Depend on the ammeter data ）
Description of measurement methods and procedures to be applied:	The readings of electricity meter will be hourly measured and monthly recorded. Automatic measurement and automatic recording by computers. Double checking by receipt of electricity sales. Electronic data will be archived for 2 years following the end of the crediting period.
QA/QC procedures to be applied:	The uncertainty level of this data is low. The measurement/ monitoring equipment should adopt the colligated automation system complying with state standard and technology. These equipment and systems should be calibrated and checked every year.
Any comment:	

Data / Parameter:	$EG_{Grid\ to\ PJ,\ y}$
Data unit:	MWh
Description:	Electricity consumed by the proposed project bought from the power grid
Source of data to be used:	The ammeter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	(Depend on the ammeter data)
Description of measurement methods and procedures to be applied:	Automation measurement and automation recording by computers. Double check by receipt of sales. Electronic data will be kept for 2 years following the end of the crediting period.
QA/QC procedures to be applied:	The uncertainty level of this data is low. The project operator is responsible for recording this set of data. Measurements are being continuously recorded, and then the output will be aggregated so that monthly electricity

	output can be shown. The related electricity receipts will also be obtained as an additional check.
Any comment:	

B.7.2 Description of the monitoring plan:

1. The aim of the monitoring plan

Monitoring is a key procedure to verify the real and measurable emission reductions from the proposed project. And, to guarantee the proposed project's real, measurable and long-term GHG emission reductions, the monitoring plan is established.

2. The data that need be monitored

- The electricity output to the power grid($EG_{PJ\ to\ Grid,\ y}$): ex-post monitoring by year.
- Electricity consumed by the proposed project bought from the power grid($EG_{Grid\ to\ PJ,\ y}$): ex-post monitoring by year.

3. 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.

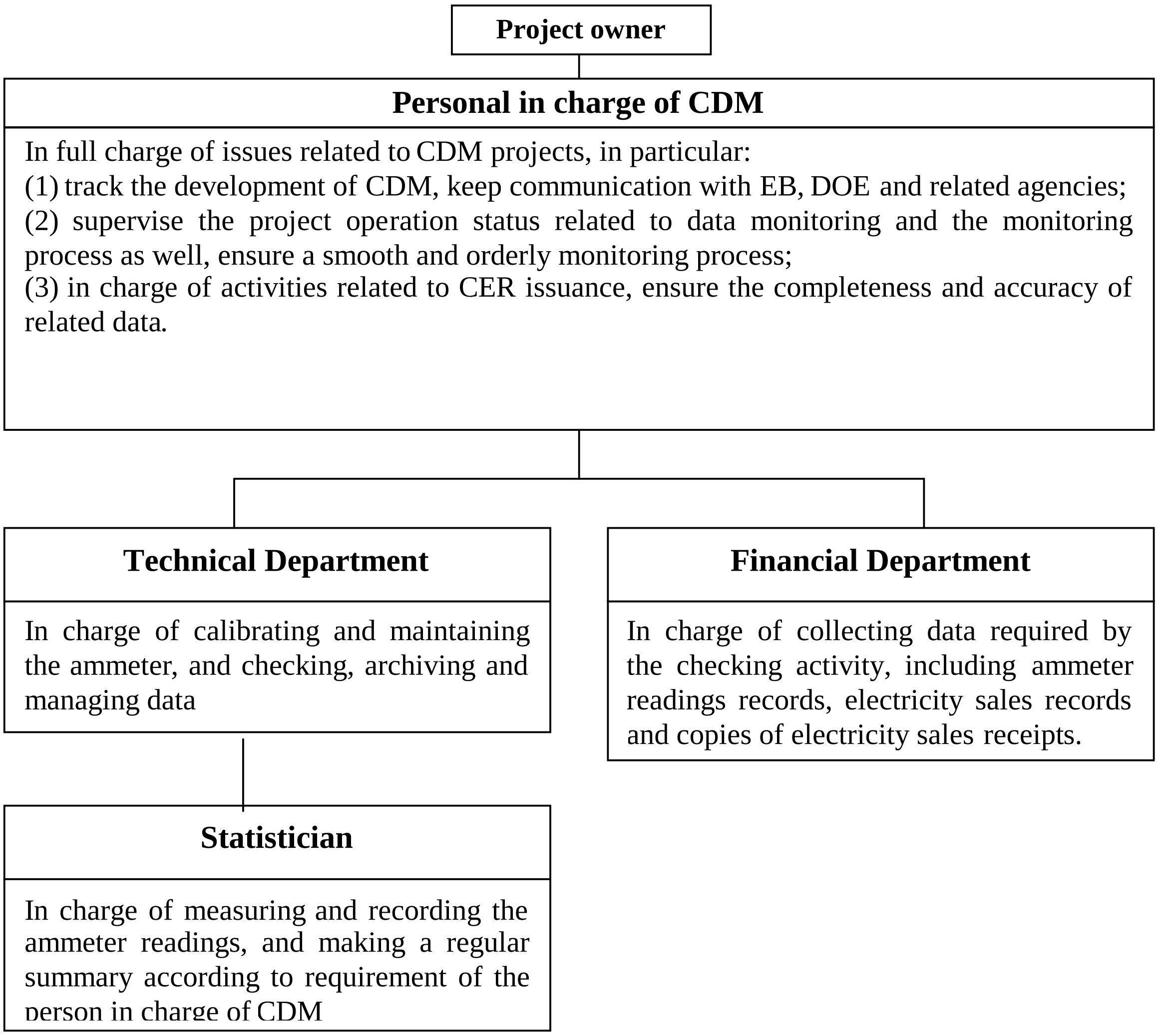

Figure 2 Monitoring Structure

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 proposed project owner at the following locations: low-pressure outline end of each generator, the former end of the main transformer and the circuit of captive electricity; and the pass meter will be installed at the terminal to the grid. 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.

The project site will install two series of measurement and monitoring equipments, one as the main equipment and the other as standby. The pass meter should meet the standard of national I type measurement reaching 0.2S 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.

B.8 Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

The baseline study and monitoring methodology of the proposed project was completed on 25/03/2007.Name of person/entity determining baseline study and monitoring methodology:

- Li Chunmin,Beijing Haohua Rivers International Water Engineering Consulting Co.Ltd.E-mail:lcm918@vip.sohu.com.
- Liu Junhui, Beijing Haohua Rivers International Water Engineering Consulting Co.Ltd.E-mail: ljh0619@shou.com.

- Su Lanren, Beijing Haohua Rivers International Water Engineering Consulting Co.Ltd.E-mail: sulanren@sohu.com;
- Ma Yajun, Guizhou Zhongshui Hengyuan Projects Management and consulting Co.Ltd, Email: Yakin.ma@vip.163.com.

Beijing Haohua Rivers International Water Engineering Consulting Co.Ltd. & Guizhou Zhongshui Hengyuan Projects Management and consulting Co.Ltd are not one of 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:

13th Nov, 2006

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

25 years

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

C.2.1. Renewable crediting period

7 years×3

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

1st .Sep, 2007 or registration date whichever is later

C.2.1.2. Length of the first crediting period:

7years

C.2.2. Fixed crediting period:

Not applicable.

C.2.2.1. Starting date:

Not applicable.

C.2.2.2. Length:

Not applicable.

SECTION D. Environmental impacts

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

The Environmental Impact Assessment (EIA) for this project was approved by Guizhou Province Zunyi City Environmental Protection Bureau in 2006. Combined with the EIA report, the influences of the proposed project on the environment are summarized as follows in the construction period and the operation period.

1. Construction Phase

1.1 Waste water

The major pollutants in wastewater during construction period are suspending materials. Based on the production characteristics and the construction work layout, the production wastewater is settled and treated by natural sedimentation, and then to discharge to reach the required standard of "the quality standard of farmland flooding water" (GB5084-92).

For life wastewater, latrines and septic tanks should be constructed in the living area. Through sedimentation and disinfection of the waste water, the disposed water can be used as manure. Therefore, the impact on the environment is minimal.

1.2Solid wastes

Excavation and land occupation by the construction will cause certain damage to vegetation and landscape. Therefore, the comprehensive virescence must be conducted in the construction area. After completion of the project, the temporary constructions should be dismantled and removed, and the project site should be levelled up and earthed up. The trees and grass also should be planted to strengthen the water and soil conservation.

1.3Noise by the construction

The noise is mainly from the excavation, drilling, blasting, crushed sand aggregate, transport vehicles, and so on. The construction units must choose the construction machinery which meets the state standards to fundamentally reduce noise intensity; meanwhile, maintenance and repair for the equipment should be enhanced to maintain lubrication of the machinery. The fuel use of single ring for the blasting should be reduced. The traffic flow at night should be reduced. Through adopting these measures, the environmental impact of noise has been greatly reduced.

1.4Waste gas by the construction

The waste gas is mainly from transport, rock blasting, and mechanical fuel. As the construction sites are dispersed, the emissions of the waste gas are diffuse with little emissions. By taking appropriate protective measures, the impact on the environment of the waste gas is minimal.

2. Operation Phase

The proposed project is run-of-river hydro power project. There are no problems for immigration. The total flooding area is 24.69mu[1] (including: paddy field is 9.41mu, dry land is 7mu, shrubbery land is

1. Mu is a unit of are, 1 mu= 666.67 m^2

1.88mu, and woods field is 6.4mu)..[1] The proposed project has the draining hole to make sure the water flux reach 2.31m3/s.The operation of the proposed project won't have negative impact on river ecosystem and hydrophilic biology community.

As mentioned above, the environmental impact of the project during the construction period is short, and measures will also be taken to minimize the adverse 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 favourable influence on the local ecological environment; especially after the project is put into operation the ecological restoration measures can improve the local ecological environment.

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:

The EIA report of the proposed project has been approved by the local Environmental Protection Bureau. The construction and operation of the proposed project have no significant environmental impacts.

1. Refer to file of Zunyi City Development & Reform (The official Reply about the application of building Yangjiawan Hydro Power project on Xishui River in Chishui City in 2006)

SECTION E. Stakeholders' comments

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

In order to know the public's opinions and suggestions about the proposed project, the format of the public participation is to hand out the questionnaires of the public opinions on the proposed project on 16th May, 2005 by the project owner. In terms of age distribution, the age of 20-30 years old accounted for 10%, 31~40 accounting for 20%, 41~50 accounting for 30%, 51~60 accounting for 40%.In terms of occupational distribution, 56.7% are farmers, workers accounted for 23.3%, the cadres accounted for only 3.3% and 16.7% for the self-employed. From the educational level point of view, 10% with elementary school education, 76.7% of junior high school, 10% of senior high school and technical secondary school accounted for 3.3%.

E.2. Summary of the comments received:

30 questionnaires were distributed to the local people, and 29 questionnaires had been returned. The response rate is 96.7%. Comments from these questionnaires for local people are summarized in this table.

The number	Item	Attitudes	Numbers (person)	Share
1	Whether to know the proposed project	Know	29	100%
		Be aware of	-	-
		Don't know	-	-
2	The attitude to the construction of the proposed project	Build quickly	27	93.1%
		Not care about	2	6.9%
		Don't agree	-	-
3	Whether to hope to participate the construction and operation of the proposed project	Hope	27	93.1%
		Not care about	2	6.9%
		Don't hope	-	-
4	The necessary need of the construction of the proposed project	Develop the economy	3	10.3%
		Improve the quality of electricity generation	24	82.8%
		Boost the tourism	-	-
		Don't know	2	6.9%
5	The environment factors that may restrict the construction of the proposed project	The flood loss	3	10.3%
		The immigrants allocation	2	6.67%
		Destroy the ecology	12	41.4%

		Don’t know	12	41.4%
6	Whether there are the sewage emissions from the industrial companies with serious water pollution around the project	Yes	1	3.4%
		No	24	82.8%
		Don’t know	4	13.8%
7	The acceptable ways of immigrants allocation in the local areas	Move	19	65.5%
		Arrange the farmland nearly	-	-
		Compensate	8	27.6%
		Don’t know	2	6.9%
8	When the construction of the proposed project will affect your farmland and you must move, whether you would like to move	Willing	29	100%
		Decided by the conditions of the allocation sites	-	-
		Unwilling	-	-
9	Whether you accept the immigrant is allocated to your village	Accept	22	75.9%
		Not care about	6	20.6%
		Don’t accept	1	3.4%
10	The influence on the local wild animals and plants	No influence	17	58.6%
		Small influence	12	41.4%
		Big influence	-	-
11	The main influence of the proposed project on environment you think	Environment	9	31%
		Water environment	14	48.3%
		Other aspects	-	-
		Don’t know	6	20.7%
12	The influence on the environment	Get better	27	93.1%
		No change	2	6.9%
		Get worse	-	-
13	The impact on the local economy	Boost	27	93.1%
		No direct impact	-	-
		Negative impact	1	3.4%
		Don't know	1	3.4%
14	The environmental and economical	Environmental	7	24.1%

	benefits that the proposed project bring about, which you prefer	benefits		
		Environmental and economical benefits	22	75.9%
		Economical benefits	-	-
15	The advantages and disadvantages of the project	Advantages bigger than disadvantages, the project is feasible	29	100%
		Advantages equal to disadvantages	-	-
		Advantages smaller than disadvantages, the project is not feasible	-	-

The result of this investigation shows that 90% of the public people supported the start of the proposed project, 83.33%thought that the advantages of operation of the power plant was bigger than the disadvantages, and 86.67% thought the proposed project would improve the environment. Therefore, the local people supported the construction of the proposed project, and they figured out that the power plant had positive meaning for local economy development. They had a positive and optimistic attitude for the environmental impacts because of the construction of the proposed project. The public generally hope that the project will start as soon as possible in order to spur local economic development, increase incomes and social benefits.

In the Opinion Paper, the proposed project makes good use of the water resource to generate electricity and supply the electricity to the local areas, and the proposed project supplies several jobs for local people. The operation of the proposed project will reduce the GHG emissions from fossil fuels. The proposed project will not emit the waste water and waste gas. The local people support the construction and operation of the proposed project.

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

The project owner will pay much attention to the comments and suggestions of the stakeholders, especially the environmental impacts problems in the construction period and the land compensation for the related farmers. The proposed project will invest RMB 0.01 million yuan as land occupation compensation and RMB 0.35 million yuan as cost for soil & water conservation and environmental protection. During the construction period and operation period of the project, the project owner will do the work of ecological environmental protection and soil & water conservation, finish the design of environmental protection to make sure that all the measures and funds should be put into effect, and strengthen the environmental management during construction period, environmental monitoring and on-site supervision and law enforcement to make sure the environmental quality can reach the quality standard and the related requirement.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Chishui Zhongshui Hydro Power Development Co.Ltd.
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State/Region:	Zunyi City
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Represented by:	Han Zengxin
Title:	Engineer
Salutation:	
Last Name:	Han
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No official development assistant (ODA) from Annex I Parties is involved in the proposed project.

Annex 3

BASELINE INFORMATION

The baseline information for calculations of OM, BM and CM emission factors of China Southern Power Grid is shown in the Report on Determination of Baseline Grid Emission Factor by China DNA at http://cdm.ccchina.gov.cn. The concrete processes are shown in the following tables.

Table A1 Thermal power generation of China Southern Power Grid in 2002

Province	Thermal power generation (MWh)	Rate of electricity self-consumption (%)	Thermal power generation connected to the grid (MWh)
Guangdong	123,081,000	5.58	116,213,080
Guangxi	13,069,000	8.31	11,982,966
Guizhou	33,231,000	7.9	30,605,751
Yunnan	15,787,000	8.21	14,490,887
Total	--	--	173,292,685

Data source: China Electric Power Yearbook 2003.

Table A2 Calculation of simple OM emission factor of China Southern Power Grid in 2002

Fuels	Units	Guangdong	Guangxi	Guizhou	Yunnan	Total	Emission factor (tC/TJ)	OXID (%)	NCV (MJ/t, or MJ/km3)	Emission (tCO_2e)
		A	B	C	D	E=A+B+C+D	F	G	H	I=E*F*G*H*44/12/10000 (quality unit) or I=E*F*G*H*44/12/1000 (volume unit）
Raw coal	ten thousand ton	4,121.06	711.35	1,430.68	1,144.39	7,407.48	25.8	98	20,908	143,582,063.7
Washed coal	ten thousand ton					0	25.8	98	26,344	0
Other washed coal	ten thousand ton			35.26	13.58	48.84	25.8	98	8,363	378,664.8248
Coke	ten thousand ton				6.44	6.44	29.5	98	28,435	194,114.788

Coke oven gas	a hundred million M^3					0	13	99.5	16,726	0
Other gas	a hundred million M^3	0.63				0.63	13	99.5	5,227	15,618.1976
Crude oil	ten thousand ton	5.8				5.8	20	99	41,816	176,078.8128
Gasoline	ten thousand ton	0.01				0.01	18.9	99	43,070	295.490349
Diesel	ten thousand ton	73.07	0.67		0.5	74.24	20.2	99	42,652	2,321,856.41
Fuel oil	ten thousand ton	701.41	0.2			701.61	21.1	99	41,816	22,471,255.5
LPG	ten thousand ton	0.09				0.09	17.2	99.5	50,179	2,833.91924
Refinery gas	ten thousand ton	1.42				1.42	18.2	99.5	46,055	43,424.12041
Natural gas	a hundred million M^3					0	15.3	99.5	38,931	0
Other petroleum products	ten thousand ton	7.91				7.91	20	99	38,369	220,340.1215
Other coking products	ten thousand ton					0	25.8	98	28,435	0
Other energy	ten thousand tce	79.28				79.28	0	0	0	0
Total		-	-	-	-	-	-	-	-	**169,406,545.9**
Total thermal power generation connected to the grid（MWh）										**173,292,685**
$EF_{simple,OM,2002}$（tCO_2e										**0.97757471**

/MWh）	

Data source: China Energy Statistical Yearbook 2000-2002.

Table A3 Thermal power generation of China Southern Power Grid in 2003

Province	The fuel fired electricity generation (MWh)	The rate of electricity self-consumption (%)	The fuel fired electricity connected to the grid (MWh)
Guangdong	143,351,000	4.99	136,197,785
Guangxi	17,079,000	4.09	16,380,469
Guizhou	43,295,000	6.57	40,450,519
Yunnan	19,055,000	3.77	18,336,627
The total	--	-	211,365,399

Note: When calculating simple OM emission factor of China Southern Power Grid in 2003, the electricity imports from Central China Power Grid is 11100 MWh, so the total thermal power generation of China Southern Power Grid in 2003 is 11100+211,365,399 = 211,376,499 MWh.
Data source: China Electric Power Yearbook 2004

Table A4 Calculation of simple OM emission factor of China Southern Power Grid in 2003

Fuels	Units	Guangdong	Guangxi	Guizhou	Yunnan	Total	Emission factor（tC/TJ）	OXID（%）	NCV（MJ/t, or MJ/km3）	Emission（tCO_2e）
		A	B	C	D	E=A+B+C+D	F	G	H	I=E*F*G*H*44/12/10000（quality unit） or I=E*F*G*H*44/12/1000（volume unit）
Raw coal	ten thousand ton	4,491.79	831.84	2,169.11	1,405.27	8,898.01	25.8	98	20,908	172,473,586
Washed coal	ten thousand ton	0.05				0.05	25.8	98	26,344	1,221.149776
Other washed	ten thousand			36.38	20.37	56.75	25.8	98	8,363	439,992.3998

coal	ton									
Coke	ten thousand ton				0.5	0.5	29.5	98	28,435	15,071.02392
Coke oven gas	a hundred million M^3				0.04	0.04	13	99.5	16,726	3,173.145213
Other gas	a hundred million M^3	3.21			11.27	14.48	13	99.5	5,227	358,970.6368
Crude oil	ten thousand ton	6.85				6.85	20	99	41,816	207,955.1496
Gasoline	ten thousand ton	0.02				0.02	18.9	99	43,070	590.980698
Diesel	ten thousand ton	31.9			0.76	32.66	20.2	99	42,652	1,021,441.68
Fuel oil	ten thousand ton	627.22	0.3			627.52	21.1	99	41,816	20,098,291.43
LPG	ten thousand ton					0	17.2	99.5	50,179	0
Refinery gas	ten thousand ton	2.85				2.85	18.2	99.5	46,055	87,154.04448
Natural gas	a hundred million M^3					0	15.3	99.5	38,931	0
Other petroleum products	ten thousand ton	11.35				11.35	20	99	38,369	316,164.3969
Other coking products	ten thousand ton					0	25.8	98	28,435	0
Other energy	ten thousand tce	93.21			22.35	115.56	0	0	0	0
Total		-	-	-	-	-	-	-	-	195,023,612
Total CO_2 emission （tCO_2e）	195,023,612+0.8422647*11100=**195,032,961.1**									
Total thermal power generation	11100+211,365,399=**211,376,499**									

connected to the grid（MWh）	
$EF_{simple,OM,2003}$（tCO_2e /MWh）	**0.92268044**

Note: The electricity imports from Central China Power Grid in 2003 is 11100 MWh, and the simple OM emission factor of Central China Power Grid in 2003 is 0.8422647 tCO_2e /MWh, so the total CO_2 emission of China Southern Power Grid in 2003 is 195,023,612+0.8422647*11100=195,032,961.1 tCO_2e.

Data source:

- China Energy Statistical Yearbook 2004;
- Report on Determination of Baseline Grid Emission Factor by China DNA NDRC at http://cdm.ccchina.gov.cn.

Table A5 Thermal power generation of China Southern Power Grid in 2004

Province	The fuel fired electricity generation（MWh）	The rate of electricity self-consumption（%）	The fuel fired electricity connected to the grid（MWh）
Guangdong	169,389,000	5.42	160,208,116
Guangxi	20,143,000	8.33	18,465,088
Guizhou	49,720,000	7.06	46,209,768
Yunnan	24,322,000	7.56	22,483,257
The total	--	--	247,366,229

Note: When calculating simple OM emission factor of China Southern Power Grid in 2004, the electricity imports from Central China Power Grid is 10951240 MWh, so the total thermal power generation of China Southern Power Grid in 2004 is 10951240+247,366,229 = 258,317,469 MWh.

Data source: China Electric Power Yearbook 2005.

Table A6 Calculation of simple OM emission factor of China Southern Power Grid in 2004

Fuels	Units	Guangdong	Guangxi	Guizhou	Yunnan	Total	Emission factor（tC/TJ）	OXID（%）	NCV（MJ/t, or MJ/km3）	CO_2emissions（tCO_2e）
		A	B	C	D	E=A+B+C+D	F	G	H	I=E*F*G*H*44/12/10000（quality

										unit） or I=E*F*G*H*44/12/1000 （volume unit）
Raw coal	ten thousand ton	6,017.7	1,305	2,643.9	1,751.28	11,717.88	25.8	98	20,908	227,132,222.1
Washed coal	ten thousand ton	0.21				0.21	25.8	98	26,344	5,128.829059
Other washed coal	ten thousand ton					0	25.8	98	8,363	0
Coke	ten thousand ton					0	29.5	98	28,435	0
Coke oven gas	a hundred million M^3					0	13	99.5	16,726	0
Other gas	a hundred million M^3	2.58				2.58	13	99.5	5,227	63,960.23777
Crude oil	ten thousand ton	16.89				16.89	20	99	41,816	512,753.6462
Gasoline	ten thousand ton					0	18.9	99	43,070	0
Diesel	ten thousand ton	48.88			1.83	50.71	20.2	99	42,652	1,585,955.53
Fuel oil	ten thousand ton	957.71				957.71	21.1	99	41,816	30,673,659.31
LPG	ten thousand ton					0	17.2	99.5	50,179	0
Refinery gas	ten thousand ton	2.86				2.86	18.2	99.5	46,055	87,459.84814
Natural gas	a hundred million M^3	0.48				0.48	15.3	99.5	38,931	104,309.2298
Other petroleum products	ten thousand ton	1.66				1.66	20	99	38,369	46,240.78404

Other coking products	ten thousand ton					0	25.8	98	28,435	0
Other energy	ten thousand tce	79.42				79.42	0	0	0	0
Total		-	-	-	-	-	-	-	-	260,211,689.5
Total CO_2 emission （tCO_2e）	260211689.5+0.810997462*10951240=**269,093,117.3**									
Total thermal power generation connected to the grid （MWh）	10951240+247,366,229=**258,317,469**									
$EF_{simple,OM,2004}$ （tCO_2e /MWh）	**1.04174748**									

Note: The electricity imports from Central China Power Grid in 2004 is 10,951,240 MWh, and the simple OM emission factor of Central China Power Grid in 2003 is 0.810997462 tCO_2e/MWh, so the total CO_2 emission of China Southern Power Grid in 2004 260211689.5+0.810997462*10951240=269,093,117.3 tCO_2e.

Data source:

- China Energy Statistical Yearbook 2005
- Report on Determination of Baseline Grid Emission Factor by China DNA NDRC at http://cdm.ccchina.gov.cn.

TableA7 the three years average OM emission factor of China Southern Power Grid

Years	2002	2003	2004	three years average emission factor（tCO2e/MWh）
Total CO_2 emission（tCO_2e）	169,406,546	195,032,144	269,093,117	0.9853
The total fuel fired electricity connected to the grid（MWh）	173,292,685	211,376,499	258,317,469	

Data Source: from the above table A1～A6.

Table A8 Calculation of the weight of CO_2 emissions from solid fuels, liquid fuels and gas fuels among total emissions in China Southern Power Grid

		Guangdong	Guangxi	Guizhou	Yunnan	Total	NCV	Emission factor (tc/TJ)	OXID	CO_2 emissions (tCO_2e)
Fuels	Units	A	B	C	D	E=A+B+C +D	F	G	H	I=E*F*G*H*44 /12/100
Raw coal	ten thousand ton	6,017.70	1,305.00	2,643.9	1,751.28	11,717.88	20,908kJ/kg	25.80	0.98	227,132,222
Washed coal	ten thousand ton	0.21	0	0	0	0.21	26,344 kJ/kg	25.80	0.98	5,129
Other washed coal	ten thousand ton	0	0	0	0	0	8,363 kJ/kg	25.80	0.98	0
Coke	ten thousand ton	0	0	0	0	0	28,435 kJ/kg	29.50	0.98	0
Total of solid fuels										227,137,351
Crude oil	ten thousand ton	16.89	0	0	0	16.89	41,816kJ/kg	20.00	0.99	512,754
Gasoline	ten thousand ton	0	0	0	0	0	43,070kJ/kg	18.90	0.99	0
Coal oil	ten thousand ton	0	0	0	0	0	43,070 kJ/kg	19.60	0.99	0
Diesel	ten thousand ton	48.88	0	0	1.83	50.71	42,652 kJ/kg	20.20	0.99	1,585,956
Fuel oil	ten thousand ton	957.71	0	0	0	957.71	41,816 kJ/kg	21.10	0.99	30,673,659
Other petroleum products	ten thousand ton	1.66	0	0	0	1.66	38,369 kJ/kg	20.00	0.99	46,241
Total of liquid fuels										32,818,610

Natural gas	Ten million M^3	4.8	0	0	0	4.8	38,931kJ/ M^3	15.30	0.995	104,309
Coke oven gas	Ten million M^3	0	0	0	0	0	16,726 kJ/ M^3	13.00	0.995	0
Other gas	Ten million M^3	25.8	0	0	0	25.8	5,227 kJ/ M^3	13.00	0.995	63,960
LPG	ten thousand ton	0	0	0	0	0	50,179 kJ/kg	17.20	0.995	0
Refinery gas	ten thousand ton	2.86	0	0	0	2.86	46,055 kJ/kg	18.20	0.995	87,460
Total of gas fuels										255,729
Total of solid, liquid and gas fuels										260,211,690

Data source: China Energy Statistical Yearbook 2005

Table A9 Emission factor of the most efficient commercial thermal power plants

Thermal power	Variable	Efficiency of electricity supply (%)	Emission factor of the fuels (tC/TJ)	OXID	Emission factor (tCO_2e/MWh)
		A	B	C	D=3.6/A/1000*B*C*44/12
Coal-fired power plant	$EF_{Coal,Adv}$	36.53	25.8	0.98	0.9136
Gas- fired power plant	$EF_{Gas,Adv}$	45.87	15.3	0.995	0.4381
Oil- fired power plant	$EF_{Oil,Adv}$	45.87	21.1	0.99	0.6011

TableA10 The weight of CO_2 emission from fossil fuels among the total emissions and the thermal power emission factor

λ_{Coal}	λ_{Oil}	λ_{Gas}	$EF_{Thermal}$（tCO_2e/MWh） (λ_{Coal}* $EF_{Coal,Adv}$ + λ_{Oil}* $EF_{Oil,Adv}$ + λ_{Gas}* $EF_{Gas,Adv}$)
87.29%	12.61%	0.10%	87.29%*0.9136+12.61%*0.6011+0.10%*0.4381==0.8543

Table A11 Calculation of BM emission factor of China Southern Power Grid

	installed capacity in 2002	installed capacity in 2003	installed capacity in 2004	Newly added installed capacity between 2002 and 2004	Weight in newly added installed capacity
	A	B	C	D=C-A	
Thermal power（MW）	35,969.2	40,444.1	46,659.7	10,690.5	65.40 %
Hydropower（MW）	22,921	25,409.3	27,580.1	4,659.1	28.50 %
Nuclear power（MW）	2,790	3,780	3,780	990	6.06 %
Wind power（MW）	76.8	83.4	83.4	6.6	0.04 %
Total（MW）	61,757	69,716.8	78,103.2	16,346.2	100 %
Share in 2004 installed capacity	79.07 %	89.26 %	100 %		

$EF_{BM,y}$ = 0.8543*65.40% = 0.5714 tCO_2e/MWh.

Data source: China Electric Power Yearbook 2003, China Electric Power Yearbook 2004, China Electric Power Yearbook 2005.

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， M2	DSSD331-3TF	Owner	the computer monitors at the same time ,record every fifteen minutes	Every 24 hours	Every month	Country gird company Every year	0.5	Electronic recording and handed hold three years	Single orientation meter
M3， M4	DSSD341-3TF	Owner	the computer monitors at the same time ,record every fifteen minutes	Every 24 hours	Every month	Country gird company Every year	0.5	Electronic recording and handed hold three years	Single orientation meter
M5	DSSD331-3TF	Owner	the computer monitors at the same time ,record every fifteen minutes	Every 24 hours	Every month	Country gird company Every year	0.5	Electronic recording and handed hold three years	Bidirectional meter
M6	2000-0420 /57.7V 5~20A	gird company	the computer monitors at the same time ,record every fifteen minutes	Every 24 hours	Every month	Country gird company Every year	0.2	Electronic recording and handed hold three years	Bidirectional meter

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Yangjiawan' Layout Diagram