Project design document form for CDM project activities

(Version 08.0)

Complete this form in accordance with the Attachment "Instructions for filling out the project design document form for CDM project activities" at the end of this form.

PROJECT DESIGN DOCUMENT (PDD)	
Title of the project activity	Yunnan Jiayan Hydropower Project
Version number of the PDD	04.4
Completion date of the PDD	10/10/2016
Project participant(s)	Yunnan Dianneng Luquan Dianlin Development Co., Ltd. (project owner) Baraka Global Advisors (the buyer)
Host Party	P. R. China
Applied methodology(ies) and, where applicable, applied standardized baseline(s)	ACM0002– "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (Version 13.0.0).
Sectoral scope(s) linked to the applied methodology(ies)	Sectoral scope 1: energy industries(renewable sources)
Estimated amount of annual average GHG emission reductions	780,106

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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Yunnan Jiayan Hydropower Project (hereafter referred to as the Project) is located at downstream of Puduhe River in Luquan County, Kunming City, Yunnan Province. The Project is constructed and operated by Yunnan Dianneng Luquan Dianlin Development Co., Ltd.

The Project is a diversion type hydropower station with 240MW (3×80MW) installed capacity. The Project has a water surface area[1] of 3,570,000m^2 at full reservoir level with a responding power density of 67.23W/m^2 which is far more than 4W/m^2. Annual average electricity generation of the Project is 1,099,000MWh, and it is estimated that the feed-in electricity of the Project to the China Southern Power Gird is 1,093,505MWh per year, and electricity generated will be delivered to the China Southern Power Gird via one 220kV outlet circuit.

In the absence of the project, the electricity would be supplied by the China Southern Power Grid which is mainly composed of fossil-fuel power plants, and it is also the baseline scenario.

The Project will carry out GHG reduction by replace the China Southern Power Gird mainly composed of fossil-fuel power plants. It is estimated the annual GHG reduction of the Project will reach 780,106tCO_2e.

As a renewable energy project, the Project will produce positive environmental and economic benefits and contribute to local sustainable development as following aspects:

- Providing zero-emitting clean power to China Southern Power Gird which dominated by fossil fuel fired electricity.[2] Mitigating the shortage of local electricity supply;
- Decreasing environmental pollution caused by fossil-fuel fired plants, such as CO_2, NOx and particulates associated with power generation from fossil fuel;
- Improving the local finance and stimulate the development of local economy;

Offer 102 employing opportunities to local residents during operation and even more temporary jobs during construction.

A.2. Location of project activity

A.2.1. Host Party

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The People's Republic of China

A.2.2. Region/State/Province etc.

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Yunnan Province

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[1] See *Yunnan Province Puduhe Jiayan Hydropower Station Feasible Study Report* P6-23

[2] According to *China Energy Statistical Yearbook 2009, Table 3-10 and Table 3-12,* among the total electricity fed into of the CSPG, the amount of fossil fuel-fired electricity accounts for about 68.42% in 2004,69.31% in 2005, 70.25% in 2006, 70.05% in 2007 and 59.16% in 2008

A.2.3. City/Town/Community etc.

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Luquan County, Kunming City

A.2.4. Physical/Geographical location

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The Project is located at downstream of Puduhe River in Luquan County, Kunming City, Yunnan Province. The dam site is located at 1.5km of downstream of Yujiao Village, Xueshan Town, Luquan County, the geographic coordinate of the dam site is 26.1522 °N, 102.7561 °E; and the powerhouse is located at 1.5km from Zeni Village, Zehei Town, Luquan County of the downstream of Puduhe River, the geographic coordinate of the powerhouse is 26.2000 °N, 102.7636 °E. Detailed physical location of the Project follows as Fig.A.1 and Fig.A.2.

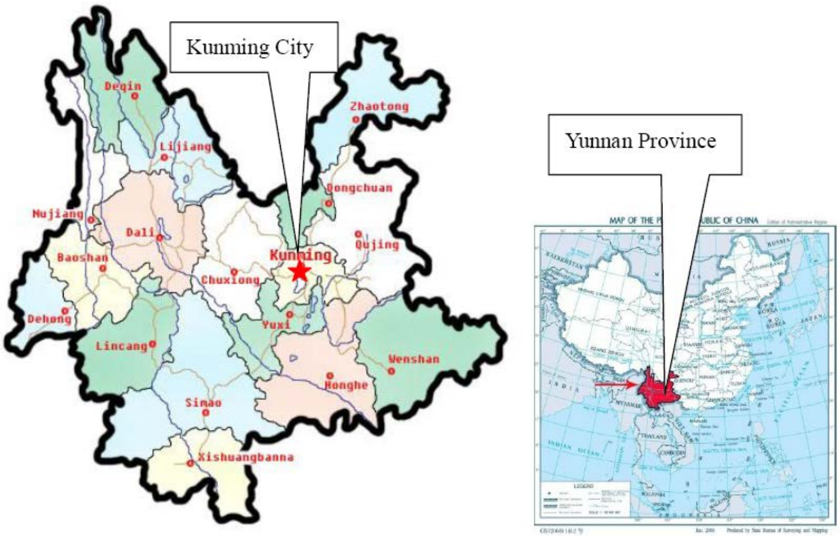

Fig A.1 the location of Kunming in Yunnan and Yunnan in China

Fig A.2 Detailed physical location of the Project

A.3. Technologies and/or measures

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The Project, which is located at Puduhe River, is a diversion type hydropower station with total installed capacity of 240MW (3×80MW), 150m rated water head and 60.5m^3/s rated flow. Three sets of 80MW turbines and associated generators which are made in China will be installed in this plant (the type and parameter of turbines and generators are as follows Table A.1). The main construction of the Project includes dam, drainage structures, diversion tunnel, plant, tail water system and 220kV switching station. The Project has a water surface area [3] of 3,570,000m^2 at full reservoir level with a responding power density of 67.23W/m^2 which is far more than 4W/m^2. Operation hours of the Project are 4,579h, the load factor is 52%. It is estimated that the feed-in electricity to the China Southern Power Grid is approximately 1,093,505MWh [4] per year, and electricity generated will be delivered to 220kV Zhongping Substation through one 220kV outlet circuit.

The Project will carry out GHG reduction by replace the China Southern Power Gird mainly composed of fossil-fuel power plants. It is estimated the annual GHG reduction of the Project will reach 780,106tCO_2e.

Table A.1 the type and parameter of turbines and generators of the Project[5]

[3] See *Yunnan Province Puduhe Jiayan Hydropower Station Feasible Study Report* P6-23

[4] The auxiliary power ratio is 0.5%, effective coefficient of the electricity is 1, the feed-in electricity is calculated as follows: annual average electricity generation×effective coefficient of the electricity×(1 — auxiliary power ratio).

[5] Hydro turbine-generator and auxiliary equipments technical agreement of Jiayan Hydropower Station

Equipment	Item	Parameter
Water turbine	Type	HLA800-LJ-280
	Number	3
	Rated water head	150m
	Rated flow	59.2m^3/s
	Rated rotational speed	300r/min
Generator	Type	SF80-20/6500
	Number	3
	Rated Power	80MW
	Rated Voltage	13.8kV
	Rated Power factor	0.85
Main Transformer	Type	SSP11-100000/220
	Rated capacity	100000kVA

Table A.2 the type and parameter of facilities of the Project

Facility	Item	Parameter
Dam	Type	Concrete face rockfill dam
	Dam crest elevation	1,006m
	Maximum dam height	146m
	Length of dam crest	418m
Diversion tunnel	Type	Underground adit
	Length	5,427m
	Inner diameter	8m

The project adopts domestic technologies and equipments, not referring to any technologies transfer from abroad.

Baseline technology description:

The scenario existing prior to the start of the implementation of the Project

The scenario existing prior to the start of the implementation of the Project involves the electricity being generated by fossil fuel power plants connected to the CSPG. This scenario is the same as the Project's baseline scenario. This scenario's main emission and GHG is CO_2 emissions from fossil fuel based power plants connected to the CSPG.

The baseline scenario is equivalent annual electricity will be supplied by China Southern Power Grid. In the most recent 5 years (2004-2008), the proportions of low-cost/must run resources in the total electricity output in China Southern Power Grid were 31.58% in 2004, 30.69% in 2005, 29.75% in 2006, 29.95% in 2007 and 40.84% in 2008[6], respectively, much less than 50%. The electricity displaced by the Project is the electricity generated by the China Southern Power Grid. The baseline scenario is the same as the scenario existing prior to the start of implementation of the project activity.

[6] *China Energy Statistical Yearbook* 2009, Table 3-10, Table 3-12

A.4. Parties and project participants

Party involved (host) indicates host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
P. R. China(host)	Yunnan Dianneng Luquan Dianlin Development Co., Ltd. (project owner)	No
Netherlands	Baraka Global Advisors (the buyer)	No

A.5. Public funding of project activity

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There is no public funding from Annex I parties for this Project.

The capital composition of the Project is 20%, others is from bank loan.

SECTION B. Application of selected approved baseline and monitoring methodology and standardized baseline

B.1. Reference of methodology and standardized baseline

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ACM0002– ***"****Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (Version 13.0.0).*

For more information, please refer to:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html.

Tool for the Demonstration and Assessment of Additionality (Version 06.0.0).

Tool to calculate the emission factor for an electricity system (Version 02.2.1).

Guidelines on Common Practice (Version 02.0)

For more information, please refer to:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html.

B.2. Applicability of methodology and standardized baseline

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Hydropower generation technology is a renewable electricity generation technology which displaces fossil fuel-fired power generation technology to supply electricity to the grid. Therefore the Project applies the consolidated baseline methodology ACM0002 (Version 13.0.0) approved by CDM EB to determine the project baseline and calculate GHG emission reductions achieved by hydropower generation.

The Project meets all applicability conditions of the consolidated baseline methodology ACM0002 (Version 13.0.0) as follows:

No.	Applicable Conditions	Justification
1.	The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit;	The Project is a greenfield diversion hydropower plant;
2.	In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use Option 2: on page 10 to calculate the parameter $EG_{PJ,y}$): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity;	The Project is a greenfield diversion hydropower plant; therefore the Project does not involve capacity additions, retrofits or replacements.
3.	In case of hydro power plants, one of the following conditions must apply: • The project activity is implemented in an existing reservoir, with no change in the volume of reservoir; or • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m^2; or • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m^2.	Power density of the Project is far higher than $10W/m^2$, no project emission according to ACM0002(version 13.0.0);

According to ACM0002 (version 13.0.0), the Project is not applicable to ACM0002 under the following conditions.

No.	Not Applicable Conditions	Justification
1.	Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site;	The Project is a greenfield hydropower plant, which does not involve any fossil fuels;
2.	Biomass fired power plants;	The Project is a greenfield hydropower plant, which does not involve any biomass fuels;

3.	Hydro power plants that result in new reservoirs or in the increase in existing reservoirs where the power density of the power plant is less than 4 W/m^2.	Power density of the Project is far higher than 10W/m^2, no project emission according to ACM0002 (version 13.0.0);

Therefore, the approved consolidated baseline methodology, ACM0002 (version 13.0.0): **"Consolidated baseline methodology for grid-connected electricity generation from renewable sources"** is applicable to the proposed project.

The Project is a grid-connected renewable power generation project activity which meets the applicability criteria according to tool to calculate the emission factor for an electricity system (Version 02.2.1).

No.	Applicable Conditions	Justification
1.	This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity, i.e. where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects);	The electricity from the Project will be delivered to CSPG, and will displace the same amount electricity of CSPG, the tool will be applied to calculating baseline emissions of the Project;
2.	Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off-grid power plants;	the emission factor for the project electricity system can be calculated either for CSPG power plants only;
3.	In case of CDM projects tool is not applicable If the project electricity system is located partially or totally in an Annex-I country.	China Southern Power Grid is located in China completely, which does not involve any Annex-I countries. Therefore this tool is applicable to the Project.

Based on the analysis, Therefore, *Tool to calculate the emission factor for an electricity system* (Version 02.2.1) is applicable to the proposed project.

The emission factor for the project electricity system applied in the Project can be calculated for grid power plants only.

According to ACM0002 (Version 13.0.0) (page 5), the additionality of the project activity shall be demonstrated and assessed using the latest version of the "Tool for the demonstration and assessment of additionality" agreed by the Board, which is available on the UNFCCC CDM website. Therefore, the "Tool for the demonstration and assessment of additionality (Version 06.0.0)" is applicable to the Project.

As per footnote 1 "Combined tool to identify the baseline scenario and demonstrate additionality (Version 03.0.0)", "the tool is, for example, not applicable in the following situation: The CDM project activity is the installation of a Greenfield facility that provides a product to a market (i.e. electricity, cement, etc.) where the output could be provided by other existing facilities or new

facilities that could be implemented in parallel with the CDM project activity". The Project is a Greenfield hydropower plant, and can provide the electricity to CSPG; at meanwhile, output electricity could be provided by other existing power plants that could be implemented in parallel with the CDM project activity. Therefore, the "Combined tool to identify the baseline scenario and demonstrate additionality (Version 03.0.0)" is not applicable to the Project.

According to"Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion (Version 02)", this tool provides procedures to calculate project and/or leakage CO_2 emissions from the combustion of fossil fuels. It can be used in cases where CO_2 emissions from fossil fuel combustion are calculated based on the quantity of fuel combusted and its properties. Methodologies using this tool should specify to which combustion process j this tool is being applied. The Project will not involve any fossil fuels during the project operation; therefore, this tool is not applicable to the Project.

B.3. Project boundary

As per ACM0002 (Version 13.0.0), The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to.

The project includes dam, water diversion tunnel, powerhouse, booster station, etc. therefore, the project and its facilities should be included in project boundary.

The electricity displaced by the Project is the electricity generated by the China Southern Power Grid. According to *2010 Baseline Emission Factors for Regional Power Grids in China*[7], CCPG has net electricity import to CSPG in 2006, 2007 and 2008, and the calculation on the baseline Operating Margin emission factor and the Build Margin emission factor is set within the China Southern Power Grid and CSPG. The spatial scope of the Project boundary covers those fossil fuel-fired power plants physically connected into the China Southern Power Grid and Central China Power Grid. The project boundary of the Project is shown in Fig.B.1.

Electricity generated by the Project will be delivered to the Yunnan Power Grid. According to the *2010 Baseline Emission Factors for Regional Power Grids in China*, Yunnan Power Grid is an integral part of the China Southern Power Grid. Therefore the China Southern Power Grid is defined as the electricity system boundary of the Project which is composed of Guangdong Power Grid, Guangxi Power Grid, Yunnan Power Grid and Guizhou Power Grid.

[7] The *2010 Baseline Emission Factors for Regional Power Grids in China* was publicly available on the website of China's DNA (http://cdm.ccchina.gov.cn/) on 20th December 2010.

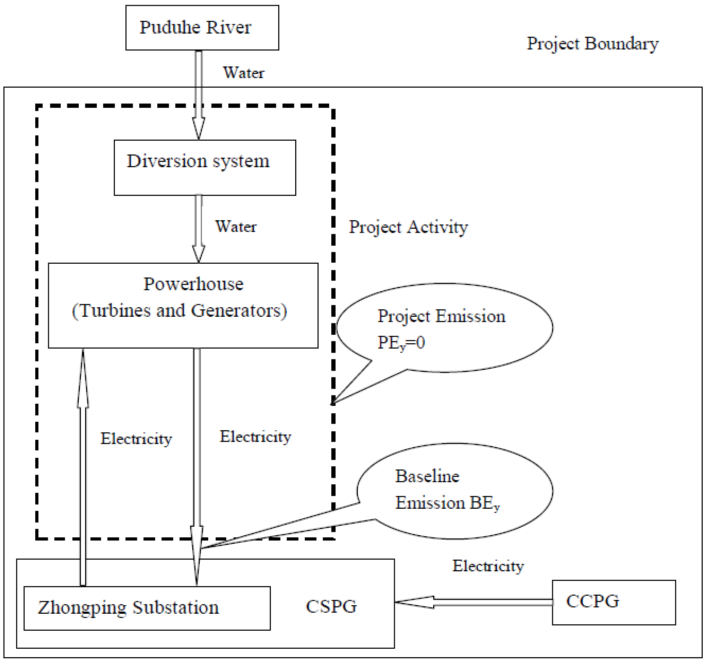

Fig.B.1 the Project Boundary of the Project

Table B.1 the Emission Sources of the Project

	Source	Gas	Included?	Justification / Explanation
Baseline	Electricity supply of those fossil fuel-fired power plants connected into China Southern Power Grid	CO_2	Yes	Main emission sources of the Project baseline scenario.
		CH_4	No	Excluded for simplification in the Project baseline scenario. This is conservable
		N_2O	No	Excluded for simplification in the Project baseline scenario. This is conservable
Project Activity	Project emission	CO_2	No	The Project has power generation with renewable energy which has no CO_2 emission
		CH_4	No	The Project is a diversion hydropower plant with a power density of far more than 10W/m^2, so it is excluded.
		N_2O	No	It can be ignored according to ACM0002 (Version 13.0.0)

B.4. Establishment and description of baseline scenario

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The Project is the installation of a new grid-connected renewable power plant, according to the methodology ACM0002 (Version 13.0.0), the baseline scenario is the following: Electricity delivered to the grid by the Project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources within China Southern Power Grid, as reflected in the combined margin (CM) calculations described in the *"Tool to calculate the emission factor for an electricity system" (Version 02.2.1)*.

B.5. Demonstration of additionality

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The Project uses the ***Tool for the Demonstration and Assessment of Additionality*****,** which was approved by CDM EB to demonstrate its additionality. The tool include following steps:

Step1. Identification of alternatives to the Project activity consistent with current laws and regulations

Sub-step1a. Define the alternatives for the Project activity

According to the Validation and Verification Manual (version 01.2): "105. The PDD shall identify credible alternatives to the project activity in order to determine the most realistic baseline scenario, unless the approved methodology that is selected by the proposed CDM project activity prescribes the baseline scenario and no further analysis is required". There is no need to further analyze alternatives to the project to assess and demonstrate the additionally, since the ACM0002 prescribes the baseline scenario for the project.

Step2. Investment analysis

Sub-step2a. Determine appropriate analysis method

We should determine whether the Project is economically and financially less attractive than the Provision of an equal amount of annual electricity supply by the grid that the Project connected into without considering the CERs sales revenues or not through analysis of this step. We take following sub-steps to conduct investment analysis:

The *Tools for the Demonstration and Assessment of Additionality(Version 06.0.0)* suggests three analysis methods which are simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III). Since the Project will earn revenues not only from the CERs sales but also from electricity sales, the simple cost analysis method is not appropriate. Investment comparison analysis method is only applicable to projects whose alternatives are similar investment projects. Therefore Option II is not appropriate. The Project will use benchmark analysis method (Option III) based on the consideration that benchmark IRR of the power sector is available.

Sub-step 2b. Benchmark Analysis Method (Option III)

According to the *Interim Rules on Economic Assessment of Electrical Engineering Retrofit Project* formulated by State Electric Power Corporation, the financial benchmark rate of return adopted by the Project is 8% for the IRR of total investment(after tax), which was widely used in the power industry in China. The Project is not financially attractive if the Internal Rate of Return (IRR) without additional revenue is lower than 8% (project IRR). On the basis of above benchmark, calculation and comparison of financial indicators are carried out in sub-step 2c.

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

(1) Basic parameters for calculation of financial indicators

According to the *Yunnan Puduhe Jiayan Hydropower Station Feasible Study Report* (FSR), the basic parameters for calculation of financial indicators of the Project are as follows:

Table B.2 Basic parameters applied in the financial indicators calculation

Parameter:		Data:	Source:
Annual average electricity (MWh)		1,099,000	FSR P15-1
Feed-in electricity (MWh)		1,093,505	FSR P15-5
Installation capacity(MW)		240	FSR P15-1
Construction period (years)		4.5	FSR P15-5
Project lifetime (years) (excluding construction periods)		30	FSR P15-5
Static total investment (ten thousands Yuan)		234,322.30	FSR P15-6
Loan (ten thousands Yuan)		183,308.94	FSR P15-6
Loan/Equity Ratio		4/1	FSR P15-6
Interest rate (%)		6.12	FSR P15-6
Expected bus-bar tariff(RMB/kWh, including VAT)		0.215	FSR P15-8
Input value of each parameter of annual O&M cost	Staff (persons)	60	FSR P15-7
	Salary (ten thousands Yuan)	3	FSR P15-7
	Welfare rate (%)	14	FSR P15-7
	Water fee (yuan/kwh)	0.007	FSR P15-7
	Reservoir area maintenance funds (yuan/kwh)	0.001	FSR P15-7
	Material fee (yuan/kw)	5	FSR P15-7
	Miscellaneous fee (yuan/kw)	6	FSR P15-7
	Insurance fee (%)	0.25	FSR P15-7
	Rate for maintenance (%)	1	FSR P15-7
Value added tax rate (%)		17	FSR P15-7
Income tax rate (%) with interest		25	FSR P15-7
Expense for city maintenance and construction (%)		5	FSR P15-7
Education fee addition (%)		3	FSR P15-7
Depreciation rate (%)		3.17	calculation
Depreciation period(years)		30	FSR P15-5
Residues value rate (%)		5	FSR P15-7
Crediting period(years)		21	Expected

Yunnan Province Puduhe Jiayan Hydropower Station Feasible Study Report was completed by Kunming Hydropower Investigation, Design & Research Institute, CHECC in December 2008 according to the price level in November 2008, and policies, laws regulations from state- and Yunnan Provincial-level. The Kunming Hydropower Investigation, Design & Research Institute, CHECC is a large scale state-level research unit with Grade A certification; the data applied in the Project is credible and reliable.

(2) Comparison of the financial benchmark of IRR of total investment for the Project

In accordance with the benchmark analysis (Option III), if the financial indicators (such as total investment IRR) of a project are lower than the benchmark, the project is not considered as financially attractive.

Based on the data above, without CERs sales revenues, the IRR of total investment of the Project is 4.50%, which is lower than the benchmark (8%). The Project is not financially attractive.

Sub-step 2d. Sensitivity analysis

The sensitivity analysis shows whether the conclusion regarding financial attractiveness is

robust to reasonable variations in the critical assumptions.

According to "Guidance on the assessment of Investment Analysis (Version 05, Annex 5 of EB 62)": Only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation. For the project, following financial parameters were taken as uncertain factors for sensitive analysis of financial attractiveness:

- Static total investment
- Annual O&M cost
- Feed-in electricity
- Bus-bar tariff

Assuming that these four financial indicators vary between -10% and +10% the corresponding results of the Project IRR are shown in Table B.3 and Fig.B.2.

Table B.3 Project IRR sensitivity analysis (Without CERs revenues)

Range / Parameters	-10%	0	+10%
Static total investment	5.42%	4.50%	3.72%
Annual O&M cost	4.72%	4.50%	4.28%
Feed-in electricity	3.78%	4.50%	5.25%
Bus-bar tariff	3.73%	4.50%	5.31%

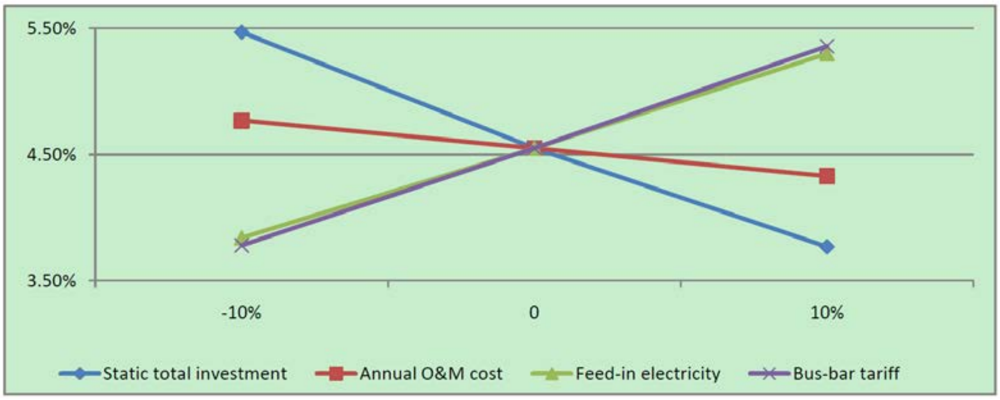

Fig.B.2 Project IRR sensitivity analysis (Without CERs revenues)

Whereas the uncertain factors vary in the range of -10% to +10% the Project IRR could not reach the benchmark (8%).

When the Project IRR whole reaches the benchmark IRR, the variation range of four indictors are shown in Table B.4.

Table B.4 the variation range of four indictors when the IRR of total investment =8%

sensitivity analysis	variation range	The IRR of total investment
static total investment	-31.10%	8.00%

annual O&M cost	-175.50%	
feed-in electricity	48.85%	
bus-bar tariff	44.40%	

From the Table B.4, Static total investment is an important factor affecting the IRR. When static total investment decreases by 31.10%, the IRR begin to exceed the benchmark IRR. The FSR was completed based on the price in November 2008 by Kunming Hydropower Investigation, Design & Research Institute, CHECC with grade A certification, the data applied in the financial indicator calculation is credible and reliable. And the price of hydropower construction and equipments installation engineering in second half year of 2011 increased 4.56%[8] than that in second half year of 2010 in Yunnan, and the labour cost in second half year of 2010 increased about 10% than that in second half year of 2008. Therefore it is not likely that static total investment decreases by 31.10%.

When feed-in electricity increases by 48.85%, the IRR begins to exceed the benchmark IRR. Annual average electricity generation will reach to 1,635,861MWh if the feed-in electricity[9] increases by 48.85%, but annual average electricity generation of the Project is 1,099,000MWh, which is determined based on 53years (1954-2006) hydrological data[10], and the FSR was completed in November 2008 by Kunming Hydropower Investigation, Design & Research Institute, CHECC with grade A certification, the data of electricity generation is credible and reliable. So it is not likely to change greatly.

Bus-bar tariff of the Project is 0.215 yuan/kwh(excluding VAT) in the FSR in December 2008. When bus-bar tariff increases by 44.40%, the IRR begin to cross the benchmark IRR. According to *The Notification of Issues Regarding Trial Implementation Rainy and Dry Tariff for New Hydropower Unit* (Yunfagaijiage [2006] No.28) issued by Yunnan Province Development and Reform Commission, the tariff of centralized regulating hydropower stations with capacity higher than 50MW is 0.215 yuan/kwh, therefore, the tariff of the Project is consistent to the official document. Furthermore, the bus-bar tariff is governed strictly by local price bureau, so it is unlikely to occur that bus-bar tariff increases by 44.40%. In addition, according to INFORMATION NOTE ON THE HIGHEST TARIFFS APPLIED BY THE EXECUTIVE BOARD IN ITS DECISIONS ON REGISTRATION OF PROJECTS IN THE PEOPLE'S REPUBLIC OF CHINA (Version 02, paragraph 78 of EB61), the highest tariff (incl. VAT) for large capacity hydropower projects with the reservoir in Yunnan Province is 0.215 yuan/kwh, and the IRR of the Project is 4.50% when adopting the highest tariff. Therefore, the IRR of the Project would not cross the benchmark IRR when the highest tariff is applied to the Project.

Annual O&M cost has little effect on the impact of IRR, and the IRR will not cross benchmark IRR even if annual O&M decreases to be zero, thus it shall be regarded as an insensitive factor.

In conclusion the practical and feasible scenario is the provision of equivalent amount of annual electricity supply by the China Southern Power Grid into which the Project is connected.

Step 3. Barrier Analysis

It is not analyzed in the Project.

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[8] http://www.hydrocost.org.cn/price/priceIndex.jsp

[9] The auxiliary power ratio is 0.5%, effective coefficient of the electricity is 1, the feed-in electricity is calculated as follows: annual average electricity generation×effective coefficient of the electricity×(1 — auxiliary power ratio)

[10] See the Section 3.4.3 of the FSR, P3-19

Step 4 Common practice analysis

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

According to the "Tool for demonstration and assessment of additionality", other activities that are operational and that are similar to the proposed project activity should be analyzed in this part. And other CDM project activities (registered project activities and project activities which have been published on the UNFCCC website for global stakeholder consultation as part of the validation process) are not to be included in this analysis.

In accordance with "Guidelines on Common Practice (Version 02.0)" Provided in Annex 8 of the minutes to the 69th Meeting of the Executive Board, the common practice analysis for the proposed project activity is as follows:

Step 1: Calculate applicable capacity or output range as +/- 50% of the design capacity or output of proposed project activity:

The installed capacity of the Project is 240MW, therefore, the applicable output range for the common practice analysis is:

Installed Capacity: 120MW~360MW

Step 2: identify similar projects (both CDM and non-CDM) which fulfill all of the following conditions:

(a) The projects are located in the applicable geographical area;

(b) The projects apply the same measure as the proposed project activity;

(c) The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity;

(d) The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant;

(e) The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1;

(f) The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity.

In China, the environment regard to regulatory framework, access to technology, access to financing, and investment climate, etc. for projects are only similar and comparable in the same Province/Autonomous Region. Project proposals are approved by the provincial DRC, and the projects' EIAs by the provincial Environmental Protection Bureau. Hence the applicable geographical area is defined as Yunnan Province where the proposed project locates.

Chinese government conducted a series reform measures in power sector in 2002. State Council approved Power System Reform Program proposed by State Plan Committee on 10 February 2002[11]. State Power Company was separated into two parts, Power generation enterprises and power grid companies, which means the separation of production and sale of power. Grid assets were divided into State Grid Corporation of China and China Southern Power Grid Corporation. The power generation assets were restructured and divided into 5 national power generation companies[12]. It took place fundamental change that competition

[11] Notice of the State Council on Printing and Distribution the Power System Reform Program(Guofa[2002] No.5).

http://www.shp.com.cn/news/info/2007/8/6/141009991.html

[12] State Council approved Electric Power System Reform Plan. http://www.ndrc.gov.cn/xwfb/t20050708_28096.htm

mechanism was induce into power industry. Before 2002, the hydropower plants were mainly developed by the state-owned enterprises; provincial governments ensure that project entity of power plants can obtain sufficient return by providing guarantee electricity tariff. Power plants were constructed with national or local government funds, or governments provided the loan guarantee for the companies, the developers didn't have financing difficulties. Thus the electricity tariff for each power plant was determined with the principle of full-cost recovery[13]. However, the partner changed after 2002, the electricity tariff will be determined on the basis of average costs of power generation using the same advanced technology and building within the same period under the provincial power grids. Thus projects operated after 2002 are considered as similar projects to the proposed project since they were operated under the same policy scheme.

The Project utilizes hydro-energy to generate electricity, therefore, hydropower Project should be included in similar projects

The Project provides power to the grid, therefore, all projects which connect the grid and provide power to the grid should be included in similar projects.

The projects whose installed capacity range is between 120MW~360MW should be included in similar projects. The projects whose electricity generated self-consumption or other purposes face different promotional policies and are technologically different. Further, the proposed project activity is newly built. The expansion projects are distinct in the newly installed capacity completely, therefore, they are technological different from the proposed project.

The Project was published for global stakeholder consultation on 02/09/2011, which is later than the start date of the Project (10/05/2009). Therefore, the projects which started commercial operation before 10/05/2009 should be included in similar projects.

Based on the analysis above, the applicable conditions for similar projects are summarized as below:

- Locate in Yunnan;
- Started commercial operation after 2002 and before 10/05/2009;
- Grid-connected hydropower projects with installed capacity range between 120MW~360MW;
- Newly-built project.

Step 3: within the projects identified in Step 2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number N_{all}.

For hydropower projects located in Yunnan, Yearbook of China Water Resources is an official statistics issued by China Water Conservancy and Hydro Power Press and as such is regarded as only one reliable source. All hydropower projects in Yearbook of China Water Resources are listed in the common practice analysis.

Table B.5 Hydropower Project in Yunnan Province

No.	Project name	Installed capacity (MW)	Excluded ?	Justification
1.	Chaishitan	60	Y	＜120MW

[13] Ministry of Water Resource and Electric Power, State Economic Committee and State Price Bureau, Notice on Implementation Methods of Various Tariff. http://www.cqpn.gov.cn/gb/laws/xxfg/wj20011.htm

2.	Gaoqiao	90	Y	＜120MW
3.	Luozehe	25	Y	＜120MW
4.	Zhangwo	54	Y	＜120MW
5.	Xiangshui	100	Y	＜120MW
6.	Lazhuang	60	Y	＜120MW
7.	Laodukou	37.5	Y	＜120MW
8.	Laohushan 2nd Cascade	25	Y	＜120MW
9.	Hongshiyan	44	Y	＜120MW
10.	Yisahe	26.6	Y	＜120MW
11.	Malutang Phase I	100	Y	＜120MW
12.	Maomaotiao	40	Y	＜120MW
13.	Nantinghe	34	Y	＜120MW
14.	Xiashilong	25	Y	＜120MW
15.	Xucun	78	Y	＜120MW
16.	Yanziya	25	Y	＜120MW
17.	Supa River Sanjiangkou	30	Y	＜120MW
18.	Houqiao 2nd Cascade	32	Y	＜120MW
19.	Supa River Ajiutian	105	Y	＜120MW
20.	Supa River Wunihe	30	Y	＜120MW
21.	Ximaxing Yunlvchang	26	Y	＜120MW
22.	Mengdian River 2nd Cascade	30	Y	＜120MW
23.	Mengga River 4th Cascade	40	Y	＜120MW
24.	Husonghe	60	Y	＜120MW
25.	Lamenga 2nd Cascade	32	Y	＜120MW
26.	Jirenhe	30	Y	＜120MW
27.	Luosiwan	60	Y	＜120MW
28.	Chongjianghe	48	Y	＜120MW

29.	Lvshuihe	65.5	Y	＜120MW
30.	Tukahe	165	N	-
31.	Yayangshan	120	N	-
32.	Dayingjiang 1st Cascade	99	Y	＜120MW
33.	Dayingjiang 2nd Cascade	70	Y	＜120MW
34.	Dayingjiang 3rd Cascade	100	Y	＜120MW
35.	Jisha	60	Y	＜120MW

Based on the analysis from the table above, only No.30 (Tukahe) and No.31 (Yayangshan) meet the application conditions, therefore, N_{all}＝2.

Step 4: within similar projects identified in Step 3, identify those that apply technologies that are different to the technology applied in the proposed project activity. Note their number N_{diff}.

According to *"Guidelines on Common Practice (Version 02.0)",* different technologies is defined as follows:

Different technologies are technologies that deliver the same output and differ by at least one of the following (as appropriate in the context of the measure applied in the proposed clean development mechanism (CDM) project activity and applicable geographical area):

(a) Energy source/fuel (example: energy generation by different energy sources such as wind and hydro and different types of fuels such as biomass and natural gas);

(b) Feed stock (example: production of fuel ethanol from different feed stocks such as sugar cane and starch, production of cement with varying percentage of alternative fuels or less carbon-intensive fuels);

(c) Size of installation (power capacity)/energy savings:

(i) Micro (as defined in paragraph 24 of decision 2/CMP.5 and paragraph 39 of decision 3/CMP.6);

(ii) Small (as defined in paragraph 28 of decision 1/CMP.2);

(iii) Large.

(d) Investment climate on the date of the investment decision, inter alia:

(i) Access to technology;

(ii) Subsidies or other financial flows;

(iii) Promotional policies;

(iv) Legal regulations;

(e) Other features, inter alia:

(i) Nature of the investment (example: unit cost of capacity or output2 is considered different if the costs differ by at least 20 %).

The difference of Tukahe Project (No.30) and Yayangshan Project (No.31) in Table B.6 with the Project is analyzed to be as follows:

The investment per kw and investment per kwh of the Project are 27.72% and 18.97% higher than Tukahe Project, 29.95% and 17.77% higher than Yayangshan Project, which are justify that Tukahe Project and Yayangshan Project have much stronger investment abstraction than the Project, and can operate without CDM help.

Table B.6 **the difference of Tukahe Project and Yayangshan Project with the Project**

No.	Project Name	Installed capacity (MW)	Annual electricity generation (MWh)	Total investment (ten thousand yuan)	Investment per kw (yuan /kw)	Investment per kwh (yuan /kwh)
30	Tukahe	165	706,600[14]	137,500[15]	8,333	1.95
31	Yayangshan[16]	120	499,000	98,280	8,190	1.97
	The Project	240	1,099,000	255,426.82[17]	1,0643	2.32

Based on the analysis above, Tukahe and Yayangshan Projects are essentially different with the Project; therefore, N_{diff}=2.

Step 5: Calculate factor F=1 － N_{diff}/N_{all} representing the share of similar projects (penetration rate of the measure/technology) using a measure/technology similar to the measure/technology used in the proposed project activity that deliver the same output or capacity as the proposed project activity.

$F=1-N_{diff}/N_{all}=1 \quad \frac{2}{2}=1 \qquad -1=0.$

According to the *"Guidelines on Common Practice (Version 02.0)"*, the proposed project activity is a "common practice" within a sector in the applicable geographical area if the factor *F* is greater than 0.2 and *Nall-Ndiff* is greater than 3.

For the Project, F=0 and $N_{all}-N_{diff}$=0, so the Project is not common practice in the applicable area.

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

There are no similar projects.

In conclusion, the Project is not financially attractive without CDM support, which means the Project cannot be implemented and the emission reductions cannot be generated without CDM. Hence, the Project fulfills the requirements of additionality.

CDM consideration

Table B.7 Timeline of the Project Implementation

Date	Milestone	Remark
12/2008	Feasible Study Report	Kunming Hydropower Investigation, Design & Research Institute, CHECC

[14] http://www.zhaobiao.gov.cn/projectinfodetail/23613756.html

[15] http://www.ynjinyu.cn/newEbiz1/EbizPortalFG/portal/html/InfoContent.html?InfoPublish_InfoID=c373e91dd731b5928ffe639d28fce14a

[16] http://www.yn.xinhuanet.com/newscenter/2006-10/09/content_8206497.htm

[17] See *Yunnan Province Puduhe Jiayan Hydropower Station Feasible Study Report* P15-6

12/2008	EIA Impact Assessment Report	Kunming Hydropower Investigation, Design & Research Institute, CHECC
04/03/2009	EIA Approval Yun Huan Shen [2009] No.56	Yunnan Province Environment Protection Bureau
17/03/2009	The Project Approval Yun Fagai Nengyuan [2009] No.453	Yunnan Province DRC
08/04/2009	The Board Decision on CDM Implementation	Board meeting
10/05/2009	The Diversion Tunnel for Right Bank and Metal Contracture Installation Engineering Contact	China Railway 16th Bureau Group Co., Ltd.
19/05/2009	Construction Starting Information	Sichuan Ertan Construction Consultant Co., Ltd.
26/05/2009	The Diversion Tunnel Phase I for Left Bank Excavation Engineering Contact	SINOHYDRO BUREAU 14 CO., LTD.
26/06/2009	Notification on CDM Implementation to China DNA	China DNA
25/09/2009	CDM Consultant Contract	Accord Global Environment Technology Co., Ltd.
23/12/2009	Loan Contract	China Minsheng Banking CORP., Ltd.
15/11/2010	Emission Reduction Purchasing Agreement	Baraka Global Advisors
08/12/2010	Head of Pivot Engineering Contract	Sinohydro Bureau 14 Co., Ltd.
17/01/2011	Main Equipments Contract	Harbin Electric Engine Plant (Kunming) Co., Ltd.
17/06/2011	Water Diversion Tunnel Construction and Metal Structure Installation Engineering Contract	China Railway 16th Bureau Group Co., Ltd.
17/06/2011	Diversion Tunnel for Left bank, Surge Shaft, Penstock, Powerhouse Construction, Electrical and Metal Structure Installation Engineering Contract	SINOHYDRO BUREAU 10 CO., LTD.
02/09/2011 ~01/10/2011	PDD Global Stakeholders Consultation	UNFCCC CDM website
02/12/2011	Publication of CDM projects	Clean Development Mechanism in China website
08/12/2011	China LoA	China DNA
24/08/2012	The Netherlands LoA	The Netherlands DNA

As per the Glossary of CDM terms, version 05, the earliest date of the project implementation events is determined to be starting date. The earliest date is the date of The Diversion Tunnel for Right Bank and Metal Contracture Installation Engineering Contact (10th May 2009) from the list of the table above. The *Guide on the Demonstration and Assessment of Prior Consideration of the CDM (hereafter refer to as the Guide) (Version 01)* was published as Annex 46 of EB41on 2nd August 2008, and The *Guide (Version 02)* was published as Annex 61 of EB48 on 17th July 2009. Project owner informed the China DNA on 26th June 2009, and the date is between the 1st version Guide and 2nd version Guide, therefore, the 1st version Guide is applied

in the Project[18]. According to Annex 46 of EB41, *Guide on the Demonstration and Assessment of Prior Consideration of the CDM (Version.01)*/2/, “The Board decided that for project activities with a starting date on or after 02 August 2008, the project participant must inform a Host Party DNA and/or the UNFCCC secretariat in writing of the commencement of the project activity and of their intention to seek CDM status. Such notification must be made within six months of the project activity start date and shall contain the precise geographical location and a brief description of the proposed project activity”, the project owner made the information to China DNA according to the requirement from the Guide (Version 01). Based on the description above, the progress of CDM development meets the requirement of EB on prior consideration of the CDM.

B.6. Emission reductions

B.6.1. Explanation of methodological choices

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The consolidated methodology ACM0002 is applied in the context of the Project in the following four steps:

·calculate the project GHG emissions;

·calculate the baseline GHG emissions;

·calculate the project leakage;

·calculate the emission reductions

1. Calculate the project GHG emissions

The Project is a new installed run-of-river hydropower plant and the power density of the Project is calculated with the follow formula:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \quad (1)$$

PD is power density of the project activity, in W/m^2;

[18] **The issue was enquired to EB secretariat:**
“The version 02 of "Guidance on the demonstration and assessment of prior consideration of the CDM" has been issued by EB48 meeting, comparing version 01, the new version requires notification to be sent to DNA AND UNFCCC Secretariat.
However, some projects, which started few months after 02/08/2008, have been noticed to DNA. Do we need notice these projects to UNFCCC? to now, the projects have been started more than six months.
For example, one project was started in Nov. 2008, as the requirement of "Guidance on the demonstration and assessment of prior consideration of the CDM (version 01)", the project participant noticed DNA regarding CDM consideration, this notice has been confirmed by DNA on 1st Dec. 2008. Should project participant send a "F-CDM prior consideration" of this project to UNFCCC now? Please keep in mind this project has been started more than six months, sending a "F-CDM-prior consideration" now looks to be inconsistent with requirement of "Guidance on the demonstration and assessment of prior consideration of the CDM (version 02)"”
The feedback from EB secretariat is as follows:
“In reply to your query below, please be informed that, as per the old procedures, the notification of a project between 02 August 2008 and now, sent to the DNA only, is sufficient and no re-submission to UNFCCC is necessary.
However, as of the date of the report of EB48 and the new established procedures, every notification for a new project needs to be sent to both DNA and UNFCCC”.

Cap_{PJ} is installed capacity of the hydro power plant after the implementation of the project activity (W);

Cap_{BL} is installed capacity of the hydro power plant before the implementation of the project activity (W), for new hydro power plants, this value is zero;

A_{PJ} is area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m^2).

A_{BL} is area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero.

The Project has a water surface area[19] of 3,715,000m^2 at full reservoir level with a responding power density of 67.23W/m^2. According to ACM0002 (version 13.0.0) the project GHG emissions can be neglected. So PE_y=0

2. Calculate the baseline GHG emissions

Baseline emissions include only CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

$BE_y = EG_{PJ,y} \cdot EF_{grid,CM,y}$ (2)

Where:

BE_y = Baseline emissions in year y (tCO_2/yr)

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)

$EF_{grid,CM,y}$ = Combined margin CO2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO2/MWh)

If the project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity. The Project is a greenfield hydropower plant, Then:

$EG_{PJ,y} = EG_{facility,y}$ (3)

Where:

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr)

Baseline emissions are calculated with combined baseline emission factor and Quantity of net electricity generation supplied by the project plant/unit as follows:

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[19] See *Yunnan Province Puduhe Jiayan Hydropower Station Feasible Study Report* P6-23

$$BE_y = EG_{\text{facility},y} \cdot EF_{grid,CM,y}$$
(4)

Where:

BE_y =Baseline emissions in year y (tCO_2/yr);

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/yr)

$EF_{grid,CM,y}$ =Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system".

Calculation of $EG_{facility}$

For the Project, *$EG_{facility}$* is calculated ex-ante, the calculated progress is as follows:

$$EG_{facility} = EG_{feed\text{-}in,y} - EG_{imported,y}$$
(5)

Where:

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/yr)

$EG_{feed\text{-}in,}$ =Feed-in electricity of the Project in year *y* (MWh/yr)

$EG_{imported,y}$ = Imported electricity from China Southern Power Grid in year *y* (MWh/yr)

Calculation of $EF_{grid,CM,y}$

According to ACM0002 (Version 13.0.0), the calculation of emission factor should use the methodology *"Tool to calculate the emission factor for an electricity system (Version 02.2.1)".* The CO_2 emission factor for the displacement of electricity generated by power plants in an electricity system is determined by calculating the "operating margin"(OM) and "build margin"(BM) as well as the "combined margin"(CM).

The tool provides procedures to determine the following parameters:

Parameter	SI Unit	Description
$EF_{grid,CM,y}$	tCO_2/MWh	Combined margin CO_2 emission factor for grid connected power generation in year y
$EF_{grid,BM,y}$	tCO_2/MWh	Build margin CO_2 emission factor for grid connected power generation in year y
$EF_{grid,OM,y}$	tCO_2/MWh	Operating margin CO_2 emission factor for grid connected power generation in year y

The following is the detailed process of calculating the baseline CO_2 emission factor of the grid which the Project connected to according to the steps provided by the *Tool to calculate the emission factor for an electricity system(Version 02.2.1) (*hereafter referred to as the *Tool).*

STEP 1. Identify the relevant electric power system.

Chinese DNA has published a delineation of the project electricity system and connected electricity system. The project physically connects through transmission and distribution lines to the China Southern Power Grid. It is composed of Guangdong Power Grid, Guangxi Power Grid, Guizhou Power Grid, Yunnan Power Grid. Therefore, the Project selects the China Southern Power Grid for the calculation of baseline emission factor.

STEP 2. Choose whether to include off-grid power plants in the project electricity system(*optional*).

Option I: Only grid power plants are included in the calculation.

Option II: Both grid power plants and off- grid power plants are included in the calcution.

Because the data of off-grid power plants is unavailable, option I is chosen.

STEP 3. Select a method to determine the operating margin (OM).

According to the *Tool*, four methods compute the Operating Margin Emission factor can be used as follows:

(a) Simple OM, or

(b) Simple adjusted OM, or

(c) Dispatch data analysis OM, or

(d) Average OM.

The simple OM method only can be used when low-cost/must run resources constitute less than 50% of total amount of grid generating output 1) in the recent five years, or 2) by taking into account long-term normal for hydroelectricity generation. Among the total electricity generations of the China Southern Power Grid which the Project is connected into, the amount of low-cost/must run resources accounts for about 31.58% in 2004, 30.69% in 2005, 29.75% in 2006, 29.95% in 2007, 40.84% in 2008[20], all less than 50%. Thus, the method (a) Simple OM is used to calculate the baseline emission factor of operating margin ($EF_{\text{grid},OM,\,y}$) for the Project.

For simple OM, the emission factor can be calculated using either of the two following data vintages:

- Ex ante option: If the ex ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emission factor during the crediting period is required. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD for validation, or
- Ex post option: If the ex post option is chosen, the emission factor is determined for the year in which the Project displaces grid electricity, requiring the emission factor to be updated annually during monitoring. If the data required calculating the emission factor for year y usually only available later than six months after the end of year y.

Project participant employs “ex-ante” for its operation margin calculation with two reasons as follows:

1) the full generation-weighted average for the most recent 3 years for which data are available at the time of PDD submission; and

2) The calculation adopts *Notification on 2010 Baseline Emission Factors for Regional Power Grids in China (20th December 2010)*, which was published by Chinese DNA, therefore it is considered as authoritative data. In this notification, the OM is calculated *ex-ants*.

STEP 4. Calculate the operating margin emission factor according to the selected method.

From the *Tool to calculate the emission factor for an electricity system (Version 02.2.1)*, ($EF_{grid,simple,OM}$) may be calculated:

[20] *China Energy Statistical Yearbook 2009, Table 3-10, Table 3-12*

• Based on the net electricity generation and a CO_2 emission factor of each power plant / unit (Option A), or

• Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system (option B)

Option B can only be used if:

(a) The necessary data for Option A is not available; and

(b) Only unclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and

(c) Off-grid power plants are not included in the calculation (i.e., if Option I has been chosen in Step 2).

As the necessary data for Option A is not available, and only nuclear and renewable power generation is considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by those sources is known, meanwhile, off-grid power plants are not included in the calculation (as option I has been chosen in Step 2), so Option B was chosen.

Where Option B is used, the simple OM method formula of $EF_{Grid,OM,Simple,y}$ calculation is:

$$EF_{Grid,OM,simple,y} = \frac{\sum_i FC_{i,y} \bullet NCV_{i,y} \bullet EF_{CO2,i,y}}{\sum EG_y} \quad (6)$$

Where:

$EF_{grid,OMsimply,y,}$ is simple operating margin CO_2 emission factor in year y(tCO_2/MWh)

$FC_{i,y}$ is amount of fossil fuel type i consumed in the project electricity system in year y ;

$NCV_{i,y}$ is net calorific value (energy content) of fossil fuel type i in year y (GJ / mass or volume unit);

$EF_{CO2,i,y}$ is CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ) and

EG_y is net electricity generated and delivered to the grid by power plant / unit m in year y (MWh);

i is all fossil fuel types combusted in power sources in the project electricity system in year y

y is either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option) or the applicable year during monitoring (ex post option), following the guidance on data vintage in step 2.

When there exists net electricity imports from a connected electricity system within the same host country(ies):

(1) The emission factor(s) of the specific power plant(s) from which electricity is imported, if and only if the specific plants are clearly known, or

(2) The emission factor of the exporting grid, if the specific plants are not clearly known.

The data on electricity generation and auxiliary electricity consumption are obtained from the *China Electric Power Yearbook* from 2007 to 2009 (published annually). The data on different fuel consumptions for power generation and the net caloric values of the fuels are obtained from the *China Energy Statistical Yearbook* from 2005 to 2009(published annually after 2003). The

emission factors and oxidation factors of the fuels adopted are obtained from "2006 IPCC Guidelines for National Greenhouse Gas Inventories" Volume 2 Energy, Charter 1, page 1.21-1.24, Table 1.3 and Table 1.4.

The detailed calculation can be find in Annex 3, the $EF_{grid,OM,y}$ = 0.9762 tCO_2/MWh

STEP 5. Calculate the build margin emission factor.

In terms of vintage of data, project participants can choose between one of the following two options:

Option 1. For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2. For the first crediting period, the build margin emission factor shall be updated annually, ex-post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex-ante, as described in option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

The PDD choose Option 1.

According to the *Tool to calculate the emission factor for an electricity system*, the following equation (7) is adopted to calculate $EF_{grid,BM,y}$.

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \cdot EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (7)$$

where:

$EF_{grid,BM,y}$ is build margin CO_2 emission factor in year y (tCO_2/MWh)

$EG_{m,y}$ is net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)

$EF_{EL,m,y}$ is CO_2 emission factor of power unit m in year y (tCO_2/MWh)

m is power units included in the build margin

y is most recent historical year for which power generation data is available

In China, EB accepts the following deviation in methodology application:

The build margin calculations featured below is derived from the *"2010 Baseline Emission Factors for Regional Power Grids in China"*, which has been renewed by the Chinese DNA on 20th December 2010

Therefore for the Project:

First, calculate the share of different power generation technology in recent capacity additions;

Second, calculate the weight for capacity additions of each power generation technology; and

Finally, calculate the emission factor use the efficiency level of the best technology commercially available in China.

Since data of installed capacities cannot be separated to coal based, oil based and gas based at present, BM is calculated with following steps and formula:

Step a. Calculate the power generation emissions for solid, liquid and gas fuel and each share of total emissions based on the *Energy Balance Table* of the most recent year.

$$\lambda_{Coal,y} = \frac{\sum_{i \in COAL,j} F_{i,j,y} \cdot NCV_{i,y} \cdot EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \cdot NCV_{i,y} \cdot EF_{CO_2,i,j,y}}$$

(8)

$$\lambda_{Oil,y} = \frac{\sum_{i \in OIL,j} F_{i,j,y} \cdot NCV_{i,y} \cdot EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \cdot NCV_{i,y} \cdot EF_{CO_2,i,j,y}}$$

(9)

$$\lambda_{Gas,y} = \frac{\sum_{i \in GAS,j} F_{i,j,y} \cdot NCV_{i,y} \cdot EF_{CO_2,i,j,y}}{\sum_{i,j} F_{i,j,y} \cdot NCV_{i,y} \cdot EF_{CO_2,i,j,y}}$$

(10)

where:

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

$NCV_{i,y}$ is the net caloric value of fuel i in year(s) y,

$EF_{CO2,i,j,y}$ is the CO_2 emission coefficient of fuel i (tCO_2/tGJ).

COAL, OIL and GAS are footnote group for solid fuels, liquid fuels and gas fuels.

Step b. Calculate emission factor for thermal power of the grid based on the result of Step a and the efficiency level of the best technology commercially available in China.

$$EF_{Thermal,y} = \lambda_{Coal,y} \cdot EF_{Coal.Adv,y} + \lambda_{Oil,y} \cdot EF_{Oil,Adv,y} + \lambda_{Gas,y} \cdot EF_{Gas,Adv,y} \quad (11)$$

Where, $EF_{Coal, Adv,y}$, $EF_{Oil, Adv,y}$ and $EF_{Gas,Adv,y}$ are emission factor proxies of efficiency level of the best coal-fired, oil-based and gas-based power generation technology commercially available in China.

Step c. Calculate BM of the grid based on the result of Step b and the share of thermal power of recent 20% capacity additions.

$$EF_{grid,BM,y} = \frac{CAP_{Thermal,y}}{CAP_{Total,y}} \cdot EF_{Thermal,y}$$

(12)

Where $CAP_{Total,y}$ is total capacity additions while $CAP_{Thermal,y}$ is capacity additions of thermal power.

The data on different fuel consumptions for power generation and the net caloric values of the fuels are obtained from the *China Energy Statistical Yearbook* from 2007 to 2009 (published annually after 2003). The emission factors and oxidation factors of the fuels adopted are obtained from the *2006 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook*.

With reference to the *2010 Baseline Emission Factors for Regional Power Grids in China*, the weighted average fuel consumption for power generation of the top 30 sets of 600 MW lowest coal-consumed power generators built in 2008 (314.35 gCe/kWh) and the 200 MW oil/gas based combined cycle power generators (238.74 gCe/kWh) are taken as the efficiency level of the best technology commercially available in China.

The Build Margin emission factor ($EF_{BM,y}$) of the China Southern Power Grid is 0.4506

tCO_2e/MWh (see Annex 3 for details).

STEP 6. Calculate the combined margin (CM) emissions factor.

The calculation of the combined margin (CM) emission factor (*EFgrid,CM,y*) is based on one of the following methods:
(a) Weighted average CM; or
(b) Simplified CM.

The weighted average CM method (option A) is chosen as the preferred option.

(a) Weighted average CM

The combined margin emissions factor is calculated as follows:

$$EF_y = w_{OM} \cdot EF_{grid,OM,y} + w_{BM} \cdot EF_{grid,BM,y} \qquad (13)$$

Where:
$EF_{grid,BM,y}$ = Build margin CO2 emission factor in year *y* (tCO_2/MWh)
$EF_{grid,OM,y}$ = Operating margin CO2 emission factor in year *y* (tCO_2/MWh)
w_{OM} = Weighting of operating margin emissions factor (%)

w_{BM} = Weighting of build margin emissions factor (%)

According to the consolidated baseline methodology ACM0002, both the weight w_{OM} and the weight w_{BM} take 0.5 as default. Therefore the combined baseline emission factor

EF_y =0.5×0.9762tCO_2e/MWh + 0.5×0.4506tCO_2e/MWh =0.7134tCO_2e/MWh.

3. Calculate the project leakage GHG emissions

The Project can take no account of leakages, L_y=0 tCO_2e.

4. Calculate the emission reductions

The project activity will generate GHG emission reductions by avoiding CO_2 emissions from electricity generation by fossil fuel power plants. The emission reduction (ER_y) during a given year y is calculated as follows:

$$ER_y = BE_y - PE_y - L_y \qquad (14)$$

Changes required for methodology implementation in 2nd and 3rd crediting periods

At the start of the second and third crediting period the Project have to address two issues:

- Assess the continued validity of the baseline; and,
- Update the baseline.

In assessing the continued validity of the baseline, a change in the relevant national and/or sectoral regulations between two crediting periods has to be examined at the start of the new crediting period. If at the start of the project activity, the project activity was not mandated by regulations, but at the start of the second or third crediting period regulations are in place that enforce the practice or norms or technologies that are used by the project activity, the new regulation (formulated after the registration of the project activity) has to be examined to determine if it applies to existing plants or not. If the new regulation applies to existing CDM project activities, the baseline has to be reviewed and, if the regulation is binding, the baseline for the project activity should take this into account. This assessment will be undertaken by the verifying DOE.

For updating the baseline at the start of the second and third crediting period, new data available will be used to revise the baseline scenario and emissions. Project participants shall assess and incorporate the impact of new regulations on baseline emissions.

B.6.2. Data and parameters fixed ex ante

(Copy this table for each piece of data and parameter.)

Data / Parameter	EG_y
Unit	MWh
Description	net electricity generated and delivered to the grid by power plant / unit m in year y
Source of data	*China Electric Statistical Yearbook, 2007-2009*
Value(s) applied	Values depend on specifically fuel, referring to Annex 3.
Choice of data or Measurement methods and procedures	According to the *Tool to calculate the emission factor for an electricity system (version 02.2.1)* requirement, use accurate and reliable local or national data where available.
Purpose of data	For baseline emission calculation.
Additional comment	Reasonable

Data / Parameter	$FC_{i,y}$
Unit	mass or volume unit
Description	Amount of fossil fuel type i consumed in the project electricity system in year y
Source of data	*China Energy Statistical Yearbook, 2007-2009*
Value(s) applied	Values depend on specifically fuel, referring to Annex 3.
Choice of data or Measurement methods and procedures	According to the *Tool to calculate the emission factor for an electricity system (version 02.2.1)* requirement, use accurate and reliable local or national data where available.
Purpose of data	For baseline emission calculation.
Additional comment	Reasonable

Data / Parameter	$F_{i,j,y}$
Unit	Mass or volume
Description	The fuel consumption of fuel i in power plant j during year y
Source of data	*China Energy Statistical Yearbook, 2007-2009*
Value(s) applied	Values depend on specifically fuel, referring to Annex 3.
Choice of data or Measurement methods and procedures	According to the *Tool to calculate the emission factor for an electricity system (version 02.2.1)* requirement, use accurate and reliable local or national data where available.
Purpose of data	For baseline emission calculation.
Additional comment	Reasonable

Data / Parameter	$NCV_{i,y}$

Unit	TJ/t, TJ/km[3]
Description	Net calorific value (energy content) per mass or volume unit of a fuel *i* in year *y*
Source of data	*China Energy Statistical Yearbook, 2007-2009*
Value(s) applied	Values depend on specifically fuel, referring to Annex 3.
Choice of data or Measurement methods and procedures	According to the *Tool to calculate the emission factor for an electricity system (version 02.2.1)* requirement, use accurate and reliable local or national data where available.
Purpose of data	For baseline emission calculation.
Additional comment	Reasonable

Data / Parameter	$EF_{CO2,i,y}$
Unit	tC/TJ (tCO_2e/TJ)
Description	CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories" Volume 2 Energy, Charter 1, page 1.21-1.24, Table 1.4, lower limit value of 95% confidence interval
Value(s) applied	Values depend on specifically fuel, referring to Annex 3.
Choice of data or Measurement methods and procedures	According to the *Tool to calculate the emission factor for an electricity system (version 02.2.1)* requirement, use IPCC default value.
Purpose of data	For baseline emission calculation.
Additional comment	Reasonable

Data / Parameter	$OXID_{i,y}$
Unit	%
Description	Oxidation factor of the fuel *i* in year *y*
Source of data	"2006 IPCC Guidelines for National Greenhouse Gas Inventories" Volume 2 Energy, Charter 1, page 1.21-1.24, Table 1.3
Value(s) applied	Values depend on specifically fuel, referring to Annex 3.
Choice of data or Measurement methods and procedures	According to the *Tool to calculate the emission factor for an electricity system (version 02.2.1)* requirement, use IPCC default value.
Purpose of data	For baseline emission calculation.
Additional comment	Reasonable

Data / Parameter	Internal use rate of power plant
Unit	%
Description	The internal power consumption of power plants in year(s) *y*
Source of data	*China Electric Power Yearbook 2007-2009*
Value(s) applied	See Annex 3 for details.

Choice of data or Measurement methods and procedures	Data used are from Chinese authorities.
Purpose of data	For baseline emission calculation.
Additional comment	-

Data / Parameter	$CAP_{i,j,y}$
Unit	MW
Description	Installed capacities of power plant category *i* of province *j* in years *y*.
Source of data	*China Electric Power Yearbook 2007-2009*
Value(s) applied	See Annex 3 for details.
Choice of data or Measurement methods and procedures	Data used are from Chinese authorities.
Purpose of data	For baseline emission calculation.
Additional comment	-

Data / Parameter	Cap_{BL}
Unit	MW
Description	Installed capacity of the hydro power plant before the implementation of the Project activity.
Source of data	Base on the methodology ACM0002 (version 13.0.0) for new hydro power plants, this value is zero.
Value(s) applied	0
Choice of data or Measurement methods and procedures	Prior to the implementation of the project activity, there was no hydropower plant at the project site.
Purpose of data	For project emission calculation.
Additional comment	-

Data / Parameter	EF_{Res}
Unit	$kgCO_2e/MWh$
Description	Default emission factor for emissions from reservoirs.
Source of data	Based on the methodology ACM0002 (version 13.0.0), The default value 90 kgCO2e/MWh is used.
Value(s) applied	90
Choice of data or Measurement methods and procedures	Data used from the methodology ACM0002 (version 13.0.0).
Purpose of data	For project emission calculation.

Additional comment	–

Data / Parameter	A_{BL}
Unit	m^2
Description	Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2).
Source of data	Base on the methodology ACM0002 (version 13.0.0) for new reservoirs, this value is zero.
Value(s) applied	0
Choice of data or Measurement methods and procedures	Prior to the implementation of the project activity, there was no hydropower plant at the project site.
Purpose of data	For project emission calculation.
Additional comment	–

B.6.3. Ex ante calculation of emission reductions

>>

1. Estimated project activity emissions:

According to *Feasible Study Report of the Project*, area of the reservoir when the reservoir is full is 3,570,000m^2,

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} = \frac{(240-0)\times 10^6 \text{W}}{3{,}570{,}000\text{m}^2} = 67.23\text{W/m}^2.$$

PD>10 W/m^2, so project emission should be neglected according to ACM0002 (version 13.0.0).

PE_y=0 tCO_2e。

2. Estimated baseline emissions:

Baseline emissions are calculated with combined baseline emission factor and Quantity of net electricity generation supplied by the project plant/unit. Quantity of net electricity generation supplied by the project plant/unit in year y ($EG_{facility}$) is calculated as subtracting the electricity import from the feed-in electricity to the grid in year y ($EG_{feed\text{-}in,y}$):

$EG_{facility} = EG_{feed\text{-}in,y} — EG_{imported,y}$

Assuming the $EG_{imported,y}$ =0 in ex-ante calculation of emission reductions for the Project.

According to the *Feasible Study Report* of the Project, the electricity delivered to the grid is 1,093,505MWh. According to the calculation in B6.1 and data in B6.2, the baseline emission factor for the Project is 0.7134tCO_2e/MWh, the annual baseline emission of the Project is calculated below:

$BE_y = EG_{facility} \cdot EF_{grid,CM,y} = (EG_{feed\text{-}in,y} — EG_{imported,y}) \times EF_{grid,CM,y}$=(1,093,505MWh—0)×0.7134$tCO_2e$/MWh=780,106$tCO_2e$

3. Estimated project leakage emissions:

As above ACM0002 (version 13.0.0), the leakage of the Project is not considered, i.e. L_y =0 tCO_2e.

4. Estimated emission reductions

As formula (14), the annual emission reductions of the Project are 780,106tCO_2e as calculated below.

$ER_y = BE_y - PE_y - L_y$ =780,106tCO_2e — 0 tCO_2e — 0 tCO_2e =780,106tCO_2e

B.6.4. Summary of ex ante estimates of emission reductions

Renewable crediting period (7years×3) is adopted by the Project. It is expected that the Project will generate emission reductions for about 5,460,742tCO_2e over the first 7-year crediting period from 1st Feb.2013 to 31st Jan.2020.

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
01/02/2013~31/01/2014	780,106	0	0	780,106
01/02/2014~31/01/2015	780,106	0	0	780,106
01/02/2015~31/01/2016	780,106	0	0	780,106
01/02/2016~31/01/2017	780,106	0	0	780,106
01/02/2017~31/01/2018	780,106	0	0	780,106
01/02/2018~31/01/2019	780,106	0	0	780,106
01/02/2019~31/01/2020	780,106	0	0	780,106
Total	**5,460,742**	**0**	**0**	**5,460,742**
Total number of crediting years	**7**			
Annual average over the crediting period	**780,106**	**0**	**0**	**780,106**

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

(Copy this table for each piece of data and parameter.)

Data / Parameter	**$EG_{facility,y}$**
Unit	MWh
Description	Quantity of net electricity generation supplied by the Project to the grid in year y
Source of data	Data used in the PDD is obtained from the Feasible Study Report of the Project. Actual data will be calculated as difference between $EG_{feed-in,y}$ and $EG_{imported,y}$.
Value(s) applied	1,093,505
Measurement methods and procedures	$EG_{facility,y} = EG_{feed-in,y} — EG_{imported,y}$
Monitoring frequency	Continuously monitored through metering equipment and monthly records by the project owner.

QA/QC procedures	Sales receipts/records for sold electricity to the grid are used to ensure the consistency. In order to maintain 0.2S precision for the main meter and backup meter, the calibration should be implemented every year.
Purpose of data	For baseline emission calculation.
Additional comment	–

Data / Parameter	$EG_{feed\text{-}in,y}$
Unit	MWh
Description	Feed-in electricity supplied by the Project to the grid in year y
Source of data	Data used in the PDD is obtained from the Feasible Study Report of the Project. Actual data will be from main meter installed at 220KV transmission line at plant side.
Value(s) applied	1,093,505
Measurement methods and procedures	Continuously monitored through the main meter and backup meter.
Monitoring frequency	Continuously monitored through metering equipment and monthly records by the project owner.
QA/QC procedures	Sales receipts/records for sold electricity to the grid are used to ensure the consistency. In order to maintain 0.2S precision for the main meter and backup meter, the calibration should be implemented every year.
Purpose of data	For baseline emission calculation.
Additional comment	–

Data / Parameter	$EG_{imported,y}$
Unit	MWh
Description	Electricity imported from the grid in year y.
Source of data	Data used in the PDD is assumed as zero. Actual data will be from main meter installed at 220KV transmission line at plant side.
Value(s) applied	0
Measurement methods and procedures	Continuously monitored through the main meter and backup meter.
Monitoring frequency	Continuous measurement and at least monthly recording
QA/QC procedures	Sales receipts/records for sold electricity to the grid are used to ensure the consistency. In order to maintain 0.2S precision for the main meter and backup meter, the calibration should be implemented every year.
Purpose of data	For baseline emission calculation.
Additional comment	–

Data / Parameter	A_{PJ}
Unit	m^2
Description	Area of the reservoir measured in the surface of the water, after the implementation of the Project activity, when the reservoir is full.

Source of data	
Value(s) applied	3,570,000
Measurement methods and procedures	The area will be monitored at the end of each year by topographical surveys or map by independent and qualified party.
Monitoring frequency	Yearly
QA/QC procedures	–
Purpose of data	For project emission calculation.
Additional comment	–

Data / Parameter	**Cap_{PJ}**
Unit	MW
Description	Installed capacity of the hydro power plant after the implementation of the Project activity.
Source of data	Data used comes from Preliminary Design Report and accurate value comes from data monitored.
Value(s) applied	240
Measurement methods and procedures	The Project owner monitored at the end of each year according to the nameplate of turbines and generators.
Monitoring frequency	Yearly
QA/QC procedures	-
Purpose of data	For project emission calculation.
Additional comment	–

B.7.2. Sampling plan

>>

Not applicable.

B.7.3. Other elements of monitoring plan

>>

1. Purpose

Baseline emission factor of the Project is determined ex ante. Therefore the electricity delivered by the Project to the CSPG is defined as the key data to be monitored.

2. Monitoring Structure

The Project owner assigns the person in charge of CDM operation with assistance of the technological departments and financial department. The structure was shown as the following Fig.B.3.

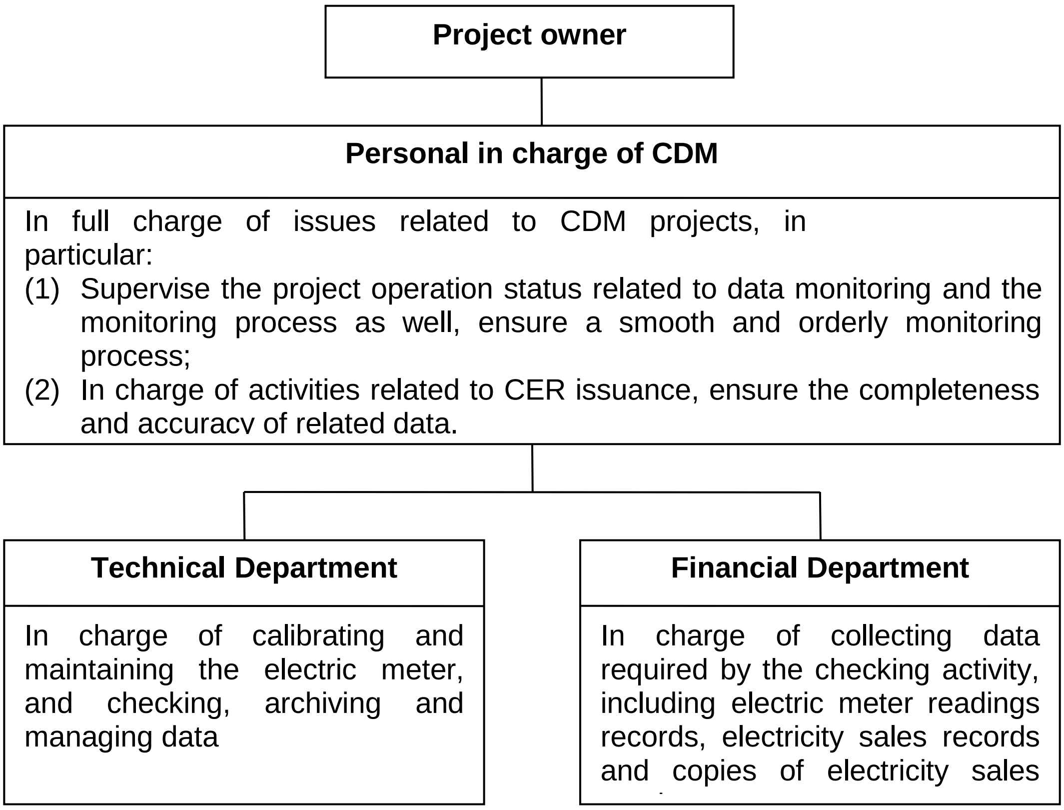

Fig.B.3 Management Structure of Monitoring Plan

3. The Information of Monitoring Equipments

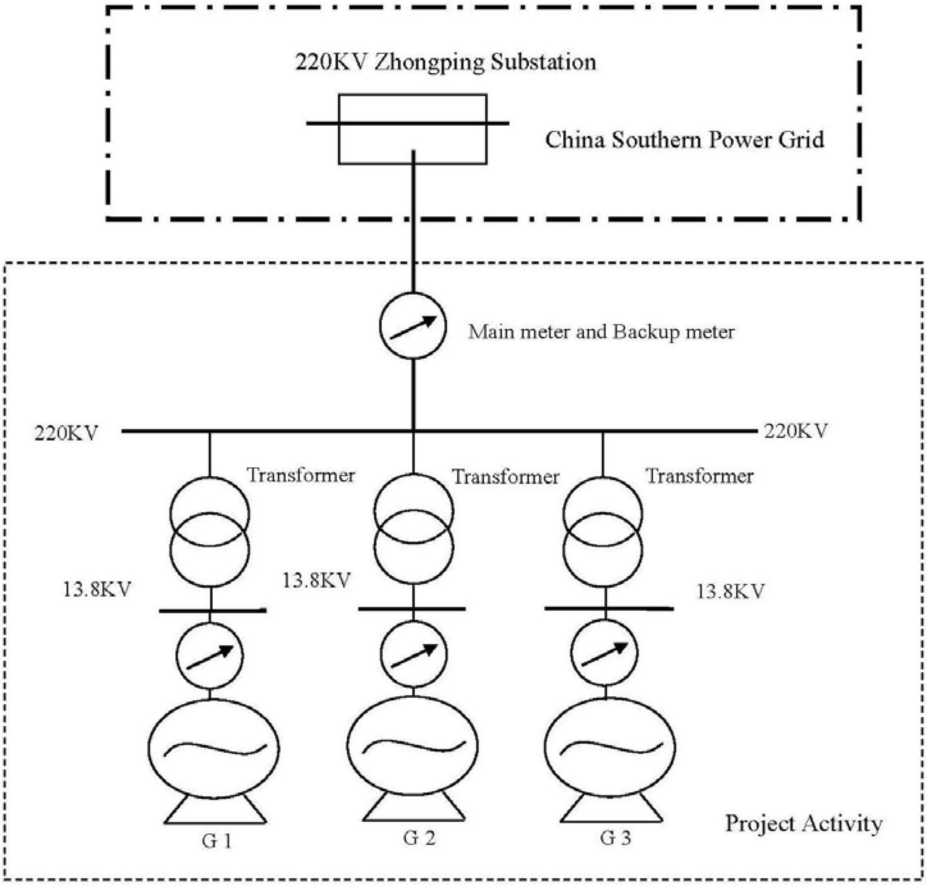

Fig.B.4 monitoring scheme figure of the Project

One bi-direction main meter and one bi-direction backup meter with 0.2S precision, which measure the feed-in electricity (electricity from the Project to the China Southern Power Grid) and imported electricity (electricity from the China Southern Power Grid to the Project), will be installed at 220KV transmission line at plant side. The net feed-in electricity is the difference between feed-in electricity and imported electricity. The backup meter meter with same function will be used when the main meter is in trouble.

The two meters should be used after calibrated by qualified measurement company, and Grid Company will take full responsibility for the operation &maintenance of the two meters with project owner.

4. Data Collection

Electricity data

The main meter will measure the feed-in electricity from the Project to the China Southern Power Grid and imported electricity from the China Southern Power Grid to the Project. And Net feed-in electricity ($EG_{facility,y}$) can be calculated as difference between the feed-in electricity ($EG_{feed-in,y}$) and the imported electricity ($EG_{imported,y}$).

Area of the reservoir

The Project owner has assigned a operation to monitor the area of the reservoir with the map or reservoir level-area arc .

Installed capacity

The nameplate data of each generator will be read and recorded every year. Recorded data will be provided to DOE for checking during the verification period.

5. QA/QC

If main meteris in trouble or damaged, which will result in erroneous measurements, the meter A′, B′ or/and C′ will be used to measure the data of the electricity.

In order to maintain 0.2S precision for the main meter, the calibration should be implemented every year according to ***Verification Regulation of Electrical Energy Meters with Electronics*** (JJG596-2012) or any updated national standard available. The calibration of the meters will be implemented by a relevant qualified institution.

Project owner should arrange the training for the staff who is in charge of data record, operation and maintenance of monitoring equipment for stable and reliable operation of the Project. Damaged equipment will be maintained or displaced immediately.

The specification and technical documents of all equipment are kept for any emergency.

6. Data Management

The monitoring data will be recorded by the staff of technical department regularly, and reviewed by the person in charge of CDM in order to avoid recording errors. The monitoring data of main meters should be saved every month; the regular summary should be made and reported to technology department by statistician periodically; and the person in charge of CDM will review the reported results/data, all monitoring data should be stored in a dedicated cabinet and filed by classification. All data collected as part of monitoring should be archived electronically and be kept at least for 2 years after the end of the last crediting period.

7. Verification

It is expected that the verification of emission reductions generated from the Project will be done according to project participants' requirement. The monitoring team should cooperate with DOE.

B.8. Date of completion of application of methodology and standardized baseline and contact information of responsible persons/ entities

>>

The application of the baseline study and monitoring methodology of the Project was completed on 25/10/2012 by Mr. Li Zongfeng

Email: lizf@accordgetc.com

Tel: +86(0)10 59009566-8008

Fax: +86(0)10 59009566-8001

Website: www.accordgetc.com

Entity: Accord Global Environment Technology Co., Ltd.

The person/entity is not project participant listed in Annex 1.

SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

>>

10/05/2009[21]

The starting date of a CDM project activity is the earliest date at which either the implementation or construction or real action of a project activity begins (Glossary of CDM terms, Version 05). The date of The Diversion Tunnel for Right Bank and Metal Contracture Installation Engineering Contact is determined to be the starting date of the Project according to the definition above.

C.1.2. Expected operational lifetime of project activity

>>

30years-0months

C.2. Crediting period of project activity

C.2.1. Type of crediting period

>>

Renewable

C.2.2. Start date of crediting period

>>

01/02/2013 or on the date of registration of the CDM project activity, whichever is later.

C.2.3. Length of crediting period

7years-0months

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>>

Besides promoting the exploration of the water resources, increasing the exploration efficiency of the whole river basin, adding electricity supply and peak load regulation capacity, releasing contradiction between electricity supply and demand, the construction of the project is also necessary to promote the local sustainable development in social and economic.

The EIA report of the project was undertaken by Kunming Hydropower Investigation, Design & Research Institute, CHECC, which was granted the grade A qualification in EIA by the State Environmental Protection Administration. And the EIA was approved by the Yunnan Province Environmental Protection Bureau in March 2009 (Document No. Yun Huan Shen [2009] No.56)

According to EIA, the environmental impact might caused by the project and the measures were listed in the following.

Land use

The total land occupation area of the Project is 7.534ha, of which, reservoir submerged area is 3.196ha, project construction area is 4.338ha. The detailed information on land occupation area is as follows:

Table D.1 detailed information on land occupation area (Unit: ha)

[21]See Table B.7 Timeline of the Project Implementation

Total occupation area	7.534		
	Reservoir submerged area	Project construction area	
	3.196	4.338	
		Permanent occupation	Temporary use
Farmland	0.302	0.163	0.639
Garden land	0.058	-	-
Forest land	1.314	0.656	2.876
Residential land	0.008	0.001	0.003
Water area and water conservancy area	0.963	-	-
Other land	0.551	-	-

588 persons were impacted directly by the Project, and 242 were resettled by the Project.

The compensation from the Project will promote the agricultural technology investment and water conservancy facilities construction, which will improve the productivity per unit land area and production condition of local villagers.

The Project owner will offer compensation for the local villagers according relevant laws, policies, regulations and rules strictly.

About land pollution, the Project is a clean energy project with utilizing the hydro energy for electricity generation, and does not pollutants; therefore, the Project does not pollute land.

Air pollution

The main pollutants which affect the air quality are dusts and wastes such as NO_x, SO_2, which comes from the concrete mixing, sand-gravel material grinding and sieving, tail gas of transportation vehicle and explosion process. Since the operation points are scattered, and the negative effect caused by the waste gases and dust is very limited.

The labor protection measures such as watering regularly should be adopted for the sake of the air quality and the constructer’s health.

Noise

The noise mainly comes from concrete mixing, comprehensive processing plant, explosion and other flow sound resource.

The constructors are provided with labour protection instruments such as ear mask and earplug in order to reduce the damage. In addition, the working hours should be arranged not at night to avoid disturbing the residents around.

Waste water

There will be waste water coming from production process and daily life. The former, whose major pollutants are suspended substance, mainly comes from sand-stone washing, concrete mixing, foundation pit wastewater and concrete curing, the later is from the emission of the domestic water.

The production wastewater will be first sedimentated then to the second precipitated, during which most suspended substance can be removed. After processing, the waste water will reach the emission standard and can be recycled. Furthermore, the domestic sewage, faces and domestic wastes should be disposed in order and can be used for farm and forest land irrigation.

Water quality has not affected by the existing hydrological structures since hydropower plants do not discharge serious pollutants.

Ecological impact

- Impacts on the function of the aquatic ecological system: the Project will make partial river flat due to the change of water flow and blocking of dams. However the Project will not cause the reduction of water quantity because water after utilization by the Project from the river will be discharge into the river.
- Impacts on the aquatic living beings specially, fishes: Water quality has not affected by the Project since hydropower plant does not discharge pollutants. To mitigate impacts, ecological flow is discharged and so diversity of fishes and the other aquatic living things would be preserved.
- Impacts on the plants/animals in the submerged area: Water area would be increased before construction of the dam, but heat condition around the reservoir would not change very much. So impact on the plants would be very little.

Ecological Flow

To maintain the river ecosystem functions in the downstream, ecological flow was determined as 10% of the average annual water flow at the dam site. And there is a large branch stream (0.84 m^3/s) on 1.6km downstream from the dam and it would help to supplement the water flow between the dam and power house.
Then, in this river section between the dam and the power station biodiversity will be preserved and numerous fishes will be able to live.

Compensation progress and assessment

Land Requisition Compensation Plans was made by Kunming Hydropower Investigation, Design &
Research Institute of CHECC in December 2008. An agreement for Development of Farmland for
Readjustment was made between Project owner and Land Resource Bureau of Luquan County on 11 October 2008 since individual person does not have the right to develop land. Total amount of compensation is 108,013,300RMB for the project. Luquan County Government noticed implementation opinion of resettlement and readjustment of farmland to town governments on 6 May 2010 and instructed fulfill compensation process sincerely so that affected residents would be satisfied with compensation and resettlement.
Local government will develop 46.76ha of farmland and readjust 12.01ha of farmland for 588 people and distribute 0.1ha of farmland per person. And local government will help the affected residents to change planting system from growing traditional grain crops to planting economic crops such as banana and mandarin orange.
And 242 people to be resettled will be supported 600 RMB/person/year for 20 years as after-resettlement subsidy. Compensation payments for occupied land were finished.
When the Jiayan Hydropower station is put into operation, energy shortage of Luquan County would be solved, agricultural industry and service industry such as tourism would be developed.
Project owner has employed 1328 local residents (75% of total workers) during the construction period and will employ 50 local residents (83% of total workers) during the operation period. As

a result of industrial development, job opportunities of local residents would be increased. Land compensation, industrial development and increased job opportunities will improve living standard of local residents.

In summary, the Project will not bring significant impacts to the environment.

D.2. Environmental impact assessment

>>

The Project use clean renewable energy to generate electricity whose environmental impact comply with relevant national laws and regulations. Environmental impacts are considered not significant.

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

>>

During the public's participation, project owner made public on the basic information and environment impact assessment of the Project on government website of Luanquan County in 08/2008 and 11/2008 separately for the public's opinions. At the same time, the questionnaires including the basic information of the Project were distributed for conducting a public consultation[22].

The stakeholders identified for the Project are the residents near the Project and local government staff. The staff of Yunnan Dianneng Luquan Dianlin Development Co., Ltd. made a survey from 25th April, 2011 on related government staff and the villagers living near the project site. The survey was conducted through distributing and collecting responses to a questionnaire. 60 questionnaires are distributed and 60 questionnaires are returned.

Items	Classification	Amount	Proportion
Gender	Male	43	71.7%
	Female	17	28.3%
Nationality	Han	39	65%
	Yi	9	15%
	Zhuang	12	20%
Age	≤20	3	5.0%
	20~29	2	3.3%
	30~39	11	18.3%
	40~49	35	58.3%
	≥50	9	15.0%
Education	Illiteracy	2	3.3%
	Primary school	47	78.3%
	Junior school	2	3.3%
	Senior school	2	3.3%
	University	7	11.67%
Job department	Land Bureau	2	3.3%
	Development and Reform Bureau	2	3.3%
	Water Resource Bueau	2	3.3%

[22] See *Yunnan Province Puduhe Jiayan Hydropower Station Environment Impact Assessment Report* P188~189

	Dengzishang Village, Zehei Town	25	41.7%
	Kazu Village, Zehei Town	3	5.0%
	Zhuji Village, Zehei Town	7	11.7%
	Wande Village, Zehei Town	1	1.7%
	Baogushan Village, Zehei Town	1	1.7%
	Huajiaoyuan Village, Xueshan Town	9	15%
	Luji Village, Wumeng Town	8	13.3%

·What is the attitude of the stakeholders on the construction and operation of the Project?

·What positive impacts will be introduced by the implementation of the Project from the view of stakeholders?

·What negative impacts will be introduced by the implementation of the Project from the view of stakeholders?

·What measures should be applied to reduce the negative impacts from the view of stakeholders?

E.2. Summary of comments received

>>

Based on the 60 returned questionnaires, the summary of the comments are shown as follows:

·All people surveyed (100%) support the construction of the Project.

·Possible positive impacts considered by the people surveyed to be caused by the construction of the Project include increase in income (98.3%) and improvement of living conditions (98.3%).

·Possible negative impacts considered by the people surveyed to be caused by the construction of the Project include land occupation (13.3%).

·All villagers (100%) whose land is occupied are satisfied to land compensation.

E.3. Report on consideration of comments received

>>

Analysis on the desires expected by the people surveyed to be resolved by the Project is as follows:

- The Project owner provides compensation strictly according to the relevant laws and regulations, and all respondents whose land was occupied are satisfied to compensation;
- The Project owner will adopt lower noise construction equipments, and avoid construction activities during rest-time and night-time;
- The Project have not any impact on the arable land that not occupied by the Project, and the Project owner will resume the function of temporarily occupied land as soon as possible after the construction of the Project.
- Solid waste will be backfilled and cleaned up during the construction of the Project.
- The Project constructs strictly according to *Construction Design* and insures construction safety.

To sum up, construction of the Project satisfies the interests and requirement of stakeholders and has gained the necessary support. Based on the comments received from stakeholders, there has been no need to modify the design, construction and operation pattern of the Project.

SECTION F. Approval and authorization

>>

The LoAs from both Project Participants are not available at the time of submitting the PDD to the validating DOE.

Appendix 1. Contact information of project participants and responsible persons/ entities

Project participant and/or responsible person/ entity	√ Project participant ☐ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	Yunnan Dianneng Luquan Dianlin Development Co., Ltd.
Street/P.O. Box	Beijing Road, Panlong District, Kunming City
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State/Region	-
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Contact person	Zhang Huangui
Title	-
Salutation	Mr.
Last name	Zhang
Middle name	-
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Project participant and/or responsible person/ entity	√ Project participant ☐ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
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Appendix 2. Affirmation regarding public funding

There is no public funding from Annex I Parties for this Project.

Appendix 3. Applicability of methodology and standardized baseline

No further information.

Appendix 4. Further background information on ex ante calculation of emission reductions

The emission factors of OM and BM are calculated based on Tool to calculate the emission factor for an electricity system (version 02.2.1)
. The information provided by the tables includes data, data sources and the underlying calculations.
Table 3.1 Electricity generation of the China Southern Power Grid in 2006

Province	Electricity generation (MWh)	Auxiliary electricity consumption (%)	Electricity delivered to the grid (MWh)
Guangdong	188429000	5.27	178,498,792
Guangxi	27967000	4.45	26,722,469
Guizhou	76039000	6.06	71,431,037

Yunnan	39791000	4.12	38,151,611
Total			314,803,908

Data source: China Electric Power Yearbook 2007

Table 3.2 Electricity generation of the China Southern Power Grid in 2007

Province	**Electricity generation (MWh)**	**Auxiliary electricity consumption (%)**	**Electricity delivered to the grid (MWh)**
Guangdong	215,700,000	6.01	202,736,430
Guangxi	36,100,000	7.42	33,421,380
Guizhou	84,300,000	6.62	78,719,340
Yunnan	47,400,000	7.23	43,972,980
Total			358,850,130

Data source: China Electric Power Yearbook 2008

Table 3.3 Electricity generation of the China Southern Power Grid in 2005

Province	**Electricity generation (MWh)**	**Auxiliary electricity consumption (%)**	**Electricity delivered to the grid (MWh)**
Guangdong	210,700,000	6.18	197,678,740
Guangxi	34,200,000	7.14	31,758,120
Guizhou	81,300,000	7.04	75,576,480
Yunnan	41,800,000	7.29	38,752,780
Total			343,766,120

Data source: China Electric Power Yearbook 2009

Table 3.4 Calculation of simple OM emission factor of the China Southern Power Grid in 2006

Fuel	Unit	Guangdong	Guangxi	Guizhou	Yunnan	Total fuel	Default carbon content (tC/TJ)	Oxidation Rate (%)	Emission factor $kgCO_2e/TJ$	NCV (MJ/t or km^3)	Emission (tCO_2e)
							（tc/TJ）	（%）	($kgCO_2/TJ$)	（ MJ/t,km3 ）	$J=E\times H\times I/10^5$(mass)
		A	B	C	D	E=A+B+C+D	F	G	H	I	$J=E\times H\times I/10^4$(volume)
Coal	10^4t	7303.19	1490.01	4001.54	2735.88	**15530.62**	25.8	100	87,300	20,908	283,475,499
Cleaned coal	10^4t					**0**	25.8	100	87,300	26,344	0
Other washed coal	10^4t			19.53	45.8	**65.33**	25.8	100	87,300	8,363	476,968
Briquette	0^4t	133.75				**133.75**	26.6	100	87,300	20,908	2,441,296
Coke	10^4t				1.31	**1.31**	29.2	100	95,700	28,435	35,648
Coke oven gas	10^8 m^3		0.84		2.06	**2.9**	12.1	100	37,300	16,726	180,925
Other gas	10^8 m^3	0.89			19.15	**20.04**	12.1	100	37,300	5,227	390,714
Crude oil	10^4t	0.87				**0.87**	20	100	71,100	41,816	25,866
Gasoline	10^4t					**0**	18.9	100	67,500	43,070	0
Diesel oil	10^4t	29.92	1.26		3	**34.18**	20.2	100	72,600	42,652	1,058,396
Fuel oil	10^4t	685.85	0.09			**685.94**	21.1	100	75,500	41,816	21,655,867
LPG	10^4t					**0**	17.2	100	61,600	50,179	0
Refinery gas	10^4t					**0**	15.7	100	48,200	46,055	0
Nature gas	10^8 m^3	7.92				**7.92**	15.3	100	54,300	38,931	1,674,251
Other oil products	10^4t	0.67				**0.67**	20	100	72,200	41,816	20,228
Other coking products	10^4t					**0**	25.8	100	95,700	28,435	0
Other energy	10^4t Ce	93.54	189.68		20.29	**303.51**	0	0	0	0	0

										total	311,435,658
Total emission of the China Southern Power Grid (tCO_2e) K						311,436,583					
Imported electricity from the Central China Grid (MWh) L						21,730,840					
Emission factor of Central China Grid (tCO_2e/MWh) M						1.12157					
Total emission (tCO_2e) N_{2006}=K+ L*M						335,809,186					
Total electricity supply (MWh) O_{2006}						336,534,748					

Data sources: China Energy Statistical Yearbook 2007

Table 3.5 Calculation of simple OM emission factor of the China Southern Power Grid in 2007

Fuel	**Unit**	**Guangdong**	**Guangxi**	**Guizhou**	**Yunnan**	**Total fuel**	**Default carbon content (tC/TJ)**	**Oxidation Rate (%)**	**Emission factor $kgCO_2e/TJ$**	**NCV (MJ/t or km^3)**	**Emission (tCO_2e)**
							（tc/TJ）	**（%）**	**($kgCO_2/TJ$)**	**（ MJ/t,km3 ）**	**J=E×H×I/10^5(mass)**
		A	**B**	**C**	**D**	**E=A+B+C+D**	**F**	**G**	**H**	**I**	**J=E×H×I/10^4(volume)**
Coal	10^4t	8214.78	1750.63	4298.8	3170.79	**17435**	25.8	100	87,300	20,908	318,235,546
Cleaned coal	10^4t	3.46				**3.46**	25.8	100	87,300	26,344	79,574
Other washed coal	10^4t		0.65	21.58	14.64	**36.87**	25.8	100	87,300	8,363	269,184
Briquette	0^4t	271.25				**271.25**	26.6	100	87,300	20,908	4,951,041
Coke	10^4t	0.04	1.69		2.15	**3.88**	29.2	100	95,700	28,435	105,584
Coke oven gas	10^8 m^3		0.96	3.19	1.8	**5.95**	12.1	100	37,300	16,726	371,208
Other gas	10^8 m^3		30.77		21.63	**52.4**	12.1	100	37,300	5,227	1,021,628
Crude oil	10^4t					**0**	20	100	71,100	41,816	0
Gasoline	10^4t					**0**	18.9	100	67,500	43,070	0
Diesel oil	10^4t	21.37	2.13		2.29	**25.79**	20.2	100	72,600	42,652	798,596
Fuel oil	10^4t	467.97	0.41			**468.38**	21.1	100	75,500	41,816	14,787,262
LPG	10^4t					**0**	17.2	100	61,600	50,179	0
Refinery gas	10^4t	0.37				**0.37**	15.7	100	48,200	46,055	8,213
Nature gas	10^8 m^3	32.17				**32.17**	15.3	100	54,300	38,931	6,800,588
Other oil products	10^4t	8.47				**8.47**	20	100	72,200	41,816	255,719
Other coking products	10^4t					**0**	25.8	100	95,700	28,435	0
Other energy	10^4t Ce	118.04	81.89	44.1	50.3	**294.33**	0	0	0	0	0

										total	347,684,143
Total emission of the China Southern Power Grid (tCO_2e) K						347,684,143					
Imported electricity from the Central China Grid (MWh) L						24,237,240					
Emission factor of Central China Grid (tCO_2e/MWh) M						1.10197					
Total emission (tCO_2e) N_{2007}=K+ L*M						374,392,940					
Total electricity supply (MWh) O_{2007}						383,087,370					

Data sources: China Energy Statistical Yearbook 2008

Table 3.6 Calculation of simple OM emission factor of the China Southern Power Grid in 2008

Fuel	**Unit**	**Guang dong**	**Guan gxi**	**Guizh ou**	**Yunna n**	**Total fuel**	**Default carbon content (tC/TJ)**	**Oxidation Rate (%)**	**Emission factor $kgCO_2e/TJ$**	**NCV (MJ/t or km^3)**	**Emission (tCO_2e)**
							（tc/TJ）	**（%）**	**($kgCO_2/TJ$)**	**（ MJ/t,km3 ）**	**$J=E \times H \times I/10^5$(mass)**
		A	**B**	**C**	**D**	**E=A+B +C+D**	**F**	**G**	**H**	**I**	**$J=E \times H \times I/10^4$(volume)**
Coal	10^4t	8001.54	1513.1	4117.45	2766.85	**16398.94**	25.8	100	87,300	20,908	299,324,670
Cleaned coal	10^4t	2.31				**2.31**	25.8	100	87,300	26,344	53,126
Other washed coal	10^4t		0.08	13.38	57.11	**70.57**	25.8	100	87,300	8,363	515,224
Briquette	0^4t	297.43				**297.43**	26.6	100	87,300	20,908	5,428,896
Coke	10^4t	3.24	1.73		2.74	**7.71**	29.2	100	95,700	28,435	209,807
Coke oven gas	10^8 m^3		1.55	3.92	2.17	**7.64**	12.1	100	37,300	16,726	476,644
Other gas	10^8 m^3	1.09	29.6		35.71	**66.4**	12.1	100	37,300	5,227	1,294,582
Crude oil	10^4t					**0**	20	100	71,100	41,816	0
Gasoline	10^4t	0.01				**0.01**	18.9	100	67,500	43,070	291
Diesel oil	10^4t	10.46	0.97		2.28	**13.71**	20.2	100	72,600	42,652	424,535
Fuel oil	10^4t	344.59	0.24			**344.83**	21.1	100	75,500	41,816	10,886,656
LPG	10^4t					**0**	17.2	100	61,600	50,179	0
Refinery gas	10^4t	0.76				**0.76**	15.7	100	48,200	46,055	16,871
Nature gas	10^8 m^3	35.6				**35.6**	15.3	100	54,300	38,931	7,525,674
Other oil products	10^4t	7.3				**7.3**	20	100	72,200	41,816	220,395
Other coking products	10^4t					**0**	25.8	100	95,700	28,435	0
Other energy	10^4t Ce	120.17	103.26	89.44	42.63	**355.5**	0	0	0	0	0

<table>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>total</td><td>326,377,370</td></tr>
<tr><td colspan="6">Total emission of the China Southern Power Grid (tCO_2e) K</td><td colspan="6">326,377,370</td></tr>
<tr><td colspan="6">Imported electricity from the Central China Grid (MWh) L</td><td colspan="6">22,342,090</td></tr>
<tr><td colspan="6">Emission factor of Central China Grid (tCO_2e/MWh) M</td><td colspan="6">1.04205</td></tr>
<tr><td colspan="6">Total emission (tCO_2e) N_{2008}=K+ L*M</td><td colspan="6">349,658,904</td></tr>
<tr><td colspan="6">Total electricity supply (MWh) O_{2008}</td><td colspan="6">366,108,210</td></tr>
</table>

Data sources: China Energy Statistical Yearbook 2009

$EF_{OM,y}$= (N_{2006}+N_{2007}+N_{2008})/ (O_{2006}+O_{2007}+O_{2008}) = 0.97617tCO_2e/MWh

Table 3.7 Data and result of Step (1)

Fuel	**Unit**	**Guangdong** **A**	**Guangxi** **B**	**Guizhou** **C**	**Yunnan** **D**	**Total fuel** **E=A+B+C+D**	**NCV (MJ/t or 1000m^3)** **F**	**Default carbon content (tC/TJ)** **G**	**Oxidation Rate** **H**	**Emission (tCO_2e)** **I**[23]
Coal	10^4t	8,001.54	1,513.10	4,117.45	2,766.85	16,398.94	20,908	87,300	1	299,324,670
Cleaned coal	10^4t	2.31	0	0	0	2.31	26,344	87,300	1	53,126
Other washed coal	10^4t	0	0.08	13.38	57.11	70.57	8,363	87,300	1	515,224
Briquete	10^4t	297.43	0	0	0	297.43	20,908	87,300	1	5,428,896
coke	10^4t	3.24	1.73	0	2.74	7.71	28,435	95,700	1	209,807
Other coke product		0	0	0	0	0.00	28,435	95,700	1	0
Total solid fuel										**305,531,723**
Oil	10^4t	0	0	0	0	0	41,816	71,100	1	0
Gasoline	10^4t	0.01	0	0	0	0.01	43,070	67,500	1	291
Diesel oil	10^4t	10.46	0.97	0	2.28	13.71	42,652	72,600	1	424,535
Fuel oil	10^4t	344.59	0.24	0	0	344.83	41,816	75,500	1	10,886,656
Other oil products	10^4t	7.3	0	0	0	7.3	41,816	72,200	1	220,395
Total liquid fuel										**11,531,876**
Nature gas	10^7m^3	356	0	0	0	356	38,931	54,300	1	7,525,674
Coke oven gas	10^7m^3	0	15.5	39.2	21.7	76.4	16,726	37,300	1	476,644
Other coal gas	10^7m^3	10.9	296	0	357.1	664	5,227	37,300	1	1,294,582
LPG	10^4t	0	0	0	0	0	50,179	61,600	1	0
Finery gas	10^4t	0.76	0	0	0	0.76	46,055	48,200	1	16,871
Total gas fuel										**9,313,770**
Total										**326,377,369**

Data sources: China Energy Statistical Yearbook 2008

[23] $I=E\times F\times G\times H/10^5$

Table 3.8 Emission factor of best technology

	Variable	Electricity supply efficiency	Carbon content of fuel* (tC/TJ)	Oxidation rate*	Emission factor (tCO_2/MWh)
		A	B	C	D=3.6/A/1000*B*C44/12
Coal-based power plants	$EF_{Coal,Adv}$	39.08	87,300	1	0.8042
Gas-based power plants	$EF_{Gas,Adv}$	51.46	75,500	1	0.5282
Oil-based power plants	$EF_{Oil,Adv}$	51.46	54,300	1	0.3799

Calculate with formula (4), (5) and (6), the value for λ_{Coal} is 93.61%, the value for λ_{Oil} is 3.54% and the value for λ_{Gas} is 2.85%. Therefore $EF_{Thermal,y} = \lambda_{Coal,y} \times EF_{Coal,Adv,y} + \lambda_{Oil,y} \times EF_{Oil,Adv,y} + \lambda_{Gas,y} \times EF_{Gas,Adv,y}$ = 0.7823tCO_2/MWh

Table 3.9 Installed capacity of the China Southern Power Grid in 2008

	Guangdong	Guangxi	Yunnan	Guizhou	Total
Thermal power (MW)	45,730	10,270	10,030	17,170	83,200
Hydro power (MW)	10,280	13,970	15,740	9,470	49,460
Nuclear power (MW)	3,780	0	0	0	3,780
Wind power and Other (MW)	290	0	80	0	370
Total (MW)	60,080	24,240	25,850	26,640	136,810

Data source: China Electric Power Yearbook 2009

Table 3.10 Installed capacity of the China Southern Power Grid in 2007

	Guangdong	Guangxi	Yunnan	Guizhou	Total
Thermal power (MW)	44,710	9,310	10,630	15,960	80,610
Hydro power (MW)	10,110	10,440	11,580	8,210	40,340
Nuclear power (MW)	3,780	0	0	0	3,780
Wind power and Other (MW)	250	0	0	0	250
Total (MW)	58,850	19,750	22,210	24,170	124,980

Data source: China Electric Power Yearbook 2008

Table 3.11 Installed capacity of the China Southern Power Grid in 2006

	Guangdong	Guangxi	Yunnan	Guizhou	Total
Thermal power (MW)	40,615	5,434	8,564	14,350	68,963

Hydro power (MW)	9,320	7,624	9,698	7,534	34,176
Nuclear power (MW)	3,780	0	0	0	3,780
Wind power and Other (MW)	183	0	0	0	183
Total (MW)	53,898	13,058	18,262	21,884	107,102

Data source: China Electric Power Yearbook 2007

Table 3.12 Calculation of BM emission factor of the China Southern Power Grid

	Installed capacity in 2006 (MW)	**Installed capacity in 2007 (MW)**	**Installed capacity in 2008 (MW)**	**Capacity additions from** 2006 to2008[1]	**Capacity additions from** 2007 to2008[2]	**Share in total capacity additions**
	A	B	C	D	E	F
Thermal power	68,963	80,610	83,200	21,412	6,030	57.60%
Hydro power	34,176	40,340	49,460	15,572	9,317	41.89%
Nuclear power	3,780	3,780	3,780	0	0	0.00%
Wind power and other	183	250	370	187	120	0.50%
Total	**107,102**	**124,980**	**136,810**	**37,171**	**15,467**	100.00%
Share in 2008				27.17%	11.31%	

Note 1 and note 2 refer to capacity additions considers installed capacity, capacity of shut-down power units, capacity of pumped storage power units.

$EF_{BM,y}$ =0.7823×57.6%=0.4506tCO_2/MWh

Appendix 5. Further background information on monitoring plan

No other additional information

Appendix 6. Summary of post registration changes

The Project Participant of Netherlands, Baraka Global Advisors, has been withdraw on 07/08/2014.