



GUIZHOU QINGSHUIHE GELIBRIDGE HYDROPOWER PROJECT



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1 PROJECT DETAILS

1.1 Summary Description of the Project

Guizhou Qingshuihe Gelibridge Hydropower Project (hereafter referred to as the project) is to utilize the hydro resource for renewable electricity generation through the construction of a 150MW (2*75MW) hydropower plant located at Maoyun village in Kaiyang county of Guizhou province, the People's Republic of China. The owner of the project is Guizhou Wujiang Qingshuihe Hydropower Development Co., Ltd. The construction of the hydropower plant started in June of 2007. Partial operation of the project (1 of 2 turbines) commenced on 06/02/2010 and full operation (2 of 2 turbines) started on 12/03/2010. The electricity generated by the project is 508GWh annually, of which 497.3 GWh is supplied to the South China Power Grid via the local Guizhou Power Grid.

The project is a grid-connected renewable energy project by replacing grid electricity, which otherwise would have been produced mainly by fossil fuel fired power plants. The scenario existing prior to the start of implementation of the project activity is the provision of equivalent quantity of electricity generated mostly by fossil fuel fired power plants (coal) connected to the South China Power Grid. The baseline scenario is the same as the scenario existing prior to the start of implementation of the project activity. The estimated annual GHG emission reductions of the project are 179,625tCO₂e and the total GHG emission reductions are 1,796,250tCO₂e during the second crediting period from 06/02/2020 to 05/02/2030.

The project was registered with the VCS registry with the registration number 656. VCS VCUs from 06/02/2010 to 03/10/2010 were issued already.

1.2 Sectoral Scope and Project Type

Sectoral Category: 1 – Energy industries (renewable / non-renewable sources)

Project Activity: Grid-connected renewable power generation from a hydropower plant with a reservoir.

The project is not a grouped project, which is defined by the VCS standard v4.1 as a number of projects and their related methodologies included in a single VCS PD at the time of the validation. The project is a single project at a single location.

1.3 Project Eligibility

- The project does not generate GHG emissions primarily for the purpose of their subsequent reduction, removal or destruction;
- The project does not have created another form of environmental credit.

The project is eligible under the scope of the VCS program in accordance with VCS 2007.1 when the project was accepted by the VCS board. And the eligibility is still valid during the second crediting period.

1.4 Project Design

The project is designed to include a single installation of an activity.

Eligibility Criteria

Not applicable, the project is not a grouped project.

1.5 Project Proponent

Organization name	Guizhou Wujiang Qingshuihe Hydropower Development Co., Ltd.
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1.6 Other Entities Involved in the Project

Organization name	Beijing Sindicatum Clean Energy Technology and Services Co., Ltd.
Role in the project	VCU Buyer
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1.7 Ownership

The project owner is Guizhou Wujiang Qingshuihe Hydropower Development Co., Ltd., who has the full ownership of the project. The approval of Environmental Impact Assessment (EIA) and Feasibility Research Report (FSR) from local government, LoA for the project as a CDM project issued by China National Development and Reform Commission, and the business license are evidences for legislative right of the project owner. Besides, the equipment purchasing contract and the power-sale agreement are also evidences for the ownership of the plant, equipment and power generated.

1.8 Project Start Date

The project start date is 06/02/2010 when the electricity was generated and supplied to the South China Power Grid.

1.9 Project Crediting Period

The project crediting period is ten years, twice renewable for a total of 30 years. However, the project is also registered as a CDM project with a seven year twice renewable crediting period, it is not eligible for VCU issuance beyond the end of those 21 years. The project first crediting period is from 06/02/2010 to 05/02/2020. Now the project second crediting period from 06/02/2020 to 05/02/2030 is going to be renewed. .

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	✓
Large project	

Year	Estimated GHG emission reductions or removals (tCO _{2e})
06/02/2020-05/02/2021	179,625
06/02/2021-05/02/2022	179,625
06/02/2022-05/02/2023	179,625
06/02/2023-05/02/2024	179,625
06/02/2024-05/02/2025	179,625
06/02/2025-05/02/2026	179,625

06/02/2026-05/02/2027	179,625
06/02/2027-05/02/2028	179,625
06/02-2028-05/02/2029	179,625
06/02/2029-05/02/2030	179,625
Total estimated ERs	1,796,250
Total number of crediting years	10
Average annual ERs	179,625

1.11 Description of the Project Activity

Guizhou Qingshuihe Gelibridge Hydropower Project involves the installation of two sets of 75MW turbine generator (total installed capacity of 150MW). The main construction works of the project includes dam gates, flood discharge gates, power house and switch station, etc. The main equipment, such as the turbines, generators and transformers, are all made in China. The manufacturer of the turbine and generator sets is Tianjin Tianfa Heavy Hydropower Equipment, a well-known company in Chinese hydropower equipment manufacture industry. The power generation technology to be used by this project is commonly used in China, and has proven to be reliable and unlikely to be replaced during the project lifetime. The key technical specifications for the installed equipment are shown as follows:

Table 1. Key Project Technical Specifications

Items	Parameter
Total installed capacity	150MW
Model for the turbines (installed)	HL 233-LJ-328
Model for the generators (installed)	SF75-28/7300
Estimated amount of electricity uploaded to the grid annually	497.3GWh
Normal water level	719m
Reservoir size under normal water level	2.13Km ²
Rated water head	84m
Average flow rate over years	82.3m ³ /s

1.12 Project Location

The project is located at Maoyun village in Kaiyang county of Guizhou province, the People's Republic of China. The dam is located at 27°00'30"N and 107°12'22"E (Google Earth coordinates 27.008333 and 107.206111) and the power plant is located at 27°00'33"N and 107°12'02"E (Google Earth coordinates 27.009167 and 107.200556). The project is located 108km away from Guiyang and 15km away from Maoyun Village in Kaiyang County.



Figure 1. Location of Guizhou province in China

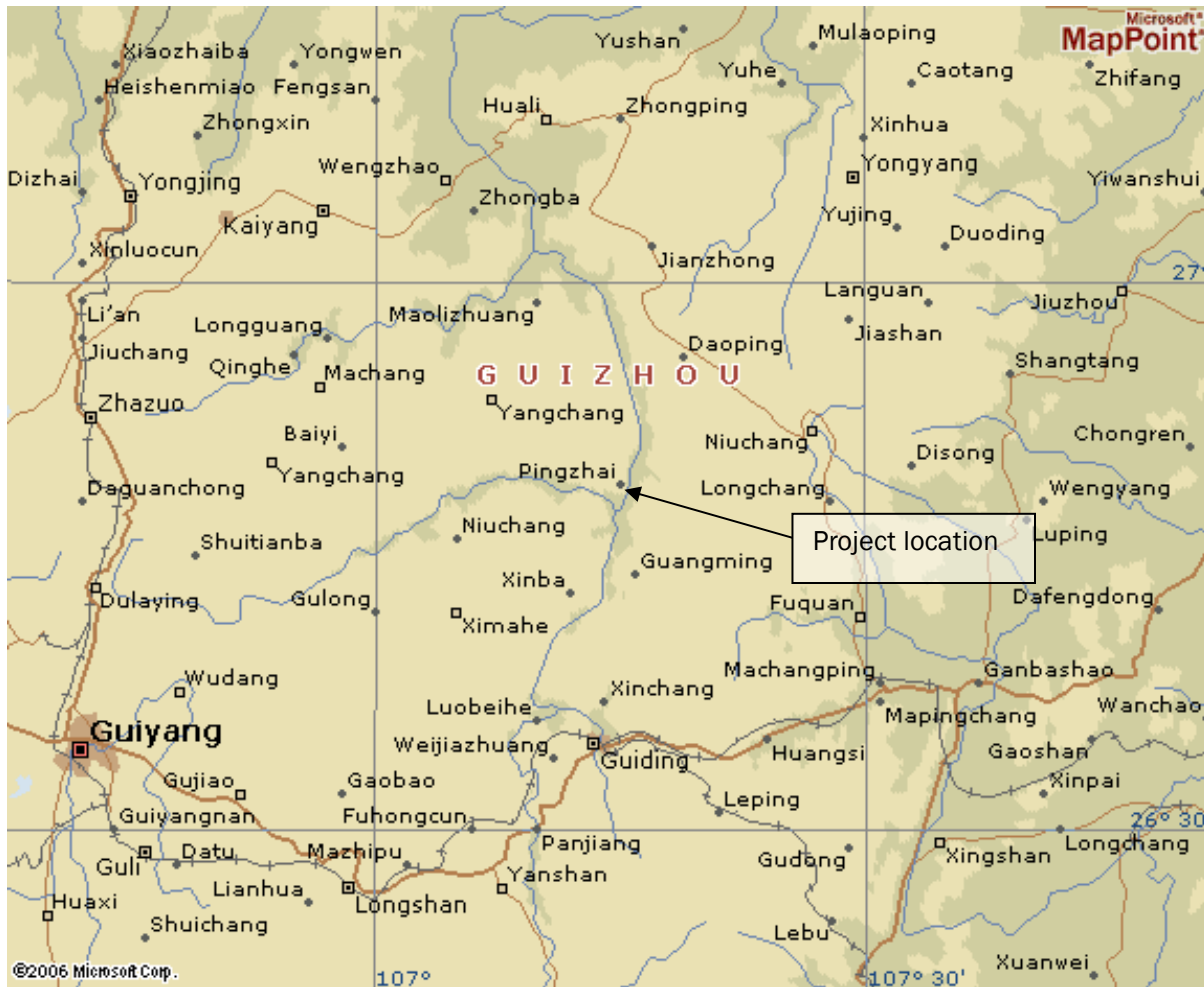


Figure 2. Location of the project

1.13 Conditions Prior to Project Initiation

The scenario existing prior to the implementation of the project activity is the South China Power Grid providing the same electricity service as the project. The South China Power Grid is predominantly composed by fossil fuel fired power plants.

The baseline scenario is the same as the scenario existing prior to the implementation of the project activity.

The project activity is the installation and operation of a hydropower plant with the total installed capacity of 150MW which supply estimated average annual electricity of 497.3GWh to the South China Power Grid and replace the same amount of electricity generated mostly by fossil fuel fired power plants connected to the grid.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project is a hydropower power generation project and meets all the relevant laws, statutes and regulations of the People's Republic of China. Approval letters for the implementation of the project issued by Guizhou Province Development and Reform Commission on 04/06/2007 (Approval No. [2007]701) and Guizhou Environmental Protection Bureau on 27/09/2006 (Approval No. [2006]390) are still valid now.

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

The project has been registered as a Clean Development Mechanism (CDM) project in UNFCCC on 04/10/2010 (UNFCCC Ref. No. 3351), with the seven-year crediting period, twice renewable for a total of 21 years, starting from 04/10/2010. GHG emission reductions of 717,593 tCO₂e generated from 04/10/2010 to 31/08/2012 (both days included) by the project has been issued as CDM CERs (please refer to <https://cdm.unfccc.int/Projects/DB/TUEV-SUED1265278332.26/view> for more details).

1.15.2 Projects Rejected by Other GHG Programs

The project has not been rejected by other GHG programs.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

The project does not reduce GHG emissions from activities that are included in an emissions trading program or any other mechanism that includes GHG allowance trading.

1.16.2 Other Forms of Environmental Credit

The project has not sought or received any other forms of GHG-related environmental credit, including renewable energy certificates.

1.17 Additional Information Relevant to the Project

Leakage Management

Not applicable.

Commercially Sensitive Information

No commercially sensitive information has been excluded from the public version of the project description.

Sustainable Development

The project helps to fulfil the objectives of the Rural China Plan to improve the standard of living for the rural population. Other ways in which the project activity contributes to sustainable development are set out below:

Climate change benefits: The project activity achieves obvious greenhouse gas (CO₂) emission reductions by generating renewable energy and displacing fossil fuel-fired power from the South China Power Grid

Economic impacts: Guizhou is the second poorest province in China after Tibet. During the construction phase, there will be employment opportunities for the local people, which will significantly add to their income. The project is located in a very remote area and consequently, the project has brought infrastructure improvements, including road access, which had a massive impact on the quality of life of local residents. Mobile phone coverage and fixed-line telephones have been installed, providing internet access to the village for the first time.

Environmental impacts: By increasing renewable energy capacity, the project will displace electricity that may have been generated from fossil fuel fired power plants, such as coal, and consequently will deliver improved air quality, both locally and globally, by reducing NO_x, SO_x and CO₂ emissions.

Social impacts: The construction, operation and maintenance will provide employment opportunities for the region. For example, see <http://www.china.org.cn/english/China/164278.htm> which highlights Chinese 11th 5-year plan to help reduce poverty in Guizhou Province. The project which resulted in new or improved transport links also improved access to potable water and water for localized irrigation. Additionally, the project will provide cheaper electricity for the villages directly adjacent to the power plants.

Further Information

No further information.

2 SAFEGUARDS

2.1 No Net Harm

There are no negative environmental and/or socio-economic impacts due to the project.

2.2 Local Stakeholder Consultation

In order to collect stakeholder's comments, the project owner sponsored two stakeholder consultation meetings. The project owner pasted bulletins at markets around the project site to inform local stakeholders before distributing questionnaires. Furthermore, the project owner also entrusted the local government to distribute the questionnaires to local stakeholders, such as the migrant population. The geographic scope of the survey involved the Maoli, Duimen and Jiangshan villages. On 22/11/2006, the project owner held the first consultation meeting in Guiyang. Based on the EIA, the local stakeholders identified include the workers from the surrounding villages (such as Pingzhai Village). In addition, relevant stakeholders were also invited. Due to their involvement in the project approval process, the Environmental Protection Bureau (responsible for the approval of project EIA) and the local Development and Reform Committee (DRC responsible for project approval) were included as key stakeholders. As the project involves power generation, the Power Company was identified as a stakeholder. Participants of the first consultation meeting included investors and officials from Guizhou DRC, provincial power grid company, Municipal Council of Kaiyang, DRC of Kaiyang and Environmental Protection Bureau of Kaiyang, etc. On 24/11/2006, the second consultation meeting was held at Maoyun village, which was hosted by the project owner and attended by local farmers.

In April 2007, the project owner conducted a survey amongst local farmers to further gather stakeholder's comments on the project. During this activity, 99 questionnaires were delivered to the farmers. The return rate of the questionnaires was 100%. Questions include:

- How much do you know about hydro-power projects and the project?
- Do you think the implementation of the project will bring any positive influence to your current life?
- Do you think the implementation of the project will bring any negative influence to your current life?
- What extent of impact will the project bring to the local environment?
- Do you think that the implementation of the project will bring any influence on the local economy?
- Generally speaking, what is your attitude to the construction of the project?
- Other suggestions

During the consultation meetings, all of the government and regulatory officials were very supportive of the project. They think that the implementation of the project will exert positive influence on the local energy structure, economic development and tourism industry.

The villagers were very proud to host a hydropower project because they felt that it would be beneficial for their environment, in comparison to a coal-fired power plant. They were

aware of many benefits, including: road access, piped drinking water, tourism potential, the construction of a central market, installation of mobile phone and fixed line telephones, etc.

All shareholders who participated in both of the meetings agreed with the construction of the project and looked forward to it. No objections were received during the consultation meetings.

According to the statistical results from the questionnaires, all stakeholders agreed to and supported the implementation of the project. Meanwhile, some different comments and suggestions were also received, but no objections. The details are shown below:

1. 100% of the participants questioned expressed that they had some knowledge about hydropower projects and the project. Some of them expressed that they have only a little knowledge on hydropower and the project;
2. 89.90% of the participants were willing to relocate for the project;
3. 77.55% of the participants thought that the project will bring them a positive or no change to their lives;
4. 69.70% of the participants indicated that they were willing to partake in the construction of the project;
5. 85.86% of the participants felt that the project would have a positive or no change to the local economy;
6. 45.12% of the participants felt that they had been well or adequately compensated for their relocation;
7. All participants support the implementation of the project.

On-going communication with local stakeholders

A grievance book is kept at the project owner office. Anyone can go there and record their grievance or comment in the book. The project owner personnel will review and respond to the comments and record the response in the book as well. Meanwhile, the local authority has also conducted spot checks on the implementation of the project from time to time as per the request from the local governments' regulations. There are no negative comments received for the project. In line with VCS requirements all the processes have been implemented to receive comments from local stakeholders as well as communicate with them at periodic intervals.

2.3 Environmental Impact

According to the Environmental Impact Assessment (EIA) report, the environmental effects caused by the project include:

1. Noise Impact

The project owner will use equipment that meets national standards. The project owner also will take several measures to mitigate noises levels produced during the project construction period, such as strengthening construction management, limiting the construction time at night, banning blasting activities during the night time, and limiting the speed of and banning honking when transport vehicles pass through the villages. As for the construction workers, the project owner will provide noise-proof equipment in line with national regulations.

2. Sewage

The waste water created from construction will be properly treated via usage of a sand basin and sedimentation basin. The water is recycled after treatment. The sewage produced during the construction and operation periods will be treated by integrated organic sewage treatment equipment. All the sewage discharged will meet the requirement of the first level standard of “Sewage discharge standards” (GB8978-1996).

3. Waste Residue

The project owner established two waste residue fields. In order to avoid water and soil loss caused by residue slipping, the waste residue field will be kept flat. Also, water and soil conservation measures will be undertaken to avoid water and soil loss. Vegetation protection and restoration will be carried out after the construction period.

4. Air Pollution

Sprinklers will be used in the construction area to reduce dust in the excavation and blasting areas. Concrete Mixing System will be equipped with a dust catcher to limit the dust levels on site. Construction workers will be supplied with dustproof respirators.

5. Ecological Impact

In order to reduce ecological impacts during the construction period, measures, such as marking the construction area clearly and banning the activities of smoking, hunting, and fishing in the area, were taken. The construction operations and construction seasons will be strictly controlled to prevent water and soil lost during the construction period from entering into the waters. In the construction area, topsoil should be stored and protected properly so that it can be reused to refill the temporarily occupied land. The project involves a small number of migrants, and they have been properly resettled.

2.4 Public Comments

No comments received during the first Global Stakeholder Consultation Process from 01/02/2007 to 02/03/2007 on TUV SUD website and the 2nd Global Stakeholder Consultation Process from 03/04/2009 to 02/05/2009 on CDM website during CDM validation.

2.5 AFOLU-Specific Safeguards

Not applicable.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

The project activity is a registered CDM project (UNFCCC Reference No. 3351) that applies the following CDM methodology and tools, which are approved by the VCS Board:

- Approved consolidated baseline methodology ACM0002 “Grid-connected electricity generation from renewable sources” (version 20.0)
- “Tool to calculate the emission factor for an electricity system” (version 07.0)
- “Assessment of the validity of original/current baseline and update of the baseline at the renewal of the crediting period” (version 03.0.1)
- “Baseline, Project and/or leakage emissions from electricity consumption and monitoring of electricity generation (version 03.0)”

For more information regarding the methodology and tools, please refer to: <https://cdm.unfccc.int/methodologies/DB/XP2LKUSA61DKUQC0PIWPGWDN8ED5PG>.

3.2 Applicability of Methodology

1. ACM0002 “Grid-connected electricity generation from renewable sources” (version 20.0)

The Guizhou Qingshuihe Gelibridge Hydropower Project is a grid-connected renewable power generation project which fully meets all the applicability requirements stated in the ACM0002 version 20.0, as shown below:

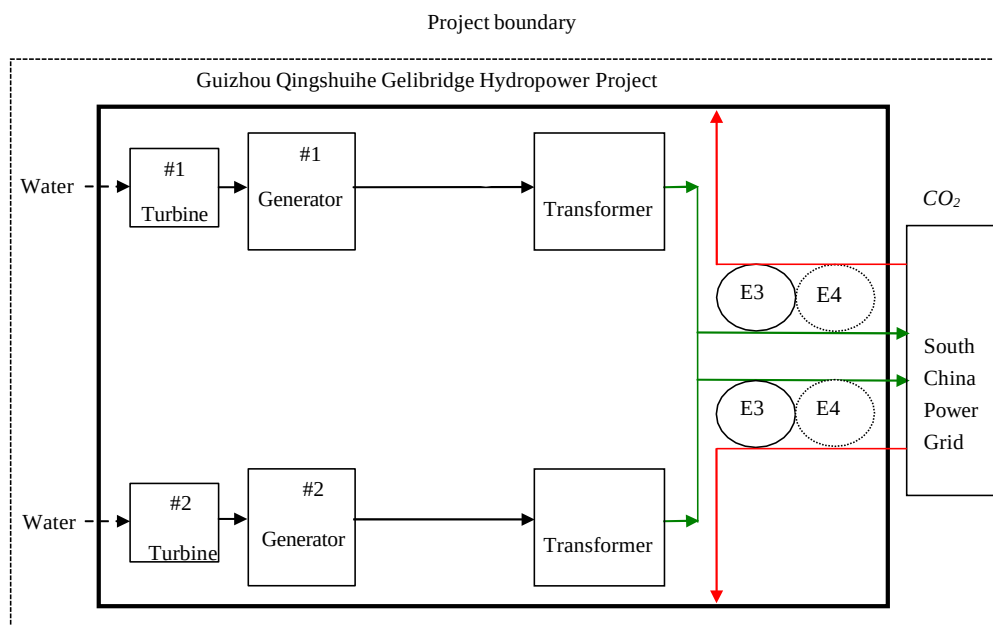
- The project is to install a greenfield power plant, which is the case of 3(a) of ACM0002;
- The project activity includes hydropower plant with a reservoir, which is the case of 4(a) of ACM0002;

- The project activity results in new single reservoir and the power density calculated is 71.09W/m² at the start of the second crediting period, which is greater than 4 W/m², this is the case of 5(c) of ACM0002;
 - The project activity is not the case 7 of ACM0002:
 - (a) It does not involve switching from fossil fuels to renewable energy sources at the site of the project activity, and
 - (b) It is not a biomass fired power plant.
2. “Tool to calculate the emission factor for an electricity system” (version 07.0)
- The project activity supplies electricity to the South China Power Grid and substitutes grid electricity, according to item 3 of the tool, it can be applied to estimate the OM, BM and/or CM when calculating baseline emissions.
3. “Assessment of the validity of original/current baseline and update of the baseline at the renewal of the crediting period” (version 03.0.1)
- The first crediting period of the project activity was from 06/02/2010 to 05/02/2020. In accordance with VCS-Standard v4.1, the validation report shall be issued after the end of the (previous) project crediting period but within two years after the end of the (previous) project crediting period. It is quite urgent for the project to have the crediting period renewed. This tool provides a stepwise procedure to assess the continued validity of the baseline and to update the baseline at the renewal of the second crediting period.
4. “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” (version 03.0)
- This tool is used to monitor the net electricity generation that is produced and fed into the grid as a result of the implementation of the project activity.

3.3 Project Boundary

The boundary of the project includes all of the equipment and instruments installed in the system from the reservoir immediately leading up to the power output at the transformer substation, as well as all the power plants that are connected to the South China Power Grid. According to “Chinese Regional Grid Baseline Emission Factors 2019¹” issued by Chinese DNA, the areas covered by the South China Power Grid include Guangdong, Guangxi, Yunnan, Guizhou and Hainan. Figure 3 shows the boundary of the project.

¹ http://www.mee.gov.cn/ywgz/ydqhbh/wsqtz/202012/t20201229_815386.shtml



Legend

(E) = Electricity Meter

(E) = Back-up Electricity Meter

→ Exported electricity flow = 497.3GWh

→ Self-consumed electricity flow = 0.508GWh

Figure 3. Diagram of project boundary

Source		Gas	Included?	Justification/Explanation
Baseline	CO ₂ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO ₂	Yes	Main emission source
		CH ₄	No	Minor emission source
		N ₂ O	No	Minor emission source
Project	For hydro power plants, emissions of CH ₄ from the reservoir	CO ₂	No	Minor emission source
		CH ₄	No	The power density of the reservoir is 71.09 w/m ² which is greater than 10W/m ²
		N ₂ O	No	Minor emission source

3.4 Baseline Scenario

The baseline scenario in the first crediting period of the project activity is the provision of the equivalent quantity of electricity via the South China Power Grid.

For the second crediting period, the validity of the original baseline should be assessed.

In accordance with “Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period” (version 03.0.1), the validity of the current baseline is assessed using the following steps:

Step 1: Assess the validity of the current baseline for the next crediting period

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies

There are no new national and/or sectoral policies that could affect the baseline scenario during the renewal of the crediting period. In the absence of the project activity, the same quantity of electricity would still have been provided by the South China Power Grid. The current baseline still complies with all relevant mandatory national and sectoral policies which have come into effect after the submission of the project activity for validation and are still applicable at the time of requesting renewal of the second crediting period.

Step 1.2: Assess the impact of circumstances

The baseline scenario identified at the validation of the project activity was the continuation of the current practice without any investment. The investment environment or market characteristics especially the feed-in tariff, the policy in terms of market access permit, these circumstances continue during the second crediting period and do not have an impact on the current baseline emissions. As reviewed with the China Electric Power Yearbook 2014-2018, the electricity supplied to South China Power Grid from fossil fuel is 54.38%, coal fired power plant(s) is still the dominated power supplied to the grid. Hence the current baseline does not need to be updated.

Step 1.3: Assess whether the continuation of use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested.

The project is a greenfield project. The lifetime of turbines and generators is 45 years² and 40 years³ respectively as per the evidence documents for the Project Description. The lifetime of the project and main equipment exceeds the second crediting period (06/02/2020-05/02/2030). The current baseline equipment will continue its use and there will be no investment in the second crediting period for which renewal is requested.

Step 1.4: Assessment of the validity of the data and parameters

Data and parameters that need to be updated are as follows:

² P.48, “Equipment Purchasing Contract for Turbines Generators and Auxiliary Equipment Signed between Guizhou Wujiang Qingshuihe Hydropower Development CO., LTD. and Tianjin Tianfa Heavy Hydropower Equipment Manufacturing CO., LTD.” GLQ-JD-02, 10/06/2007.

³ P.86, “Equipment Purchasing Contract for Turbines Generators and Auxiliary Equipment Signed between Guizhou Wujiang Qingshuihe Hydropower Development CO., LTD. and Tianjin Tianfa Heavy Hydropower Equipment Manufacturing CO., LTD.” GLQ-JD-02, 10/06/2007.

$EF_{grid,CM,y}$: the baseline emission factor that determined once for the first crediting period at the time of validation, it has been updated using the latest version of “Tool to calculate the emission factor for an electricity system”. Please refer to section 4.1 for details.

The application of steps 1.1, 1.2, 1.3 and 1.4 confirmed that the current baseline is valid for the second crediting period but data and parameters need to be updated. Then proceed to step 2.

Step 2: Update the current baseline and the data and parameters

Step 2.1: Update the current baseline

The baseline emissions for the second crediting period will be updated, without reassessing the baseline scenario, based on the latest approved version of the methodology ACM0002 (Version 20.0). This update was applied in the context of the sectoral policies and circumstances are still applicable at the time of requesting for renewal of the second crediting period. More details for the updated baseline emissions in the second crediting period can be seen in section 4.

Step 2.2: Update the data and parameters

The updated baseline emission factor ($EF_{grid,CM,y}$) for the project is 0.3612 tCO₂e/MWh.

3.5 [Additionality](#)

The project has demonstrated its additionality in the first crediting period. No surplus regulatory information and no more investment has been added since its registration with VCS. No changes affect the additionality of the project in the second crediting period.

3.6 [Methodology Deviations](#)

There is no deviation applied to the methodology during the second crediting period.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 [Baseline Emissions](#)

According to the ACM0002 (Version 20.0), baseline emissions include only CO₂ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activitycalculated as follows.

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y} \quad (1)$$

BE_y	=	Baseline emissions in year y (t CO ₂ e/y)
$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project activity in year y (MWh/y)
$EF_{grid,CM,y}$	=	Combined margin CO ₂ emission factor for grid connected power generation in year y calculated using the latest version of “TOOL07: Tool to calculate the emission factor for an electricity system” (tCO ₂ e/MWh)

The project activity is a greenfield hydropower plant, then

$$EG_{PJ,y} = EG_{facility,y} \quad (2)$$

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

$EF_{grid,CM,y}$ is calculated as per the latest version of “Tool to calculate the emission factor for an electricity system” (version 07.0). The baseline emission factor $EF_{grid,CM,y}$ is calculated ex ante and fixed for the second crediting period. Details are as follows:

Step 1: Identify the relevant electricity systems

According to the “Tool to calculate the emission factor for an electricity system (Version 07.0)”, project participants may delineate the project electricity system using option 1: “A delineation of the project electricity system and connected electricity systems published by the DNA”. Chinese DNA has been authorizing the publication of “Chinese Regional Power Grid Baseline Emission Factors⁴” every year, from which the project electricity system and connected electricity systems are clearly delineated. According to the delineations, the South China Power Grid is identified as the relevant electricity system for the project, which includes Guangdong, Guangxi, Yunnan, Guizhou, and Hainan. The project is located at Kaiyang County, Guizhou Province which is covered by the South China Power Grid.

Step 2: Choose whether to include off-grid power plants in the project electricity system

⁴ http://www.mee.gov.cn/ywgz/ycqhbh/wsqtz/202012/t20201229_815386.shtml

Based on Chinese real situation, the option 1-only grid power plants are included in the calculation.

Step 3: Select a method to determine the operating margin (OM)

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on the following methods in accordance with “Tool to calculate emission factor for an electricity system”:

- (a) Simple OM; or
- (b) Simple adjusted OM; or
- (c) Dispatch data analysis OM; or
- (d) Average OM

The simple OM method (Option a) can only be used if any one of the following requirements is satisfied:

- (a) Low-cost/must-run resources constitute less than 50 per cent of total grid generation (excluding electricity generated by off-grid power plants) in average of the most recent five years; or
- (b) The average amount of load (MW) supplied by low-cost/must-run resources in a grid in the most recent three years is less than the average of the lowest annual system loads (LASL) in the grid of the same three years.

The average share of electricity generation from Low-cost/must-run resources of total grid generation during the most recent five years shall be determined by using the approach described below in accordance with the tool:

$$\text{Share}_{\text{LCMR}} = \text{average} \left[\frac{EG_{\text{LCMR},y-4}}{\text{total}_{y-4}}, \dots, \frac{EG_{\text{LCMR},y}}{\text{total}_y} \right] \quad (3)$$

Using data from “China Electric Power Yearbook 2014-2018”, the electricity generation of low-cost/must-run electric power resources during the most recent five years from 2013 to 2017 constitutes 45.62% in average of the total grid generation of the South China Power Grid, which is lower than 50% and satisfies the above-mentioned requirement (a). Therefore, the simple OM method is chosen for the calculation of the OM emission factor $EF_{grid,OM,y}$.

Step 4: Calculate the operating margin emission factor according to the selected method

The simple OM emission factor is calculated as the generation-weighted average CO₂ emissions per unit net electricity generation (tCO₂e/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

As the CO₂ emission factor of each power unit is not available in China, Option B is chosen for to calculate the simple OM. The calculation is based on total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_y} \quad (4)$$

$EF_{grid,OMsimple,y}$ = Simple operating margin CO₂ emission factor in year y (tCO₂e /MWh)

$FC_{i,y}$ = Amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit)

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

$EF_{CO2,i,y}$ = CO₂ emission factor of fossil fuel type i in year y (tCO₂e /GJ)

EG_y = Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year y (MWh)

i = All fossil fuel types combusted in power sources in the project electricity system in year y

y = The relevant year as per the data vintage chosen in Step 3

The ex ante option is chosen for the calculation of simple OM. 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 PD to the VVB for validation. For the project activity, the $EF_{grid,OMsimple,y}$ is fixed during the second crediting period.

Data for EG_y , $FC_{i,y}$ and $NCV_{i,y}$ are obtained from “China Energy Statistical Yearbook 2016-2018” and “China Electric Power Yearbook (2016~2018)”. $EF_{CO2,i,y}$ of fossil fuel comes from IPCC default values. To be conservative, the lower limit of 95% confidence interval is used. The simple OM emission factor $EF_{grid,OMsimple,y}$ of the South China Power Grid is calculated as 0.8042tCO₂e/MWh⁵.

Step 5: Calculate the build margin (BM) emission factor

The build margin emissions factor is the generation-weighted average emission factor (t CO₂e/MWh) of all power units m during the most recent year y for which electricity generation data is available, calculated as follows:

⁵ http://www.mee.gov.cn/ywgz/ydqhbh/wsqtz/202012/t20201229_815386.shtml

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (5)$$

$EF_{grid,BM,y}$ = Build margin CO₂ emission factor in year y (tCO_{2e}/MWh)

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

$EF_{EL,m,y}$ = CO₂ emission factor of power unit m in year y (tCO₂/MWh)

m = Power units included in the build margin

y = Most recent historical year for which power generation data is available

Option 1 for the calculation of build margin given in the “Tool to calculate the emission factor for an electricity system (version 07.0)” is chosen for the project. That is, 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 VVB. 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.

The determination of sample group of power units m

The procedure determining the sample group of power unit m given by the tool is to identify the most recent five power units excluding CDM project activities or the most recent power units that comprise 20% of total electricity generation of the power grid. But data of plant specific power generation and fossil fuel consumption as well as energy conversion efficiency is not publicly available in China. Therefore a deviation is adopted by Chinese DNA to calculate the BM. The most recent power units are categorized by time (year), location (regional power grid) and technology. The most recent power units installed in the same year, using the same technology and located in the same regional power grid are identified as “one” most recent power unit. The electricity generation of each “most recent power unit m” in year y is calculated by its installed capacity and annual operation hours in year y as the following:

$$EG_{m,y} = CAP_m \times H_{m,y} \quad (6)$$

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

CAP_m = The installed capacity of the most recent power unit m

$H_{m,y}$ = The annual operation hour of the most recent power unit m, taken as the average value of the most recent power units using the same technology in the same regional power grid

CAP_m is calculated statistically by adding the installed capacity of the most recent power units in the same regional power grid using the same technology in year y . For the BM calculation in 2019, the year y is 2017 (most recent data available), 2016...etc., until the total electricity generation of the most recent power units is equal to or greater than 20% of the annual electricity generation of the regional power grid in year 2017.

Taking figure 4 of the “Tool to calculate the emission factor for an electricity system” (version 07.0) as a reference, the procedure to determine the sample group of power units m followed by the Chinese DNA is shown below:

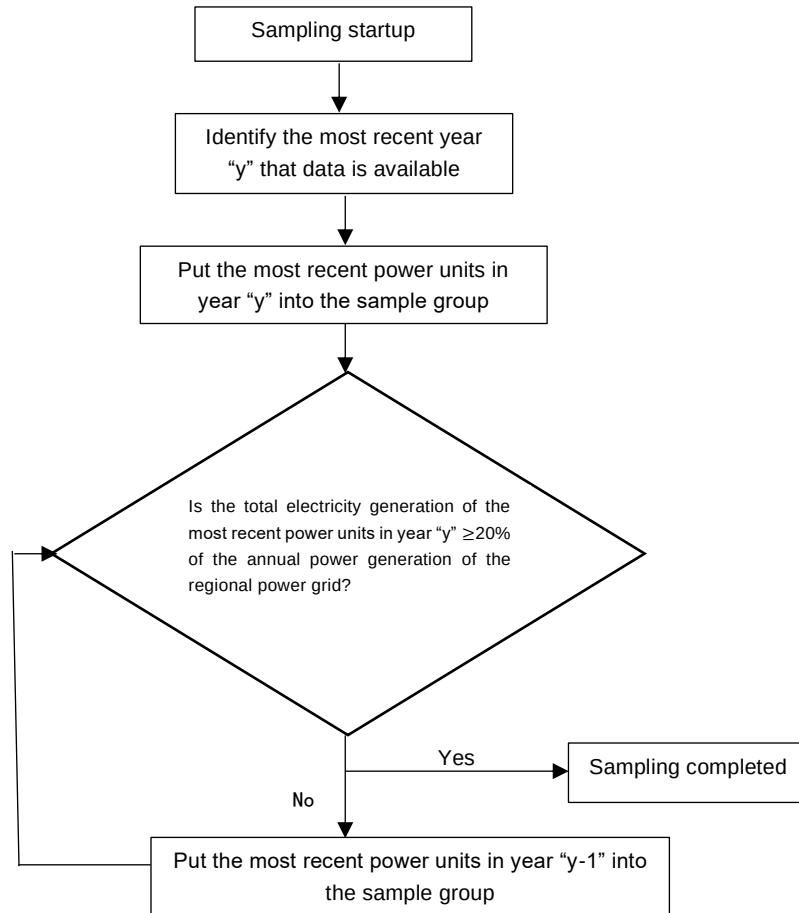


Figure 4 Procedure to determine the sample group of power unit m for BM calculation

The CO_2 emission factor of each power unit m ($EF_{EL,m,y}$) should be determined as per the tool in Step 4 section 6.4.1.1.1 for the simple OM, using Option A2, using for y the most recent historical year for which electricity generation data is available (2017 in this calculation), and using for m the power units included in the build margin.

$$EF_{EL,m,y} = \frac{EF_{CO2,m,i,y} \times 3.6}{\eta_{m,y}} \quad (7)$$

$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (t $\text{CO}_2\text{e/MWh}$)

$EF_{CO2,m,i,y}$	=	Average CO ₂ emission factor of fuel type i used in power unit m in year y (tCO ₂ e/GJ)
$\eta_{m,y}$	=	Average net energy conversion efficiency of power unit m in year y (ratio)
m	=	All power units serving the grid in year y except low-cost/must-run power unit
y	=	The year to account for the most recent power units, 2017, 2016...for this calculation
3.6	=	Conversion factor (GJ/MWh)

In accordance with equation 7, only coal, gas, oil and waste solid fired (excluding low-cost/must-run) and most recent power units are taken into account for the $EF_{EL,m,y}$ calculation. To be conservative, the commercially best energy conversion efficiency is used and equation 7 is converted to:

$$EF_{EL,m,y} = \frac{EF_{CO2,m,y} \times 3.6}{\eta_{Best,m,y}} \quad (8)$$

$EF_{CO2,m,y}$	=	The CO ₂ emission factor of coal, gas, oil and waste solid as a fuel;
$\eta_{Best,m,y}$	=	The commercially best energy conversion efficiency for the most recent coal, gas, oil, and waste solid fired power units in year y;
m	=	The most recent power units with coal, gas, oil and waste solid as fuel in the regional power grid in year y.

For the $EF_{CO2,m,y}$ of coal, gas, oil and waste solid as the fuel, IPCC default value at the lower limit of 95% confidence interval is taken. Only the non-biomass material is considered as waste solid.

The commercially best energy conversion efficiency for coal, gas and waste solid fired power units which were newly installed in 2017 are calculated from statistical data in “The Compilation of Statistics for Electric Power Industry in 2017”. As there was no new oil fired power units in 2017, the commercially best energy conversion efficiency for it was taken as the previous value given by the Chinese DNA.

As a result, the CO₂ emission factor $EF_{EL,m,y}$ for the most recent coal, gas, oil and waste solid fired power units are calculated as the following:

Table 2 The calculation of $EF_{EL,m,y}$ for the most recent coal, gas, oil and solid waste fired power units

Most recent power units	η_{Best} (%)	$EF_{CO_2, fuel}(tCO_2e/GJ)$	$FE_{EL, m, y}(tCO_2e/MWh)$
	A	B	$C=B \times 3.6/A$
Coal fired	41.33	87.3×10^{-3}	0.7605
Gas fired	55.05	54.3×10^{-3}	0.3551
Oil fired	52.9	75.5×10^{-3}	0.5138
Waste solid fired	23.82	73.3×10^{-3}	1.1080

$EF_{grid, BM, y}$ is calculated to be $0.2135 tCO_2e/MWh$ ⁶ according to the latest results issued by Chinese DNA at the time of this PD submission.

Step6. Calculate the combined margin emission factor

The combined margin emission factor is calculated as follows:

$$EF_{grid, M, y} = EF_{grid, OM, y} \times \omega_{OM} + EF_{grid, BM, y} \times \omega_{BM} \quad (9)$$

$EF_{grid, BM, y}$ = Build margin CO_2 emission factor in year y (tCO_2e/MWh);

$EF_{grid, OM, y}$ = Operating margin CO_2 emission factor in year y (tCO_2e/MWh);

ω_{OM} = Weighting of operating margin emissions factor (percent);

ω_{BM} = Weighting of build margin emissions factor (percent).

The following default values should be used for ω_{OM} and ω_{BM} :

For hydropower project, $\omega_{OM} = 0.25$ and $\omega_{BM} = 0.75$ for the second and third crediting period in accordance with the tool. The CO_2 emission factor of the South China Power Grid in the second crediting period is:

$$EF_{grid, CM, y} = 0.8042 tCO_2e/MWh \times 0.25 + 0.2135 tCO_2e/MWh \times 0.75 = 0.3612 tCO_2e/MWh$$

4.2 Project Emissions

The project is a hydropower plant, its project emissions shall be calculated by using the following equation according to ACM0002(version 20.0):

$$PE_y = PE_{FF} + PE_{HP, y} \quad (10)$$

PE_y = Project emissions in year y (tCO_2e/y)

⁶ http://www.mee.gov.cn/ywgz/ydqhbh/wsqtz/202012/t20201229_815386.shtml

$PE_{FF,y}$ = Project emissions from fossil fuel consumption in year y (tCO₂e/y)

$PE_{HP,y}$ = Project emissions from water reservoirs of hydropower plants in year y (t CO₂e/y)

It is stated in ACM0002 (version 20.0) that for all renewable energy power generation project activities, emissions due to the use of fossil fuels for the backup generator can be neglected. Therefor the fossil fuel combustion emissions from the diesel backup generator for the project is taken as zero, $PE_{FF,y}=0$.

Power density of the reservoir is calculated as follows in accordance with ACM0002(version 20.0):

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \quad (11)$$

Where,

PD = Power density of the project activity (W/m²)

Cap_{PJ} = Installed capacity of the hydropower plant after the implementation of the project activity (W)

Cap_{BL} = Installed capacity of the hydropower plant before the implementation of the project activity (W). Zero if it is a new hydropower plant.

A_{PJ} = Area of the project reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m²)

A_{BL} = Area of the project reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m²). Zero if it is a new reservoir.

The project is a new hydropower project with a new reservoir, $Cap_{BL}=0$ and $A_{BL}=0$.

The installed capacity of the project has not been changed since its operation, which is still 150MW in the second crediting period. The surface area of the project reservoir was surveyed to be 2.11⁷Km² at the start of the second crediting period (on 06/02/2020), only a little different from the value at the start of the first crediting period. Then PD is calculated to be 71.09 w/m² which is greater than 10 W/m². $PE_{HP,y}=0$ in accordance with ACM0002(version 20.0).

⁷ Identified based on an automatic measuring and calculating system provided by a third party and operated by the project owner itself .

Based on the above, $PE_y=0$.

4.3 Leakage

According to ACM0002(version 20.0), no leakage emissions are considered. The emissions potentially arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, transport etc.) are neglected.

4.4 Net GHG Emission Reductions and Removals

Emission reductions of the project activity are calculated as follows:

$$ER_y = BE_y - PE_y \quad (12)$$

ER_y = Emission reductions in year y (t CO₂e/y)

BE_y = Baseline emissions in year y (t CO₂e/y)

PE_y = Project emissions in year y (t CO₂e/y)

As discussed in section 4.2, project emissions equal to zero, $PE_y=0$. Therefore:

$$ER_y=BE_y \quad (13)$$

Based on information provided in the original registered VCS PD, the electricity provided to the South China Power Grid is 497,300MWh, the CO₂ emission factor of the South China Power Grid for the second crediting period of the project is 0.3612tCO₂e/MWh, then $BE_y=179,625\text{tCO}_2\text{e}$.

Year	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated net GHG emission reductions or removals (tCO ₂ e)
06/02/2020-05/02/2021	179,625	0	0	179,625
06/02/2021-05/02/2022	179,625	0	0	179,625
06/02/2022-05/02/2023	179,625	0	0	179,625
06/02/2023-05/02/2024	179,625	0	0	179,625
06/02/2024-05/02/2025	179,625	0	0	179,625
06/02/2025-05/02/2026	179,625	0	0	179,626
06/02/2026-05/02/2027	179,625	0	0	179,625

06/02/2027-05/02/2028	179,625	0	0	179,625
06/02/2028-05/02/2029	179,625			179,625
06/02/2029-05/02/2030	179,625	0	0	179,625
Total	1,795,250	0	0	1,796,250

5 MONITORING

5.1 Data and Parameters Available at Validation

The baseline CO₂ emission factor for the South China Power Grid is obtained directly from the official document “Chinese Regional Grid Baseline Emission Factors 2019” issued by Chinese DNA ex ante and no monitoring is required during the second crediting period. Data and parameters that are available at validation are summarized below:

Data / Parameter	EF _{grid,CM,y}
Data unit	tCO ₂ e/MWh
Description	South China Power Grid Baseline Emission Factor in 2019
Source of data	Authorized by Chinese DNA (Ministry of Ecology and Environment of the PRC)
Value applied	0.3612
Justification of choice of data or description of measurement methods and procedures applied	Data from official authorization as per http://www.mee.gov.cn/ywgz/xdqhbh/wsqtz/202012/t20201229_815386.shtml for more information. Ex ante calculation, no measurement required for the second crediting period.
Purpose of Data	For Calculation of baseline emissions
Comments	Calculated ex ante and fixed for the second crediting period

Data / Parameter	Cap _{BL}
Data unit	W
Description	Installed capacity of the hydropower plant before the implementation of the project activity (W). For a new hydropower plant, this value is zero.

Source of data	Project site
Value applied	0 (For a new hydropower plant)
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	For Calculation of project emission
Comments	-

Data / Parameter	A_{BL}
Data unit	m^2
Description	Area of the single or multiple reservoirs measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For a new reservoir, this value is zero
Source of data	Project site
Value applied	0 (For a new reservoir)
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	For calculation of project emissions
Comments	-

5.2 Data and Parameters Monitored

Data / Parameter	$EG_{\text{facility},y}$
Data unit	MWh
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y
Source of data	Direct measurement from more than one electricity meters
Description of measurement methods	Use electricity meters installed at the grid interface for electricity export to grid in case of grid and net electricity

and procedures to be applied	generation. This parameter is monitored using bi-directional electricity meter continuously. The measurement data will be recorded monthly by plant staff.
Frequency of monitoring/recording	Continuous measurement and monthly recording
Value applied	497,300
Monitoring equipment	Bi-directional electricity meter, accuracy 0.2S
QA/QC procedures to be applied	Meters will be calibrated according to national regulations or, in the absence of national regulations, per manufacturer's specifications. Readings of the meters can be corroborated against payments from the local power grid company. Meter readings should be collected by both the project owner and local grid company on-site. The data will be archived electronically and stored for two years after the end of the crediting period.
Purpose of data	For the calculation of baseline emissions
Calculation method	Not applicable
Comments	No more comments

Data / Parameter	Cap _{PJ}
Data unit	W
Description	Installed capacity of the hydropower plant after the implementation of the project activity
Source of data	Project site
Description of measurement methods and procedures to be applied	Determine the installed capacity based on manufacturer's specifications or commissioning data or recognized standards
Frequency of monitoring/recording	Once at the beginning of each crediting period
Value applied	150,000,000
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Not applicable

Purpose of data	For the calculation of project emissions
Calculation method	Not applicable
Comments	No more comments

Data / Parameter	A _{PJ}
Data unit	m ²
Description	Area of the project reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full
Source of data	Project site
Description of measurement methods and procedures to be applied	The project owner bought services from the Planning and Design Branch of Guiyang Hydroelectric Investigation, Design & Research Institute of China Hydropower Engineering Consulting Group, including an automatic measuring system with a detector for determining the water depth of the reservoir, and a software system to calculate the surface area and volume of the reservoir automatically.
Frequency of monitoring/recording	Once at the beginning of each crediting period (at 06/02/2020)
Value applied	2,110,000
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Not Applicable
Purpose of data	For the calculation of project emissions
Calculation method	Not applicable
Comments	No more comments

5.3 Monitoring Plan

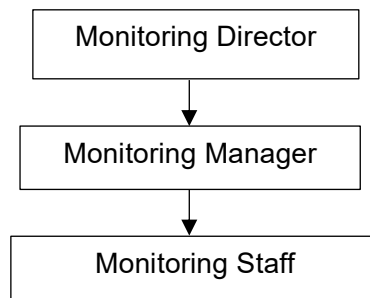
The purpose of the monitoring plan is to ensure that the monitoring and calculating of project activity emission reductions in the second crediting period are complete, consistent, clear and accurate. Staff will be assigned by the project owner to perform this task.

1. Data to be monitored

The baseline emission factor is based on ex-ante calculation. Therefore, the data to be monitored is the quantity of electricity generated and supplied by the project to the South China Power Grid.

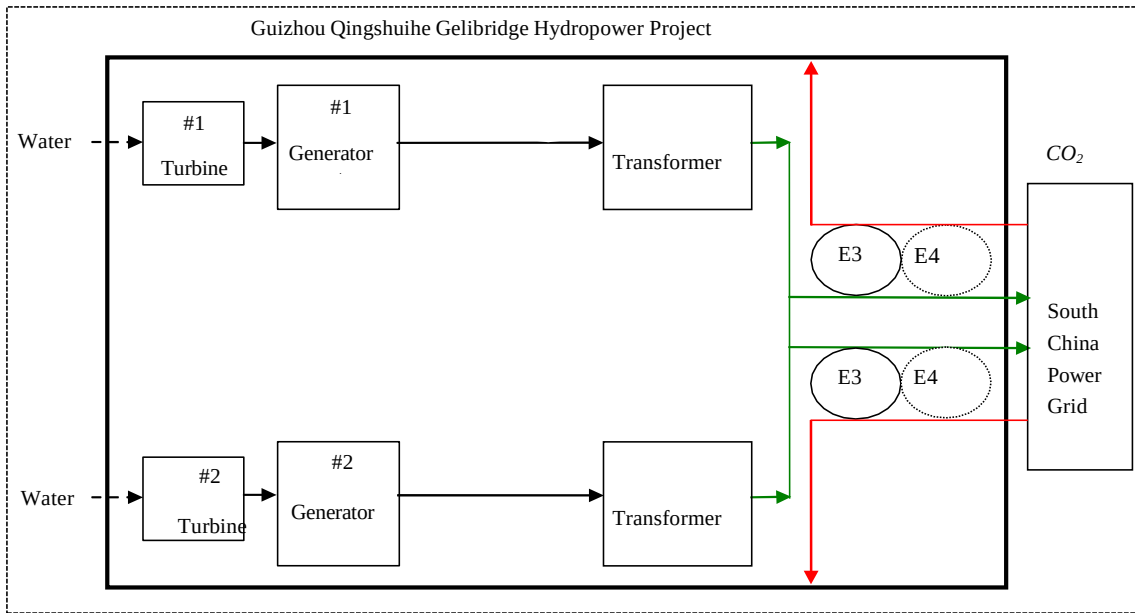
2. Persons responsible for the monitoring work

In order to obtain effectively monitored data, the project owner established a monitoring management structure which identifies the relevant staff for data recording, collection and archiving. In addition, the project owner will designate a monitoring director to supervise the process. The monitoring director is responsible for the check of monitoring and recording tasks (such as meter reading, sales invoices), emission reductions calculations and the preparation of monitoring reports, etc. The detailed structure is as follows:



3. Monitoring equipment and its installation

Meters are installed in the system and data from those meters are monitored by the hydropower plant staff as part of their routine check in order to monitor the proper operation of the system. There are two meters (refer to E3 and E4 meters in the figure below) installed at the grid interface on each of the lines. The quantity of electricity generated and supplied by the project to the South China Power Grid is monitored by the bi-directional meters E3 (refer to figure below). One back-up meter (E4) has been installed for each of the E3 meters and reads measurements simultaneously to E3 in order to ensure continuous data measurement. Meters E3 and E4 are owned by the grid company. The data taken from the E3 and/or E4 meters will be used for VCS purposes. The quantity of electricity from these meters can be cross-checked with the quantity of electricity exported listed on electricity sale invoices. Before formal operation, the measuring devices will undergo inspection acceptance according to the rules and regulations.



Legend

(E) = Electricity Meter

(E) = Back-up Electricity Meter

→ Exported electricity flow = 497.3GWh

→ Self-consumed electricity flow = 0.508GWh

Figure 5 Monitoring diagram of the project activity

The accuracy of the meters are shown below.

- Meters at grid interface E3 and E4: 0.2S

4. Data collection

The Grid Company will be responsible for normal operation of the grid interface meters. They must ensure the proper function and maintenance of the meters.

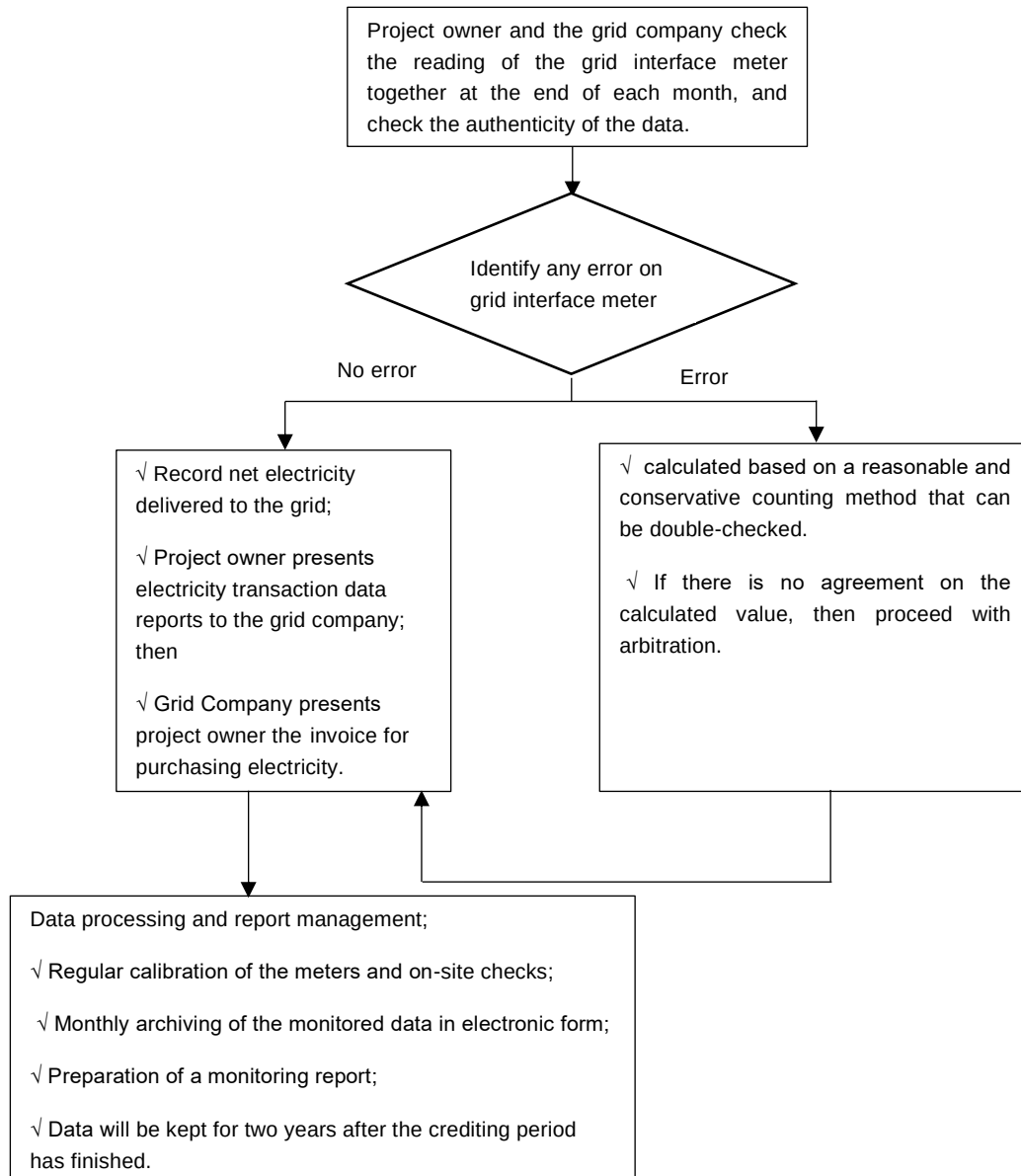


Figure 6 Data collection procedures

5. Calibration and maintenance of the meters

In order to ensure the accuracy of the meters, regular calibration and maintenance of the meters will be conducted. Calibration will be conducted in accordance with national regulations or, in the absence of national regulations, manufacturer specifications.

The site staff are responsible for data recording. Sales invoices will be used to cross-check meter readings. In case of metering failure, the meter will be serviced by a qualified institution.

6. Data management system

Data management system describes the procedure for data recording and storing which is collected during monitoring period. All monitoring data will be stored in a computer

system. Regular backup will be foreseen to secure data. Sales invoices will be retained at a central place. All data will be stored for a period of 2 years after the crediting period. Monitoring and data management will be governed by the monitoring manager responsible for day-to-day monitoring activities.

7. Monitoring report

By the end of each monitoring period (to be decided), a monitoring report will be prepared. The monitoring report will be subject to verification by the VVB.

8. Emergency treatment

Measures taken at emergency situations:

In situations where the reservoir water level exceeds the reservoir's capacity, a motor for the dam controls the waterway gates. To guarantee normal operation of the motor in the case of emergency situations, the following measures are taken:

1) Under normal conditions: the motor will be run by electricity generated by the hydropower plant;

2) Under conditions where the hydropower plant is not in operation (e.g., maintenance): the motor will be run by electricity from the grid.

3) Under conditions of extreme nature (e.g., both the hydropower plant and grid are unable to provide electricity to the motor): a backup diesel generator is installed, which would be used during extreme situations. The purpose for installing this equipment is to supply the motor at the dam and the equipment and instruments at the power station with electricity when an emergency situation occurs.

9. Training program

All staff involved in the monitoring process will be trained. The training contains CDM&VCS knowledge, operational regulations, quality control (QC) standard flow, data monitoring requirements and data management regulations, etc.

A site specific monitoring manual comprising monitoring procedures will be developed and implemented to ensure a robust data gathering system at the project location. All relevant monitoring personnel will receive specific training and responsibilities within the monitoring process.