

VCS VALIDATION REPORT FOR

LUOFAN 24MW HYDROPOWER PROJECT IN GUIZHOU PROVINCE CHINA



Document Prepared By China Classification Society Certification Company

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Summary:

China Classification Society Certification Company(CCSC), commissioned by Guizhou Honor Carbon Asset Management Co., Ltd, has performed a Validation of Luofan 24MW Hydropower Project in Guizhou Province China (hereafter referred to as "the project"), on the basis of requirements of Verified Carbon Standard (VCS) Version 3.4.

The project is developed and operated by Guizhou Zhongshui Energy Co., Ltd, which is located in Yanjia Town, Ceheng County, Guizhou Province, People's Republic of China. The project is a newly built hydropower project with total installed capacity of 24MW. The electricity generated by the project will meet the electricity demand of industrial and agricultural production and local people's life, and assume the task to adjust the peak in the local grid, finally connected to China Southern Power Grid.

The objective of the Validation is to have an independent evaluation of a project activity against the requirements of Kyoto Protocol requirements, UNFCCC rules, Verified Carbon Standard (VCS) v.3.4 and associated interpretation on the basis of the project design document.. In particular, the project's

baseline, monitoring plan, and the project's compliance with the methodology ACM0002 Version 14.0.0, the relevant UNFCCC requirements and host Party criteria are validated in order to confirm that the project design, as documented, is sound and reasonable and meets the identified criteria.

The validation scope is defined as an independent and objective review of the project description, the project's baseline study, monitoring plan and other relevant documents and consisted of the following three phases:

- 1) Desk review of documents;
- 2) On-site visit and follow-up interviews;
- 3) Resolution of outstanding issues and the issuance of the final verification report and opinion.

China Classification Society Certification Company (CCSC) appointed a qualified verification team in accordance with internal procedures to perform the validation.

In the course of the validation, 4 Corrective Action Request (CAR) and 3 Clarification Requests (CLs) were raised and successfully closed. There are no uncertainties associated with the validation.

As a result of this validation, the validation team confirms the following validation conclusion:

-All operations of the project are implemented and installed as planned and described in the validated project description (VCS-PD);

-The project description (VCS-PD) is in accordance with the applied approved CDM methodology, i.e., ACM0002 Version 14.0.0 "Grid-connected electricity generation from renewable sources", and meets the relevant UNFCCC requirements for the CDM methodology, Voluntary Carbon Standard (VCS) v.3.4 requirements and the relevant country criteria;

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1 INTRODUCTION

1.1 Objective

Guizhou Honor Carbon Asset Management Co., Ltd has commissioned CCSC to validate conclusions regarding the additional project description produced in accordance with the VCS rules on participation under the approved CDM methodology ACM0002 Version 14.0.0/13/ and to validate and provide a validation statement of the project of Luofan 24MW Hydropower Project in Guizhou Province China (hereafter referred to as “the project”), owned by Guizhou Zhongshui Energy Co., Ltd (hereafter referred to as “the PP”), which is located in Yanjia Town, Ceheng County, Guizhou Province, People’s Republic of China on the basis of requirement of VCS Standard (Version 3.4)/8/, CDM Validation and Verification Standard (VVS) (Version 05.0)/30/ and the approved methodology ACM0002 Version 14.0.0/13/.

CCSC as the validation/verification body (VVB) of the project has been accredited as a DOE by UNFCCC and also meets the competence requirements under the framework of VCSA.

The objectives of validation are to:

- a) Ensure a thorough, independent assessment of the project activity submitted for registration as a VCS-VCU project against relevant UNFCCC CDM Methodology, Verified Carbon Standard (VCS) v.3.4 requirements and host country criteria;
- b) Ensure that the project description and other supporting documents provided are complete in accordance with the latest applicable version of Registration and Issuance Process and in accordance with the additional requirements stated by the VCS Association (VCSA);

1.2 Scope and Criteria

The validation scope is defined as an independent and objective review of the VCS-PD, the project’s baseline study, monitoring plan and other relative documents, against Kyoto Protocol requirements, UNFCCC rules, Verified Carbon Standard (VCS) v.3.4 and associated interpretations.

The validation scope covers the VCS-PD and the relative documents to be independently reviewed the project geographical locations usually to be visited on-site, the project local stakeholders to be interviewed with, and processes that are necessary to acquire objective evidence for the evaluation of the project compliance to the VCS requirements.

The validation team has, based on the instructions in the VCS validation Verification Manual v3.1, and employed a risk-based and step-wise approach when conducting the validation, focusing on the identification of significant risks for project implementation and the generation of VCUs.

The validation is not meant to provide any consulting towards the project participants. However, stated requests for clarifications and/or corrective actions may have provided input for improvement of the project design.

1.3 Level of Assurance

CCSC has undertaken a reasonable assurance engagement in accordance with VCS (Version 3.4)/8/. It requires a reasonable level of assurance in validation that GHG assertions are free of material errors, omissions and misrepresentations. The validation conclusion is based on the VCS-PD, supporting evidences made available to the verifier and information collected through performing interviews and during the on-site inspection.

1.4 Summary Description of the Project

The project is a dam type hydroelectric power plant and involves 3 turbines, consisting of 2 sets of 10MW and 1 set of 4MW turbines, with a total installed capacity of 24 MW. The project activity is located in Yanjia Town, Ceheng County, Guizhou Province, People's Republic of China. The main equipments are three hydro-turbines, and all of them are domestically manufactured that means no technology transfer is involved. The validation team has cross-checked the approved PDR/3/ and is able to confirm the technical specifications described are in line with the approved PDR/3/. The electricity generated by the project is connected to Guizhou Province Power Grid, and then to China Southern Power Grid (CSPG). The designed annual electricity generation is 86,420 MWh, and the annual feed-in electricity to the grid is 85,988 MWh. This is based on the approved preliminary design report of the project/3/. Considering that PDR/3/ was finalized by an independent third party i.e. Guiyang Branch of China Water Conservancy and Hydropower Construction Consulting Company, and was approved by Qianxinan Miao and Buyi Autonomous Prefecture Development and Reform Commission, meanwhile during on-site visit, the validation team had cross-checked the project description in VCS-PD/1/, PDR/3/ and interviews, hence, CCSC can confirm the accuracy of the above description. By dividing annual generation (86,420 MWh /year) to the installed capacity (24 MW), the operation time is calculated as 3600.83 hr/year. The plant load factor is confirmed as 41%. The above factors and the calculation are confirmed by the validation team. The project coordinates are validated as follows during the site visit:

Power Plant: 105°51'E, 25°07'N

The project comes under type I – Renewable Energy Project. The project won't produce any greenhouse gas (GHG) emission during operation. The electricity generated by the project can displace part of the power from the fossil fuel-fired plants in CSPG and this had been confirmed by interviewing with project owner and local stakeholders and by cross-checking with document for the

agreement of grid connection with Guizhou Power Grid , which was signed in November, 2011/17/. The expected annual GHG emission reductions are 55,857tCO₂e.

The 1st, 2nd and 3rd turbine with a total installed capacity of 24 MW. The first turbine units were started operation on 05/12/2011. The second and third units were started on 15/12/2011.

The raised corrective action requests and clarification requests for the description of the project activity can be seen as below:

CL01: The model number of the turbine shall be corrected in the Table1 in the VCS-PD. As the VCS-PD has corrected according to the model number on site, this CL is closed.

2 VALIDATION PROCESS

2.1 Method and Criteria

CCSC has taken the following quality control measures within the validation team and of the validation process according to relevant CCSC's internal procedures:

- The contract review of the validation was conducted and concluded that CCSC has the accredited scope and competence to validate the project with impartiality as well;
- The validation team was selected with due considerations given in terms of the competence and impartiality;
- The validation team carried out the validation work and compiled a validation report strictly following CCSC's Procedures for Implementation of Validation.

The validation report submitted by the validation team was subjected to a technical review and decision-making process, the technical reviewers and decision-makers are qualified and independent from the validation team. If any issue is raised during technical review and/or decision-making the same is to be discussed between the issue-raiser and the team leader as well as the PP. All issues must be satisfactorily addressed before the submission of the report for final approval.

CCSC verified the project against the requirements set in VCS (Version 3.4)/8/, issued by VCSA on 08/10/2013 and the version 05.0 of the Clean Development Mechanism Validation and Verification Standard/30/, issued by CDM Executive Board on 04/10/2013.

2.2 Document Review

A desk review of the VCS-PD, and supporting documents related to the project design and baseline, i.e. technical documentation, assessment reports, national laws and regulations, was conducted by the validation team. The aim of the desk review of the documentation was to verify the correctness,

credibility and interpretation of presented information, and to cross check between information provided in the PDD and information from sources other than that used, if available. Review of the appropriateness of algorithms and/or formulae and correctness of calculations was also carried out during this stage based on the approved methodology being applied. Documents reviewed and information sources used during desk review are listed in Section 5 to this report

To address the CCSC's corrective action and clarification requests, the VCS-PD was revised and resubmitted by PP. The final verification conclusion presented in this report is based on the revised VCS-PD/1/ (version03, dated on 19/11/2013).

Section 5 of this report contains a complete list of all documents and proofs reviewed by the validation team.

2.3 Interviews

The validation team performed a site visit to the project site from 10/10/2013 to 11/10/2013. During the site visit, the validation team interviewed with the relevant stakeholders and cross-checked the information provided by interviewed personnel to ensure that no relevant information has been omitted from the validation (see section 5 References). Representatives of the PPs, the consultant and local stakeholders were interviewed. The interviewees and the main topics of the interview are summarized in the following table.

Table 1 Interview Topics

Date: 10/10/2013 to 11/10/2013	
Interview topics	Interviewed Organizations and persons
- Design of the project activity - The planning and the construction phase of the project - Working conditions - Training of the employees - Monitoring practices	Guizhou Zhongshui Energy Co., Ltd (the project owner): 1. Yang Mingzhi, Plant Manager 2. Lei Minjiang, Director of Production and Technology Department; 3. Fang Quanqi, Project Manager
- Sustainable development in the region - Project's impact on local economy	Local Stakeholders. 1. Chen Xue, Chexiang County Development and Reform Commission/ Secretary of office 2. Zhou Cheng, Chexiang County Environmental Protection Bureau / Manager 3. Cai Shangyong, Luofan Hydro Power Plant/ Vice Plant Manager 4. Li Rui, Luofan Hydro Power Plant/Team leader

Date: 10/10/2013 to 11/10/2013	
Interview topics	Interviewed Organizations and persons
	5. Chen Fumei ,Daxing town, Songpan County/ Villager
- Additionality of the project activity - Investment analysis - Baseline determination - Emission reduction calculations - Document review - CARs and CLs	Guizhou Honor Carbon Asset Management Co., Ltd (the Consultant): 1. Wang Xinmin, Project Manager 2. Zhang Jiaqi, Project Manager

2.4 Site Inspections

A site visit was performed on 10/10/2013 and 11/10/2013, where representatives of Guizhou Zhongshui Energy Co., Ltd, the local stakeholder and Guizhou Honor Carbon Asset Management Co., Ltd were interviewed about the project. Implementation of the project was observed on site.

2.5 Resolution of Findings

During the validation, by reviewing the VCS-PD/1/, the PDR/3/ and the relevant documentation as well as the site visit, 4 Corrective Action Request (CAR) and 3 Clarification Requests (CLs) were raised and successfully closed. There are no uncertainties associated with the validation. The detailed CARs and CLs are list in the Appendix A.

2.6 Forward Action Requests

During the validation, there were no forward action required that were identified.

3 VALIDATION FINDINGS

3.1 Project Details

The Identify, discuss and justify conclusions for the project details are discussed as following:

Table 2 Identify, discuss and justify conclusions

Criteria of VCS-PD	Ref	Validation Comments
2.1 Project type, technologies and measures implemented, and eligibility of the project	VCS-PD,	As a hydropower project, the project is confirmed to fall in the sectoral scope 1: energy industries (renewable-/non-renewable sources), which has been correctly described in the VCS-PD/1/.
2.2 Project proponent and other entities involved in the project	VCS-PD, PPA, PDR Approval,	The project owner of the project is verified to be Guizhou Zhongshui Energy Co., Ltd as same as demonstrated in the VCS-PD/1/. In addition, the project proponent has been confirmed by checking the Power Grid Connection Agreement/17/ and the approval from the local government/10/.
2.3 Project start date	VCS-PD, Daily operation & maintenance logs, Monthly electricity records	The project start date in VCS Version 3.4 is defined as the date when the Project began generating GHG emission reduction or removals. The project start date of 05/12/2011 can be substantiated by the daily operation & maintenance logs/15/ and the monthly electricity records/20/.
2.4 Project Crediting Period	VCS-PD, operation maintenance logs Daily &	The Project start date is 05/12/2011 and the VCS crediting period starting from 05/12/2011. Since 05/12/2011, the data have been monitored and collected following the monitoring procedure in the VCS-PD/1/. Therefore, starting date of the crediting period is 05/12/2011. The VCS crediting period is from 05/12/2011 to 05/12/2021.
2.5 Project scale and estimated GHG emission reductions or removals	VCS-PD,	The annual estimated GHG emission reductions are 55,857tCO ₂ e. In accordance with the VCS program definitions/12/, Mega project is defined as the project that generates 1,000,000 tonnes CO ₂ e or more of GHG emissions reductions or removals per year. Thus, it is validated that the scale of the project with estimated emission reductions less than 1,000,000 tonnes CO ₂ e is "Project" .
2.6 Project Location	Site visit, VCS-PD, PDR	The project is located in Yanjia Town, Ceheng County, Guizhou Province of China. The geographical coordinates of the power house is 105°51'E, 25°07'N. The data has been verified against the approved PDR/3/ and double checked during the onsite visit.

2.7 Conditions Prior to Project Initiation	VCS-PD, Power Grid Connection Agreement	The registered VCS-PD/1/ and the Power Grid Connection Agreement/17/ was checked and found that the conditions prior to project initiation is that electricity will be supplied by the fossil-fuel based power plants dominated China Southern Power Grid (CSPG), and the project has not been implemented to generated GHG emissions for the purpose of their subsequent reduction, removal or destruction.
2.8 Project compliance with applicable laws, statutes and other regulatory frameworks	Approval for PDR, EIA	The project has been approved by the local authority "Qianxinan Miao and Buyi Autonomous Prefecture Development and Reform Commission", on May 27, 2009/10/. EIA was approved by Qianxinan Miao and Buyi Autonomous Prefecture Environmental Protection Bureau on April 23, 2009/11/. Therefore, CCSC can confirm that the project compliance with the relevant regulation and laws of China.

2.9 Ownership and other programs: • Right of use • Emissions trading programs and other binding limits • Other forms of environmental credit sought or received and eligible to be sought or received • Participation under other GHG programs • Rejection by other GHG programs	Business license, PDR approval letter, EIA approval letter, the construction contract and purchase contract of main equipment.	• The PDR approval letter/10/ issued by Qianxinan Miao and Buyi Autonomous Prefecture Development and Reform Commission and the EIA approval letter/11/ issued by Qianxinan Miao and Buyi Autonomous Prefecture Environmental Protection Bureau were checked and found that the Guizhou Zhongshui Energy Co., Ltd is authorized to carry out the project activity. Further, the business license of Guizhou Zhongshui Energy Co., Ltd officially issued by the Administration for Industry and Commerce of Ceheng County of Guizhou province/26/ was checked to confirm its ownership of the project. The construction contract/38/ and purchase contract of main equipment/14/ were checked and found the project is implemented by Guizhou Zhongshui Energy Co., Ltd; • During the on-site visit, the management representative, i.e. Mr Yang Mingzhi, was interviewed and confirmed that no other form of GHG-related environmental credit for GHG emission reductions or removals has been or will be claimed during the reporting period from 05/12/2011 to 05/12/2021. • CCSC can confirm that the net GHG emission reductions generated from the reporting period from 05/12/2011 to 05/12/2021 has not been involved in other GHG programs; • CCSC didn't find that the project has evolved in other GHG programs.
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2.10 Additional information relevant to the project, including: • Eligibility criteria for grouped projects • Leakage management for AFOLU projects • Commercially sensitive information	VCS-PD	- It is not a grouped project; - Leakage is 0; - According to the information collected during the onsite visit, the project is confirmed to have positive impact on the local environment, economy and sustainable development. - No commercially sensitive information has been excluded to the public
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The given parameters' references are detailed in the VCS-PD/1/. All the references are checked and confirmed by the validation team.

Then CCSC hereby confirms that the project description in the VCS-PD/1/ (version 03) is accurate and complete in all aspects of the project description.

3.2 Application of Methodology

3.2.1 Title and Reference

"Grid connected electricity generation from renewable sources", ACM0002 (version 14.0.0), is applied.

The relevant tools related to ACM0002 are applied as following:

"Tool for the demonstration and assessment of additionality" (version 07.0.0);

"Tool to calculate the emission factor for an electricity system" (version 04.0);

The validation team can confirm that all of them are the most recent version and having an "active" status at the time of validation.

CAR2: as the new version of the methodology of ACM0002 has been approved on UNFCCC website, the new version shall be applied in the project. According the new version VCS-PD/1/, the CAR2 is closed.

3.2.2 Applicability

The steps taken to assess the relevant information contained in the VCS-PD against each applicability condition are described below:

No.	Applicability criteria in ACM0002 (Version 14.0.0)	Steps taken to assess PD information
1	This methodology is applicable to grid-connected renewable power generation project activities that: (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	Validation team can confirm that the project activity is a Greenfield hydropower project supplying electricity to CSPG according to the Power Grid Connection Agreement/17/ and the approved PDR/10/.
2	The methodology is applicable under the following conditions: 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.	Validation team can confirm that the project activity is a Greenfield hydropower project supplying electricity to CSPG according to the Power Grid Connection Agreement/17/ and the approved PDR/10/.
3	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.	Validation team can confirm that the project activity is a Greenfield hydropower project supplying electricity to CSPG according to the Power Grid Connection Agreement/17/ and the approved PDR/10/. Therefore, the project activity is not in the case of additions, retrofits or replacements.
4	In case of hydro power plants: ● One of the following conditions must apply: ✓ The project activity is implemented in an existing single or multiple reservoirs, with no change in the volume of any of	Validation team has confirmed that the project activity results in a new reservoirs and the power density of the project activity is $80W/m^2$, which is greater than $4 W/m^2$ based on the information in

	reservoirs; or ✓ The project activity is implemented in an existing single or multiple reservoirs, where the volume of any of reservoirs is increased and the power density of each reservoir, as per the definitions given in the project emissions section, is greater than 4 W/m^2; or ✓ The project activity results in new single or multiple reservoirs and the power density of each reservoir, as per the definitions given in the project emissions section, is greater than 4 W/m^2. In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4 W/m^2 all the following conditions must apply: ✓ The power density calculated for the entire project activity using equation 5 is greater than 4 W/m^2; ✓ Multiple reservoirs and hydro power plants located at the same river and where are designed together to function as an integrated project that collectively constitute the generation capacity of the combined power plant; ✓ Water flow between multiple reservoirs is not used by any other hydropower unit which is not a part of the project activity; ✓ Total installed capacity of the power units, which are driven using water from the reservoirs with power density lower than 4 W/m^2, is lower than 15 MW; ✓ Total installed capacity of the power units, which are driven using water from reservoirs with power density lower than 4 W/m^2, is less than 10% of the total installed capacity of the project activity from multiple reservoirs.	the approved PDR/10/.
5	The methodology is not applicable to the following: ● 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; ● Biomass fired power plants; ● A hydro power plant that results in the creation of a new single reservoir or in the	Validation team has confirmed that the project activity results in a new reservoirs and the power density of the project activity is 80 W/m^2, which is greater than 4 W/m^2 based on the information in the approved PDR/10/.

	increase in an existing single reservoir where the power density of the power plant is less than 4 W/m ² .	
6	In the case of retrofits, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is “the continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance”.	Validation team has confirmed that the project activity does not result in the retrofit, replacement or capacity additions.

Based on the on-site assessment and document cross-checking, CCSC hereby confirms that the selected baseline and monitoring methodology is previously approved by the CDM Executive Board, and the project complies with all the applicability conditions. So the selected methodology is applicable to the Project.

By reviewing of the applied methodology and the site visit, CCSC can confirm that the project activity substitutes grid electricity that results in savings of electricity that would have been provided by the grid. Therefore, the tools are applicable to the Project.

3.2.3 Project Boundary

The spatial extent of the project boundary in the VCS-PD/1/ is clearly defined as the project activity and all power plants connected physically to the CSPG including Guangdong Power Grid, Guangxi Power Grid, Yunnan Power Grid, Guizhou Power Grid and Hainan Power Grid, to which the project is connected. There are no significant transmission constraints amongst the power plants of the CSPG, nor with the project.

Validating through document review, including PDR/10/, Power Grid Connection Agreement /17/ and 2013 Baseline Emission Factors for Regional Power Grids in China issued by the DNA of China/5/, and through on-site visit and interview with local grid company representative, the validation team confirmed that the selected project boundary is correct. The defined project boundary is in line with ACM0002 Version 14.0.0/13/.

The only GHG and emission source included in the project boundary are the CO₂ emissions from the electricity generation in fossil fuel fired power plants that are displaced due to the project activity.

Details of emission sources and gases included in the project boundary are illustrated below in the table:

	GHGs involved	Source
Baseline emissions	CO ₂	CO ₂ emissions from electricity generation in fossil fuel fired power plants of the CCPG
Project emissions	CH ₄	The power density of the project is greater than 10W/m ² , so CH ₄ emissions should not be considered as per ACM0002 Version 14.0.0/13/
Leakage	Not applicable	No leakage needs to be considered in applying ACM0002 Version 14.0.0/13/ for hydropower project activities.

In

conclusion, according to VCS version 3.4/8/, CCSC confirms that the identified boundary and the selected sources and gases as documented in VCS-PD are justified for the project activity. As result of the implementation of the project activity, there are no greenhouse gas emissions occurring within the project boundary which are expected to contribute more than 1% of the overall expected average annual emission reductions, which are not addressed by the selected approved methodology.

3.2.4 Baseline Scenario

As per the conclusion drawn in Section 3.2.2 of this validation report, the ACM0002 Version 14.0.0/13/ is applicable to the project. According to the ACM0002 Version 14.0.0/13/, for baseline identification:

If the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".

The VCS-PD/1/ has provided the description on the identified baseline scenario, which includes the description on the technology and the activities that would take place in the absence of the project activity. As stated in VCS-PD/1/ Section 2.4 of this project, the baseline is described as electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, which are connected to the CSPG.

In accordance with Para.115 of EB65 VVS (Version 05.0)/42/, “Where the baseline scenario is prescribed in the approved methodology, no further analysis is required.”

As the Methodology of ACM0002 is applied and the baseline scenario has been described in the methodology. In accordance with Para.115 of VVS (Version 05.0)/42/, “Where the baseline scenario is prescribed in the approved methodology, no further analysis is required.” Therefore, **CAR1** was released as there is no need to demonstrate the alternatives. Hence the new version VCS-PD has been corrected, CAR1 is closed.

In conclusion, CCSC confirms that the baseline scenario is prescribed in the approved methodology, no further alternatives analysis is required.

After reviewing VCS-PD/1/PDR/10/ and 2011 Baseline Emission Factors for Regional Power Grids in China/5/, it is confirmed that the baseline identification is clear and accurate, and is in line with ACM0002 Version 14.0.0/13/.

And, based on the site-visit and by cross-checking the information with similar relevant projects, also based on the validation team’s local and sectoral knowledge, it is confirmed that the selected baseline scenario is the prevailing practice in the host country and in line with the host country regulations.

As per the validation in Section 3.2.3 of this report, the CSPG are identified as the project boundary. For OM and BM emission factors, the weight is set to be 50% and 50% respectively. The basic parameters used for calculating baseline emissions of the project are provided in the following table:

Parameters	Value	Note
The operating margin emission factor ($EF_{grid,OM,y}$) of the CSPG (tCO ₂ /MWh)	0.9223	Sourced from Chinese DNA: 2013 Baseline Emission Factors for Regional Power Grids in China/5/
The build margin emission factor ($EF_{grid,BM,y}$) of the CSPG (tCO ₂ /MWh)	0.3769	
The combined baseline emission factor ($EF_{grid,CM,y}$) of the CSPG (tCO ₂ /MWh)	0.6496	
Net annual electricity supplied to the CSPG (MWh)	85,988	

Referring to ACM0002 Version 14.0.0/13/ and Tool to calculate the emission factor for an electricity system (Version 04.0)/6/, and through cross-checking the information provided by the DNA of P.R. China/8/, CCSC confirms the appropriateness of the above parameters. The OM, BM and CM had been correctly cited in the VCS-PD/1/.

In conclusion, according to VCS version 3.4 /8/ and based on CCSC's local and sectoral knowledge, CCSC confirms that:

- (1) All the assumptions and data used by the project participants are listed in the VCS-PD, including their references and sources;
- (2) All documentation used is relevant for establishing the baseline scenario and correctly quoted and interpreted in the VCS-PD;
- (3) Assumptions and data used in the identification of the baseline scenario are justified appropriately, supported by evidence and can be deemed reasonable;
- (4) Relevant national and/or sectoral policies and circumstances are considered and listed in the VCS-PD;
- (5) The approved baseline methodology has been correctly applied to identify the most reasonable baseline scenario and the identified baseline scenario reasonably represents what would occur in the absence of the project activity.

3.2.5 Additionality

The steps taken and sources of information used, to cross-check the information contained in the VCS-PD versions 03/1/ on this matter are described below:

"Tool for demonstration and assessment of additionality" version 7.0.0/4/ has been utilized to demonstrate additionality. Following the requirements of the aforementioned tool, the alternatives to the project activity were determined and their compliance with relevant mandatory laws and regulation were evaluated. Following this, investment analysis and common practice analysis were used to demonstrate the additionality of the project.

3.2.5.1. Identification of alternatives

For the type of the project, the project participant chose the prescribed baseline scenario in ACM0002 "Grid-connected electricity generation from renewable sources" Version 14.0.0/13/ in the VCS- PD/1/ as follows,

Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the “Tool to calculate the emission factor for an electricity system” Version 04.0.0/6/.

In accordance with Para.115 of EB65 VVS (Version 05.0), “Where the baseline scenario is prescribed in the approved methodology, no further analysis is required.”

In conclusion, CCSC confirms that the baseline scenario is prescribed in the approved methodology; no further alternatives analysis is required.

3.2.5.2. Investment analysis

The PP chose Investment Analysis to demonstrate Additionality as per the Tool for the Demonstration and Assessment of Additionality/4/. The investment analysis was assessed by the validation team, including assessment of the spreadsheet/2/ and evidences relating to the input values to the financial analysis.

For the investment analysis, the Benchmark Analysis (Option III of Step 2 of Tool for the Demonstration and Assessment of Additionality/4/ is selected in VCS-PD, since:

(1) Simple cost analysis (Option I) is not appropriate, because the project generates financial or economic benefits through the sales of electricity other than VCU related income. This is in line with Tool for the Demonstration and Assessment of Additionality/4/, which states:

“The project activity and the alternatives identified in Step 1 generate no financial or economic benefits other than VCU related income, and then apply the simple cost analysis (Option I)”.

(2) Investment comparison analysis (Option II) is not appropriate neither. Because this Option is applicable to projects whose alternatives are also investment projects, however the alternative baseline scenario of the project is the continuation of the supply of electricity by the CSPG rather than a comparable investment project, Option II is also not an appropriate choice. This is in line with Guidelines on the assessment of investment analysis (Version 05)/5/, which states:

“If the proposed baseline scenario leaves the project participant no other choice than to make an investment to supply the same (or substitute) products or services, a benchmark analysis is not appropriate and an investment comparison analysis shall be used. If the alternative to the project activity is the supply of electricity from a grid this is not to be considered an investment and a benchmark approach is considered appropriate”.

Hence it is CCSC’s opinion that the adoption of Benchmark analysis(Option III) is appropriate.

3.2.5.3. Determination of benchmark

The financial indicator most suitable for the project type and decision context is the project Internal Rate of Return (IRR). This is correctly identified in the VCS-PD/1/. The IRR is the financial indicator commonly used in the host country to assess the economic or financial feasibility of investment projects, and is also the financial indicator used by the government to determine investment thresholds or benchmarks for construction projects.

The benchmark project IRR of 10% (after tax) for Chinese power industry is chosen for the analysis. This benchmark project IRR is derived from “Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects”/18/, which was issued by State Power Corporation of China, the former state authority who managed national power industry including new constructions of power plants. The rule is referred to the risk premiums of hydropower project with a capacity higher than 50MW, and is established based on “Economic Evaluation Code and Parameter for Construction Project”/19/, which was co-issued by NDRC and China Construction Ministry and regarded as the national criteria in project evaluating. However, for the project with a capacity not higher than 50MW, Economic Evaluation Code for Small Hydropower Project (SL 16-2010)/20/ is used widely for feasibility studies of power project investments in China, and the benchmark referred is 10%. There, the benchmark 10% applied by the project with a capacity of 24MW is appropriate.

Given the benchmark is determined by the government and also taking into consideration its appropriateness, it is reasonable to assume that no investment would be made at a rate of return lower than the benchmark. It may also be noted that these are the latest available guidelines on benchmarks in China and are widely adopted by project developers in assessing the economic and financial feasibility of their investments in the power sector. This benchmark was also applied by the independent third party design institute when assessing the feasibility of the project in the PDR/3/, which was approved by Qianxinan Miao and Buyi Autonomous Prefecture Development and Reform Commission/10/.

Based on CCSC’s sectoral and financial expertise, it is confirmed that the benchmark of 10%(after tax) used in the VCS-PD/1/ is proper, suitable for the project activity.

3.2.5.4. Input parameter validation

In project VCS-PD/1/, the project IRR (after tax) is 7.82%.

The project participants rely on values from PDR/3/ and PDR approval/10/, to conduct the investment analysis for the proposed CDM project activities, CCSC can confirm that:

The values used in the VCS-PD/1/ and associated annexes are fully consistent with the PDR/3/ and PDR approval/10/.

PDR/3/ was approved on 27/05/2009, and the key parameters e.g. installed capacity, total investment, etc. in which are consistent with PDR/3/. The equity and bank loan are consistent with PDR approval/10/. Besides, on the basis of CCSC's specific local and sectoral expertise, by cross-checking or other appropriate manner, the input values from the PDR/3/ and PDR approval/10/ are valid and applicable at the time of the investment decision.

The following detail what and how parameters are validated. Summary of key financial input values are presented as follows.

No.	Input Values Validated		Values Applied in this project
1	Bus-bar tariff		0.2574 RMB/kWh (incl. VAT)
2	Plant Load Factor(PLF)		41%
3	Installed capacity (MW)		24
4	Total Static Investment		159.69 Million RMB
5	O&M expenses		3.13 Million RMB
6	Tax	Value Added Tax (VAT)	6%
		Income Tax	25%
		Tax of City Construction & Maintenance	5% of VAT
		Tax of Education Surcharge Rate	3% of VAT
		Surplus accumulative fund	10%
7	Welfare, insurance and housing fund rate		41% of the salary
8	Depreciation Rate		4.75%
9	Loan Interest		5.94%
10	Annul net electricity generation		85,988MWh

CL02: the financial parameter in the Table 4 in the VCS-PD/1/ version 01 shall be corrected according to the approved PDR/3/. As the parameter has been corrected in the version 03 of the VCS-PD, therefore, CL02 is closed.

Bus-bar tariff

The bus-bar tariff used to calculate IRR, 0.2574RMB/kWh (incl.6% of VAT), is sourced from the approved PDR/3/. Meanwhile, the bus-bar tariff is also confirmed by the power purchase agreement signed between the local grid company and the project developer on 05/12/2012/16/. Hence, the validation team has also checked the information note on the highest tariffs applied by the CDM execute board in its decisions on registration of projects in China version 02 dated 03 June 2011. At the same time, by comparing with other similar projects, the validation team also cross checked the tariff used by other similar projects (hydropower projects with $\pm 50\%$ of capacity and located in the same province as the project) registered on UNFCCC. It is noticed that all similar projects have no higher tariff than the project i.e. 0.2574 RMB/kWh (incl. VAT). CCSC can confirm that the tariff of 0.2574RMB/kWh used for calculating project IRR is considered as suitable and conservative for the project.

CL03: The PPA was not provided during the site visit. Therefore the PPA shall be provided to cross check the electricity tariff with the value in the PDR/3/. As the PPA is provided, CL03 is closed.

In conclusion, it is CCSC's opinion that the applied tariff 0.2574 RMB/kWh (incl.VAT) is reasonable and appropriate at the time of investment decision for the project.

Plant Load Factor (PLF)

The annual utilization hours (3600.83 hours) was calculated based on the annual power generation and the installed capacity according to the approved PDR/3/ issued by a third independent party i.e. Guiyang Branch of China Water Conservancy and Hydropower Construction Consulting Company (hereinafter to be referred as the "design institute"). The design institute has been qualified by Department of Construction of Guizhou Province. The Qualification Certificate Number is A252000461/21/.

According to "Guidelines for the Reporting and Validation of Plant Load Factors" (EB48, Annex 11, Version 01)/22/, the plant load factor shall be defined ex-ante according to one of the following two options:

- (a) The plant load factor provided to banks and/or equity financiers while applying the project activity for project financing, or to the government while applying the project activity for implementation approval;
- (b) The plant load factor determined by a third party contracted by the project participants (e.g. an engineering company)."

Therefore, as shown in VCS-PD/1/, the annual utilization hours is 3600.83 hours, according to the “Guidelines for the Reporting and Validation of Plant Load Factors” (EB48, Annex 11, Version 01)/22/, the $PLF = \text{annual utilization hours} / 8,760 \times 100\% = 3600.83h / 8,760h \times 100\% = 41.1\%$.

CCSC confirms that the PLF of this project complies with above requirements because:

- a) it is provided to the government for applying the implementation approval, the approval was issued by Qianxinan Miao and Buyi Autonomous Prefecture Development and Reform Commission/10/, the municipal governing body for power projects, and;
- b) it is determined by a qualified third party, i.e. The qualified design institute/21/, contracted by the PP.

Hence the Validation Team confirms the PLF of the project is reasonably determined according to Guidelines for the Reporting and Validation of Plant Load Factors /22/.

Annual net electricity supplied to the CSPG

According to the PDR/3/, the annual net electricity generation supplied to the CSPG is calculated as average annual electricity generation $\times$ electricity effective coefficient $\times$ (1- internal consumption rate) $\times$ (1- transmission loss rate).

The average annual utilization hours is designed and determined based on 30years (1971~2008) historical statistical data of the water flow data years measured by the local hydrological station, the average values of those key elements that might affect the tunnel inlet flow rate can hardly change significantly in the operation periods. CCSC confirms the value is credible and reasonable. Therefore the average annual electricity generation was estimated as 86,420 MWh.

The validation team noticed that the electricity loss factor estimated in the PDR/3/ only considered 0.5% of the internal consumption rate. So CCSC validates the appropriateness of these three factors as follows:

As per the Economic Evaluation Code for Small Hydropower Projects (SL16-2010)/20/, the electricity effective coefficient should be 85-90% for monthly, weekly and daily regulated and non-regulated grid-connected hydropower stations. The project activity is a dam type hydropower plant with the non-regulated function. Hence, the design institute chose a value of 99.5% as the electricity effective coefficient which is higher than the range of 85-90% stipulated by the Economic Evaluation Code for Small Hydropower Projects (SL16-2010)/47/ and hence is deemed conservative.

For the Internal consumption rate, according to Relationship between House Service System and Power Generation Output in Hydraulic Power Plant, Northeast Electric Power Technology published on the Northeast Electric Power Technology (Authoritative Power Periodical), the Power Consumption Rate of hydropower stations in China is in the range of 0.3% ~ 2%, the internal consumption rate of the project is 0.5% which is within the above range. Therefore, CCSC confirm that the value used by the project i.e. 0.5% for internal consumption rate is reasonable

Therefore, according to the PDR/3/ of the project, the annual theoretical electricity generation is 86,420 MWh, the electricity loss factor estimated only considered 0.5% of the internal consumption rate, the annual net electricity generation supplied to the CCPG is calculated as 85,988 MWh(=86,420 MWh× (1-0.5%)).

Installed capacity

According to PDR/3/, PDR approval/10/, and EIA Approval/11/, there are 2 turbine-generator sets with capacity of 10 MW each set and 1 turbine-generator sets with capacity of 4 MW each, so the total installed capacity is $2 \times 10\text{MW} + 4\text{MW} = 24\text{MW}$.

This is confirmed by CCSC through validating the purchase contract for the hydro turbine-generator sets/14/ and the name plate on the generators during on-site visit, the total units of the hydro turbine-generator sets and the capacity of each set are in line with the description in VCS-PD/1/, so the installed capacity of the project is 24MW.

Total Static Investment

The total static investment of the project is claimed as 159.69 million RMB in the PDR/3/.

CCSC validated the investment values used in VCS-PD/1/ and IRR spreadsheet/2/ against the following two documents, and confirmed the consistency:

Project PDR/3/, completed in January 2009 by Guiyang Branch of China Water Conservancy and Hydropower Construction Consulting Company

Approval letter of PDR, issued on 27/05/2009 by Qianxinan Miao and Buyi Autonomous Prefecture Development and Reform Commission

It is noticed that the major share of total static investment is the construction works and equipment cost via on-site interview. In order to cross-check and confirm the investment cost, the original copies of main investment contracts, which have been signed before on-site validation, are reviewed, and their values are indicated as:

- Purchase contract for the hydro turbine-generator sets/14/: 9,573,800 RMB, signed on 20/11/2009
- General Contract for Construction/38/ signed in September 2009, which including 82,992,300RMB for building construction, 33,755,000RMB for Equipment purchase and installation, 6,480,000RMB for Steel work construction and 17,995,600 for other construction.

The total actual cost of the project is 163,888,300 RMB, which accounts for 102.63% of the total static investment (159,690,000 RMB) estimated in the PDR/3/. Since the project has already started operation in 2011. Thus, validation team can confirm that the actual total investment is higher than the estimation in the PDR/3/ finally.

The validation team further compares unit investment (RMB/kW) of the project with similar hydropower projects in Guizhou Province.

As listed in the table of Section 3.2.5.5 of this report, the unit investment of other hydropower projects registered as CDM projects in Guizhou Province varies from 4,824 RMB/kW to 7,262 RMB/kW. The unit investment of the project is 6,653 RMB/kW, within the range of similar projects in the same province.

Conclusion

Based on above validation, CCSC can confirm that the value of the total static investment applied in the project is reasonable.

O&M expenses

Detailed items covered by annual O&M costs are broken down in the IRR spreadsheet/2/. The annual operating cost did not include the depreciation costs and loan interest, which is in line with EB Guidelines on the assessment of investment analysis/27/.

The breakdown of the O&M expenses is shown in the following table:

O&M expenses			
	Item	Value	Remark
1	Total annual employee salary and welfare	564,000 RMB/year	$20 \times 20,000 \times (1+41\%)=564,000$
	Number of employee	20 persons	
	Annual average salary per	20,000 RMB/year	

	employee		
	Employee's welfare	41%	
2	Maintenance cost	1,596,900RMB/year	Estimated as 1% of fixed assets
3	Water resource fee	601,916 RMB/year	Estimated as 0.007 RMB/kWh (Average annual electricity generation is 85,988 MWh)
4	Reservoir maintenance fee	85,988 RMB/year	Estimated as 0.001 RMB/kWh
5	Other cost	288,000 RMB/year	Estimated 12 RMB/kW
Total	Annual O&M costs	3,136,804RMB/year	About 2% of total static investment

The annual O&M costs in the IRR spreadsheet is validated by CCSC and confirmed to be traceable from the PDR/3/. According to China Statistical Yearbook 2011/28/, the price trend of material and salary trend of the employees are gradually increasing in China. It is from a conservative point of view to apply a constant value of annual O&M costs from the PDR/3/ in the investment analysis.

Comparison with other similar project

The validation team further compares the ratio of annual O&M costs to total static investment of the project against the other similar hydropower projects in the table below in Section 3.2.5.5 of this report, which ranges from 1.06% to 2.48%. The ratio of the project is 2.00%, which is within the range of the similar projects.

Conclusion

Based on above validation, CCSC confirms that annual O&M costs are reasonable and conservative at the time of investment decision.

Tax

Value Added Tax (VAT) (6%)

CCSC confirms that the VAT applied (6%) in the PDD and IRR spreadsheet/2/ of the project is correct. The applied VAT rate is consistent with National Tax Law Provisional Regulation on VAT, issued by the State Council Order (Order [2008]538, dated 10/11/2008)/23/.

Income Tax (25%)

According to Law of the People's Republic of China on Enterprise Income Tax (enacted by President of the People's Republic of China Order 63, dated 16/03/2007)/25/, CCSC confirms that the applied income tax rate (25%) is correct. The income tax rate is validated consistent among project VCS-PD, PDR/3/ and IRR spreadsheet/2/.

Also, CCSC confirms that, when calculating tax payable profit and income tax in the project IRR spreadsheet/2/, the depreciation and interest cost had been considered, which is in line with the requirement of EB Guidelines on the assessment of investment analysis/23/, "Depreciation, and other non-cash items related to the project activity, which have been deducted in estimating gross profits on which tax is calculated, should be added back to net profits for the purpose of calculating the financial indicator (e.g. IRR, NPV)."

Tax of City Construction & Maintenance (5% of VAT)

According to Provisional Regulations on Urban Maintenance and Construction Tax issued by State Council (ref. Guo Fa [1985]19, 08/02/1985)/31/, CCSC confirms that the tax rate (5% of VAT) for City Construction and Maintenance is correctly applied in IRR spreadsheet/2/.

Tax of Education Surcharge Rate (3% of VAT)

According to Decision on Revising Interim Regulation on Education Surcharge issued by State Council (State Council Order [2005]448, dated 20/08/2005)/32/, the normal education surcharge is 3%. CCSC confirms that the total education surcharge (3% of VAT) is correctly applied in IRR spreadsheet/2/.

Residual Value (5%)

According to Notice of Clarifying Enforcement Time of Adjustment of Residual Value Ratio of Enterprise Fixed Assets issued by State Administration of Taxation of China (Guo Shui Han [2005]883, 14/09/2005)/39/, CCSC confirms that the residual value rate (5% of fixed assets) is correctly applied in IRR spreadsheet/2/.

Depreciation Rate (4.75%)

As stated in project IRR spreadsheet/6/, the depreciation rate is 4.75% per year. In line with Regulations for the Implementation of the Law of the People's Republic of China on Enterprise Income Tax, issued by State Council (State Council Decree No. 512, dated 06/12/2007 and valid 01/01/2008)/40/, depreciation period of 20 years is reasonable. The formula used is: Depreciation rate = $(1 - \text{residual rate}) / \text{depreciation period} = (1 - 5\%) / 20 \text{ years} = 4.75\%$.

CCSC confirms that the calculation of depreciation rate is correct. The depreciation rate is consistent between in VCS-PD/1/ and IRR spreadsheet/2/.

Interest

In the VCS-PD/1/ of the project, the interest rate of long-term commercial loan is 5.94%. The loan rates are observed in line with official information published by the People's Bank of China/34/at the time of the PDR compiling (January 2009)/3/, and is consistent in the VCS-PD/1/, PDR /3/ and IRR spreadsheet/2/. Hence CCSC confirms that the interest rates applied in VCS-PD/1/ are valid.

Operation Period (20 years)

According to the PDR /3/, the operation period was chosen as 30 years. But according the Para.3 of "Guidance on the Assessment of Investment Analysis" (Version 5.0)/7/, if the project participants choose a renewable crediting period and if the technical lifetime of the CDM project activity is more than 20 years, the investment analysis shall be conducted for 20 years and include the fair value of the project activity assets at the end of the assessment period. Hence, for operation period, "in general a minimum period of 10 years and a maximum of 20 years of financial project lifetime will be appropriate".

Therefore, the project lifetime shall be selected as 20 years, **CAR4** was released for correcting the period for the investment analysis from 30 years to 20 years both in the VCS-PD/1/ and the IRR spreadsheet/2/. The new version of the VCS-PD and the IRR spreadsheet has corrected the operation period in the investment analysis. So CAR4 was closed.

Based on CCSC's local and sectorial experience, the selection of project lifetime (20 years) is regarded reasonable and acceptable.

3.2.5.5. Similar Projects Information

To confirm that the input parameters used in VCS-PD/1/ and IRR spreadsheet/2/ are reasonable and adequately represent the practical financial situation of the project, and to cross check the above validation process, CCSC identified through referring to UNFCCC website the similar projects for key parameters. The projects meet the following four criteria were selected for comparison:

- Hydropower projects;
- Located in Guizhou Province;
- the starting date is after 2002 (on 10/02/2002, China State Council issued the Notice on Issuing Electric Power Sector Reform Program/35/, which launched a reform on China power industry,

separated power plants from network to compete in price to enter network. This notice is regarded as a milestone to promote market competition and started to create market-driven structure);

- Installed capacities range from 12MW to 36MW as +/-50% of the capacity of the project activity (24MW); and

The key parameters of these projects, which are all sourced from UNFCCC website <http://cdm.unfccc.int/Projects/projsearch.html>, are summarized in the table below.

As validated in above steps, the key parameters of the project are all within the ranges of similar projects as indicated in the table below. So CCSC is confident that the key parameters of the project are reasonable and acceptable.

Comparison of financial indicators among the registered hydropower CDM projects in Guizhou Province

No.	UNFCCC Ref. No.	Project title	Installed capacity (MW)	Annual Operational hours	Unit Investment (RMB/kW)	Percentage of annual O&M costs to total static investment
1	1125	Nandong 12MW Hydro Power Project in Guizhou Province, China	12	4,128	4,824	1.54
2	1484	Shaba 30MW Hydro Power Project in Guizhou Province China	30	4,310	6,241	1.97
3	1486	Luojiaohe 20MW Hydro Power Project in Guizhou Province China	20	3,480	6,667	1.16
4	1517	Guizhou Shuicheng Jinshizi Hydropower Station	20	4,255	7,215	2.01
5	1809	Huangyutang Hydro Power Project in Guizhou Province	12.6	4,465	5,881	1.35
6	1875	Sanchawan 32MW Hydro Power Project in Guizhou Province China	32	4,872	6,623	2.02
7	2210	Xaba 20MW Hydro Power Project in Guizhou Province China.	20	3,210	5,323	1.58
8	2204	Longwangtan 15MW Hydro Power Project in Guizhou Province	15	4,001	5,467	1.06
9	1953	Guizhou Taijiang Yanzhai Hydropower Station	25	4,000	5,657	1.93
10	2136	Tongren Tianshengqiao Hydropower Project, Guizhou Province, China	22	3,512	6,130	1.89
11	2104	Baishuiquan Hydropower Project, Guizhou Province, China	20	3,994	5,399	2.00
12	2448	Qingxi 28MW Hydropower Project in Guizhou Province, China	28	3,451	6,778	1.20
13	2574	Guizhou Kaiyang Zijiang Hydropower Station Project	12	3,700	6,260	2.48
14	2501	Guizhou Kaiyang Nanjiang Hydropower Station Project	21	3,367	5,248	2.40
15	2955	Guizhou Tongzihe Yuanmanguan Hydropower Project	40	3,415	7,262	2.18



16	4128	Guizhou Xishui Jinyang Hydropower Station	20	2,954	6,257	2.07
17	4746	Niudu 20MW Hydropower Project on Furong River, Guizhou province	20	3,515	6,633	1.79
18	7047	Guizhou Yinlu First Stage (Yinwang) Hydropower Project	17.5	3,964	6,194	2.07
19	/	Banian Plant	12.6	3,178	6,144	2.31
		Minimum		2,954	4,824	1.06
		Maximum		4,872	7,262	2.48
		The Project		3,600.	6,653	2.00



3.2.5.6 Sensitivity Analysis

Four parameters are used as critical assumptions during sensitivity analysis,

Bus-bar Tariff,

Total Static Investment,

Annual O&M Costs, and

Net annual electricity supplied to the CSPG.

Based on CCSC's local and sectorial expertise, that the above four parameters subjected to sensitivity analysis is reasonable to supplement the IRR calculation, and there are no other parameters having significant impact that are not included in the sensitivity analysis. Calculation results and justification of the adopted fluctuation range ($\pm 10\%$), together with variation analysis when the benchmark IRR(10%) is reached, are validated as follows.

Summary of Variations in Critical Assumptions on post-tax Project IRR

	-10%	0%	10%	the corresponding variation when the benchmark IRR (10%) is reached
Total Static Investment	9.00%	7.82%	6.82%	- 17.20%
Annual O&M costs	8.00%	7.82%	7.64%	- 100%
Net annual electricity supplied to the CCPG	6.66%	7.82%	8.93%	+19.90%
Bus-bar Tariff	6.62%	7.82%	8.97%	+ 19.20%

For the total static investment, when decreases 10%, the post-tax Project IRR will be 9.00%; when decreases 17.20%, the post-tax Project IRR will reach the benchmark 10%. However, in practice, the project has already started operation. As validated the total static investment in Section 3.2.5.4 of this report, the total contracted amount of the major signed contracts/14//38/ has already been 163,888,300RMB, which is 102.63% of the total static investment in the PDR/3/. Besides, since the trend of Price Index for Investment in Fixed Assets in Guizhou Province has kept growing from 2006 to 2010 in accordance with China Statistical Yearbook 2011 issued by the National Bureau

of Statistics of China/68/, it is obviously impossible to make the static total investment decreased by 17.20%.

For annual O&M costs, when decreases 10%, the post-tax Project IRR is 8.00%; when decreases over 100%, the post-tax Project IRR will achieve the benchmark 10%. The annual O&M costs is based on the PDR/3/, and comprises seven parts: employee salary and welfare, material cost, maintenance cost, water resource fee, reservoir maintenance fee, insurance for fixed assets and miscellaneous cost. According to China Statistical Yearbook 2011, the trends of employee salary indexes and the purchase price indexes of the material, fuel, power from 2006-2010 are increasing. As stated in Section 3.2.5.4 of this validation report, a 100% reduction of annual O&M costs is not considered realistic or likely.

For net annual electricity supplied to the CSPG, when increases 10%, the post-tax Project IRR will be 8.93%; when increases 19.90%, the post-tax Project IRR will reach benchmark 10%. However, this is considered unlikely because the average annual electricity generation is estimated based on the long term statistic data provided by official meteorological station, and electricity output is calculated by the independent third party design institute. Moreover, the net annual electricity supplied to the CSPG is calculated as electricity generation $\times$ electricity effective coefficient $\times$ (1- internal consumption rate) $\times$ (1- transmission loss rate), in which only 0.5% of the internal consumption rate is considered. Therefore, the adoption of those factors of the project is reasonable and conservative in IRR calculation. More importantly, even if the electricity effective coefficient were 1 and the transmission loss rate and internal consumption rate were 0, the project IRR (after-tax) is 7.88%, still below benchmark. Furthermore, according to the power generation records from 05/12/2011 to 25/08/2013, the average annual power generation is 84,118MWh, which is still lower than the expected annual power generation in the PDR/3/. CCSC has confirmed this by validating project PDR/3/ and its approval/10/, and it is impossible that the net annual electricity supplied to the CSPG of the project in average would increase by 19.90% to make the IRR to meet the benchmark.

For bus-bar tariff, when increases 10%, the post-tax Project IRR is 8.97%; when increases 19.20%, the post-tax Project IRR will reach benchmark 10%. The bus-bar tariff of 0.2574RMB/kWh is referred to the PDR/3/. Meanwhile, as stated in Section 3.2.5.4 of this validation report, the bus-bar tariff of 0.2574RMB/kWh (incl. VAT) was applied based on the Power purchase agreement (valid from 05/12/2011 to 31/12/2012) signed between Guizhou Power Grid and Guizhou Zhongshui Energy Co., Ltd, dated on 05/12/2012/16/, and confirmed by Power Connection Agreement between Guizhou Power Grid and Guizhou Zhongshui Energy Co., Ltd in November, 2011/17/. Therefore it is unlikely for the tariff to increase 19.20%.

CCSC assessed all the calculations and regarded that calculation outputs presented in the VCS-PD/1/ are correct. For the project's sensitivity analysis, it is CCSC's opinion that the conclusion regarding the sensitivity analysis of the project is robust. The project remains financially unattractive without VCU revenues as evidenced by the post-tax Project IRR which is constantly below the threshold.

In conclusion, the investment analysis, including the sensitivity analysis, has shown that, the project cannot be considered as financially attractive.

3.2.5.7 Conclusion for investment analysis

Based on the assessment of above steps and Guidelines on the Assessment of Investment Analysis (Version 5.0)/7/, CCSC examined the correctness of computations carried out and documented. Conclusions can be drawn that, regarding IRR calculation:

For the input parameters and values, CCSC cross-checked VCS-PD/1/, IRR spreadsheet/2/, PDR/3/ and its approval/10/, and confirmed the credibility and consistency. CCSC confirms that the input values used in the VCS-PD/1/ meet the requirements VCS standard/8/.

For the underlying assumptions and adopted formula, CCSC confirms the suitability and correctness, and the VCS-PD/1/ and the IRR spreadsheet/2/ are transparent, viewable and unprotected.

For the financial calculation process, CCSC has scrutinized IRR spreadsheet/2/ and assessed the correctness of computations carried out by the project participants by reproducing the results using the IRR spreadsheet/2/. CCSC confirms that the financial calculation process is correct, the calculation results can be reproduced and the outcomes are properly documented and consistent with the results of the PDR/3/. The calculation is also in line with the Guidelines on the Assessment of Investment Analysis (Version 5.0)/27/.

3.2.5.6. Common Practice Analysis

The common practice analysis was conducted in the VCS-PD/1/ following the “Tool for the Demonstration and Assessment of Additionality (Version 07.0.0)/4/ as well as “Guidelines on common practice” version 02/36/.

As the project is a newly-built hydropower project, the project activity belongs to the type (b) of the measures mentioned in the additionality tool

Step 1: In VCS-PD/1/, the applicable output range from 12MW to 36MW as +/-50% of the capacity of the project activity (24MW) is defined in Step 1 because the output of the project is confirmed by CCSC during the validation according to the approval and the design reports.

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

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

China is a very large country over the world. The investment environment for each province in China is different. This is due to variation of available natural resources such as water resources, the economic development level, the industrial structure, the fundamental infrastructure, development strategy and the policy framework. These all affect the demand for the products in terms of amount as well as the types of products and technologies. As such a number of key economic factors vary from province to province. Comparing with other province in China,

Guizhou province has different economic conditions, caused mainly by the vast expanse of land inherent to Chinese provinces, and causing the following features:

- More independence and less relation with other provinces economically and politically, which causes different environments and conditions for investment in a project industrial development technology development price of equipment and material, especially required for construction of modern industrial facilities, availability of engineers and technical workers, availability of transportation and so on.
- Difference in climate and weather, including rainfall, which greatly affects the operation duration of a hydropower plant and the structure of the plant. Availability of a hydropower plant is affected by its capacity.
- The Provincial Government is responsible for taxes, loan policies, electricity tariff policies etc., that are specifically applicable to the Province. In addition, grid planning, construction, operation, and electricity supply in Guizhou Province are organized and regulated by the Guizhou Electric Power Corporation, while the CSPG Company Ltd, is responsible for grid planning and electricity dispatch of different provincial grids included in CSPG, and electricity dispatch with other grids of the Host Country (e.g. the CCPG).

Therefore CCSC confirmed that Guizhou province should be applicable geographic area; however for conservativeness, in the VCS-PD, the applicable geographic area was enlarged into CSPG (including Guizhou, Guangdong, Guangxi, Hainan and Yunnan province) which is in line with the project boundary of the project furthermore in line with Chinese DNA's guidance for the determination of grid boundaries and emission factors in 2011/5/.

The start date is confirmed to be 05/12/2011, then only project started operation before 05/12/2011 are considered. Also according to "Guidelines on common practice" version 02.0/36/, only projects use the same energy source/fuel and feedstock as the project activity should be identified, then the projects with other kind of resources are not included.

Based on all these conditions, 4 categories were set in the VCS-PD which cover all projects under the criteria mentioned above:

Category 1: Hydropower projects between 12MW to 36MW in Guizhou province with investment start date before year 2002.

Category 2: CDM Hydropower projects between 12MW to 36MW in Guizhou province with investment start date after year 2002 and before 05/12/2011

Category 3: None-CDM Hydropower projects between 12MW to 36MW in Guizhou province with investment start date after year 2002 and before 05/12/2011

Category 4: Power generation projects with applicable output range in Guizhou provinces of China.

Step 3: CCSC checked the latest available document i.e. Yearbook of China Water Resource 2003, 2006~2011/37/, there are only 3 projects belong to category 1, and there are on projects belong to category 3. CCSC confirms that N_{all} covers all plants with capacities of 12~36MW and

are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation.. Therefore, $N_{all}=N_1+N_4$

Step 4: CCSC validated the identification of different technologies and selection criteria for N_{diff} in as follows:

Energy source/fuel: the project is hydropower project, which is a renewable power generation project. All the non-renewable energy power plants (including fossil fuel plants, nuclear plants, waste heat/gas plants, solid waste treatment plants etc.), other renewable energy power plants (including solar power, biomass, etc.) and captive plants in China use different energy source/fuel, which are included Category 4, fall in N_{diff}

Power industries in different periods: As validated in Section 3.2.5.5, this is considered reasonable given that the power industry was significantly reformed in 2002, which is shown at page 10-14 of China Electric Power Yearbook 2003/33/. Under a set of reforms enacted in 2002, the China power industry started to create a market-driven structure by separating power generation from transmission and distribution. Based on checking relevant policy, CCSC confirms the year of 2002 is a threshold for power industry, which may be a reasonable and significant difference of hydropower projects starting operation before and after 2002. Thus, the projects starting operation before 2002 referred to Category 1 are included in the N_{diff} .

Therefore, $N_{diff} = N_1+N_4$

Step 5: In accordance with step 4, $N_{diff} = N_{all} = N_1+N_4$, therefore: $F = 1 - N_{diff}/N_{all} = 1 - 1 = 0 < 0.2$, and $N_{all} - N_{diff} = 0 < 3$.

According to the “Tool for the Demonstration and Assessment of Additionality (Version 07.0.0)/4/ as well as “Guidelines on common practice” version 02/36/., the project activity is a common practice within the applicable geographical area if both the following conditions are fulfilled: (a) the factor F is greater than 0.2, and (b) $N_{all}-N_{diff}$ is greater than 3. In other words, if F is not greater than 0.2 or $N_{all}-N_{diff}$ is not greater than 3, the project is not a common practice. Therefore, CCSC’s opinion is that common practice analysis of the project complies with required tool/36/. CCSC confirms that the project is not a common practice.

3.2.6 Quantification of GHG Emission Reductions and Removals

The calculations of baseline emissions, project emissions and leakage and emission reductions have been checked by the validation team. The parameters and equations presented in the VCS-PD/1/ and further documentation have been compared with the information and requirements presented in applied methodology and respective tools.

Baseline emission

The calculation of the baseline emissions followed the procedures described in the methodology ACM0002 (Version 14.0.0)/13/. Baseline emissions are the product of the grid emission factor ($EF_{grid,CMY}$ in tCO_2/MWh) times the electricity supplied by the project to the CSPG($EG_{facility,y}$, in MWh).

In the project VCS-PD/1/, the grid emission factor is calculated based on the latest data which was the most available at the commencement of validation. The data used is quoted from “China Energy Statistical Yearbook”/28/ and “China Electric Power Yearbook”/33/. The document “2011 Baseline Emission Factors for Regional Power Grids in China”/5/ is also referred to, as this document provides guidance on the calculation of baseline emission factors for project electricity system and connected electricity systems in China.

The grid emission factor is determined as Combined Margin (CM), combination of the Operating Margin (OM) and Build Margin (BM), which is following the “Tool to calculate the emission factor for an electricity system”/6/.

Operating Margin (OM). Ex-ante option was selected. Simple OM method was chosen and this is justified since the low cost/must run resources constitute less than 50% of total grid generation in the average of the five recent years. The Simple OM emission factor is “calculated as the generation-weighted average CO₂ emissions per unit net electricity generation (tCO₂/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units”, as per “Tool to calculate the emission factor for an electricity system” /6/.

Because (1) the net electricity generation and a CO₂ emission factor of each power unit are not available in China, and (2) the nuclear and renewable power generations are considered as low-cost/must-run power sources and the quantity of electricity supplied to the CSPG by these sources is known in China, at the same time, (3) off-grid power plants are not included in the calculation. The “Option B - Calculation based on total fuel consumption and electricity generation of the system” is adopted for Simple OM calculation, which is “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”.

Net calorific values of each fuel type were obtained from the China Energy Statistical Yearbook/31/. IPCC 2006 default values /29/ were used for the CO₂ emission factors of each type of fossil fuel. The values used and the calculation of the simple OM are considered to be reasonable, and are in line with official data published by the Government of China/5/.

The $EF_{grid,OM,y}$ is calculated to be 0.9223 tCO₂/MWh. The sources and calculation have been verified by CCSC.

Build Margin (BM). BM emission factor was calculated in VCS-PD/1/ with Option 1 of “Tool to calculate the emission factor for an electricity system” /6/ with ex ante approach. Because plant specific fuel consumption and electricity generation data are not publicly available in China, the guidance given by the CDM Executive Board for a deviation from methodology AM0005 has been applied for calculation of the BM emission factor for the project, which suggests to “use the efficiency level of the best technology commercially available in the provincial/regional or national grid of China, as a conservative proxy, for each fuel type in estimating the fuel consumption to estimate the build margin (BM)” .

In accordance with this guidance, the build margin consists of the set of power capacity additions in the electricity system that comprises 20% of the generation capacity (in MW) of the system, that have been built most recently, based on the aggregate incrementally installed capacity of all

generation sources in year y . The emissions factor of fossil fuel fired power generation in CSPG is calculated using the proportions of GHG emissions from solid, liquid and gaseous fuels in the total GHG emissions related to power generation as the weights, and the emission factors of the most advanced commercial generation technologies available in the host country (as published by the NDRC).

Finally, based on data in the China Electric Power Yearbook /33/, $EF_{grid, BMy}$ is calculated to be 0.3769 tCO₂/MWh. The sources and calculation have been verified by CCSC.

Combined Margin (CM). CM emission factor is calculated following “weighted average CM method (option A)” of “Tool to calculate the emission factor for an electricity system”/6/. The weighting is set to be 50% and 50% for OM and BM emission factors respectively. For this project, the combined baseline emission factor will remain fixed during the first crediting period, via $EF_{grid, CM, y} = EF_{grid, OM, y} \times W_{OM} + EF_{grid, BM, y} \times W_{BM} = 0.9223 \times 0.50 + 0.3769 \times 0.50 = 0.6496$ tCO₂/MWh. The results are consistent with the data published by the DNA of China in 2013 Baseline Emission Factors for Regional Power Grids in China/5/.

As validated above, the CM emission factor of the project is 0.6496 tCO₂/MWh. The estimated annual electricity supplied to the CSPG by the project is 85,988 MWh. So according to ACM0002 Version 14.0.0/13/, the annual baseline emissions in the first crediting period are calculated as:

$$BE_y = EF_{grid, CM, y} \times EG_{facility, y} = 0.6496 \times 85,988 = 55,857 \text{ tCO}_2\text{e}.$$

The adoption of intpart in VCUs calculation spreadsheet/2/ results in the emission reduction of 55,857 tCO₂e above, which is conservative.

CAR3: as the new version of the baseline emission factors for regional power grid in china has been published, the VCS-PD shall be corrected accordingly. Since the VCS-PD has been corrected, CAR3 is closed.

Project Emissions

The power density of the project is greater than 10W/m², so project emissions should not be considered as per ACM0002 Version 14.0.0/13/. Based on document review and on-site visit, CCSC regards this consideration is correct, and in line with methodology ACM0002 Version 14.0.0/13/.

Leakage

The project does not need to consider leakage. CCSC regards this consideration is correct and in line with methodology ACM0002 Version 14.0.0/13/.

Emission Reductions

According to ACM0002 Version 14.0.0/13/, emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y$$

Where:

ER_y	=	Emission reductions in year y (t CO ₂ e/yr)
BE_y	=	Baseline emissions in year y (t CO ₂ e/yr)
PE_y	=	Project emissions in year y (t CO ₂ e/yr)

Hence for this project, within the first crediting period, emission reductions $ER_y = 55,857$ tCO₂e/yr.

For the calculation of emission factors in the VCS-PD/1/, the CM value shall be corrected according to the latest version from the NDRC website, and the annual emission reduction shall be corrected in the VCS-PD/1/. **CAR 3 was** raised requesting to correct the inconsistency. In response, after revisions, the calculation of emission factors in Appendix 4 is consistent with the calculation process issued by NDRC. Hence, CAR 3 is closed. Please refer to Annex 1 for more details.

The validation team cross-checked the whole calculation process of emission reductions in the VCS-PD/1/ against referenced sources and applied methodology and tools. Based on the information reviewed, it can be confirmed that in the VCS-PD/1/, the sources used are correctly quoted and interpreted, the calculation processes are complete and replicable, and the calculation outcomes are reasonable and accurate.

In conclusion, CCSC confirms that:

- (a) All assumptions and data used by the project participants are listed in the VCS-PD/1/, including their references and sources;
- (b) All documentation used by project participants as the basis for assumptions and source of data is correctly quoted and interpreted in the VCS-PD/1/;
- (c) All values used in the VCS-PD/1/ are considered reasonable in the context of the proposed VCS project activity;
- (d) The baseline methodology has been applied correctly to calculate project emissions, baseline emissions, leakage and emission reductions;
- (e) All estimates of the baseline emissions can be replicated using the data and parameter values provided in the VCS-PD/1/.

3.2.7 Methodology Deviations

There are no methodology deviations applied to the project.

3.2.8 Monitoring Plan

The project applies the approved consolidated monitoring methodology ACM0002 “Grid-connected electricity generation from renewable sources” version 14.0.0/13/. As validated in Section 3.2.1 of this report, the selected monitoring methodology is applicable for the project activity as it involves grid-connected renewable power generation using water resource.

1. Monitoring Parameters

The following three parameters will be monitored in accordance with ACM0002 Version 14.0.0/13/:

Parameter	Description	Measurement methods
$EG_{PJtoGRID,y}$	electricity supplied by the project to the CSPG	Measured continuously and recorded on a monthly basis
$EG_{GRIDtoPJ,y}$	electricity delivered to the project from the grid	Measured continuously and recorded on a monthly basis
$EG_{facility,y}$	net electricity generation supplied by the project plant to the CSPG	$EG_{facility,y} = EG_{PJtoGRID,y} - EG_{GRIDtoPJ,y}$
Cap_{PJ}	Installed capacity of the hydro power plant after the implementation of the project activity	Project sites
A_{PJ}	Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full.	The data was measured every year by professional design institute is reliable and creditable.

2. Monitoring Arrangement

As stated in the VCS-PD/1/, the power generated by the project will be transmitted to the CSPG through a 110kV Substation. Two meters (bi-directional, at least 0.5s), of which one is main meter and the other is backup, located at the outlet of the 110kV Substation according to the Technical Administrative Code of Electric Energy Metering (DL/T 448-2000)/41/. These two meters are used to measure the electricity supplied to the CSPG and the electricity delivered to the project from the grid. Grid Company will be responsible for the measurement.

The recording frequency will be continuously measured; the project owner and the grid company will record the recordings at least once a month. The measurement results of meter will be cross checked against the values on record of electricity sales and purchases.

3. Data Management and Quality Control

In Section 4.3 of the VCS-PD/1/, authorities and responsibilities regarding monitoring have been described. The relevant person is in full charge of issues related to the project, in particular, 1) supervising the project operation status related to data monitoring and the monitoring process as well, ensuring a smooth and orderly monitoring process; 2) in charge of recording the data, ensuring the completeness and accuracy of related data. General office is in charge of collecting

data required by the checking activity, including ammeter readings records, electricity sales records and copies of electricity sales records and purchase records. Technical department is in charge of calibrating and maintaining the ammeter, and checking, archiving and managing data. Finance departments will be responsible for saving the recordings, sales receipts and calculation of emission reductions.

The data monitored and required for verification and issuance be kept and archived electronically for two years after the end of the crediting period or the last issuance of VCUs, whichever occurs later.

The regular calibration of electric meters will be annually carried out according to Verification Regulation of Electrical Energy Meters with Electronics” (JJG596-1999)/41/ by qualified third party. After calibration, the electricity meters must be sealed. In case, the main meter has the malfunction or the breakdown, the readings of the backup meter would be adopted; if both the main meter and back-up meter have breakdowns, or both the main meter and back-up meter are inaccurate, the net electricity supplied to the grid would be determined according to the stipulation of the Power Purchase Agreement (PPA) if possible, otherwise neglected. All test and repair records will be maintained by the project owner.

The monitoring staff will be trained together. The main training contents are hydro turbine-generator operation regulations, operation and management regulations and training. All attendances have to be recorded for the courses.

Monitoring authorities and data management measures have been confirmed with PP during on-site visit. In conclusion, based on document review, on-site interview, together based on local and sectoral expertise, CCSC confirms that:

- the monitoring plan is in compliance with the requirements of the methodology.
- monitoring arrangements described in the monitoring plan are feasible within the project design.

3.3 Non-Permanence Risk Analysis

As the project is not a AFOLU project, therefore, non-permanence risk analysis is not applicable to the project.

3.4 Environmental Impact

Environmental Impact Statement Form (EIA) has been prepared by Guizhou Hydro Resources and Power Reconnaissance Design Institute in January 2009, and approved by Environmental Protection Department of Guizhou on 28/11/2011/11/. By reviewing EIA and its approval/11/, CCSC confirms that the environment impact assessment of the project complies with Chinese law and regulation. The potential environmental impacts identified in EIA have been sufficiently described in the VCS-PD/1/, which include the impacts to air, noise, solid waste, water and ecological and transboundary impact. No significant environmental impacts are expected from the project activity.

Through on-site interviews with local authorities and local residents, CCSC confirms that there is no significant environmental impact identified, the relevant mitigation measures stated in the EIA had been properly implemented so far, and there is no environmental complaint or accident happened..

3.5 Comments by Stakeholders

Besides the stakeholder consultation process stipulated in the Chinese EIA regulation, the PP conducted an additional local stakeholder consultation in May 2009 through distributing and collecting responses to a questionnaire. 30 local residents were invited to the join the survey.

The validation team has reviewed the meeting minutes and conducted the on-site interview, and confirmed that the persons participated in the survey are the nearby villages. Thus, the validation team is able to confirm that the surveyed residents are stakeholders of the project and their comments are representative. It is reflected in the questionnaires/74/ that all of the respondents expressed their support to the implementation of the project and most people considered the project has positive impact on income of residents, local employment, and local living standard of residents and has no negative impacts aroused by the project. The comments were summarized and recorded in the Section 6 of the the VCS-PD/1/.

During the on-site visit, the representatives of the local residents were interviewed by the validation team and they expressed their support to the construction of the project and they confirmed the project does not produce negative impact on living of local residents.

From above validation, CCSC regards that the local stakeholder consultation was made in an open and transparent manner, in a way that facilitated comments to be received from local stakeholders and allowed for a reasonable time for comments to be submitted. CCSC confirms the adequacy of the local stakeholder consultation.

4 VALIDATION CONCLUSION

China Classification Society Certification Company(CCSC), commissioned by Guizhou Honor Carbon Asset Management Co., Ltd has performed a validation of the Luofan 24MW Hydropower Project in Guizhou Province China (hereafter referred to as "the project") based on UNFCCC criteria for the Clean Development Mechanism, applied CDM Methodology ACM0002 v.14.0.0, VCS criteria and host country criteria.

The validation was executed by taking the following methods and in the following steps so far:

- Global Stakeholder Consultation Process (uploaded from 25/09/2013)
- Desk review of the VCS-PD (Version 01, 23/09/2013)/1/ and relative documents
- On-site visit with stakeholder interviews (from 10/10/2013 to 11/10/2013)
- Issue of checklist with corrective action requests (CARs) and clarification requests (CLs)
- Desk review of revised VCS-PDs and responses to CARs/CLs
- Issue of this version of the validation report

In the course of the validation, 4 Corrective Action Requests (CARs), 3 Clarification Requests (CLs) and no Forward Action Request (FAR) were raised for the project activity (VCS version 01, dated 23/09/2013) in relation to all relevant requirements. Until issuance of this version of validation report, all the CARs and CLs are successfully closed.

The review of the VCS-PD/1/ and additional background documents, the subsequent follow up onsite visit and interviews, together with the review of comments by Parties, Stakeholders and NGOs, have provided CCSC with sufficient evidence to confirm that the project has satisfied the stated criteria.

The validation covered all project components and issues that need to be validated for registration as a VCS project. In our opinion, the selected baseline/monitoring methodology is applicable to the project and correctly applied, in terms of the project boundary, baseline identification, algorithms and/or formulae to determine emission reductions, additionality and monitoring methodology. The project activity is not a likely baseline scenario, emission reductions attributable to the project are additional to any that would occur in the absence of the project activity.

CCSC hereby requests the registration of the project as a VCS-VCU project activity. Provided that the project is implemented and maintained as designed, the project is expected to achieve annual average emission reduction of 558,57tCO₂e within the 1st crediting period.

5 REFERENCES

/1/	VCS-PD of Luofan 24MW Hydropower Project in Guizhou Province China Version 01 dated 23/09/2013 Version 02 dated 07/11/2013 Version 03 dated 19/11/2013
/2/	IRR calculation spreadsheet
/3/	Preliminary Design Report issued by Guiyang Branch of China Water Conservancy and Hydropower Construction Consulting Company, on 01/2009
/4/	Tool for the Demonstration and Assessment of Additionality (version 7.0.0)
/5/	2013 Baseline Emission Factors for Regional Power Grids in China issued by the DNA of China
/6/	Tool to calculate the emission factor for an electricity system" (version 04.0.0)
/7/	Guidelines on the assessment of investment analysis (Version 05)
/8/	VCS Standard, version 3.4, dated 08/10/2013
/9/	VCS Registration and Issuance Process, version 3.4, dated 04/10/2012
/10/	PDR approval letter issued by Qianxinan Miao and Buyi Autonomous Prefecture Development and Reform Commission, dated on 27/05/2009
/11/	EIA report issued by Guizhou Hydro Resources and Power Reconnaissance Design Institute in January in 2009. EIA approval letter issued by Environmental Protection Department of Guizhou, dated on 23/04/2009
/12/	VCS Program Definitions, version 3.5, dated 08/10/2013
/13/	Approved consolidated baseline and monitoring methodology ACM0002 "Grid-connected electricity generation from renewable sources", version 14.0.0, EB75 Annex 13, dated on 04/10/2013
/14/	Purchase contract for hydro power generators between Guizhou Hydropower Mechanical Industry Company and Kunming Power Generator Co. Ltd., dated on 20/11/2009
/15/	Daily operation & maintenance logs
/16/	Power purchase agreement (valid from 05/12/2011 to 31/12/2012) signed between Guizhou Power Grid and Guizhou Zhongshui Energy Co., Ltd, dated on 05/12/2011
/17/	Power Connection Agreement between Guizhou Power Grid and Guizhou Zhongshui Energy Co., Ltd in November, 2011
/18/	Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects
/19/	Economic Evaluation Code and Parameter for Construction Project
/20/	Economic Evaluation Code for Small Hydropower Project (SL 16-2010)
/21/	The certification of the design institute, Guiyang Branch of China Water Conservancy and Hydropower Construction Consulting Company, issued by Department of construction of Guizhou Province on 01/01/2009, valid until 01/01/2014.
/22/	Guidelines for the Reporting and Validation of Plant Load Factors" (EB48, Annex 11, Version 01)
/23/	National Tax Law Provisional Regulation on VAT, issued by the State Council Order (Order [2008]538, dated 10/11/2008)
/24/	Nameplate of turbine-generator units involved in the project, dated 25/04/2013
/25/	China on Enterprise Income Tax (enacted by President of the People's Republic of China Order 63, dated 16/03/2007)

/26/	Business license of Guizhou Zhongshui Energy Co., Ltd issued by the Administration for Industry and Commerce of Ceheng county Guizhou Province, Registration No. 522327000004495, dated on 20/06/2013
/27/	Guidelines on the assessment of investment analysis
/28/	China Statistical Yearbook 2012, 2011, 2010, 2009
/29/	2006 IPCC Guidelines on National GHG Inventories
/30/	Clean Development Mechanism Project Standard (Version5.0), issued by CDM Executive Board dated on 04/10/2013
/31/	Provisional Regulations on Urban Maintenance and Construction Tax issued by State Council (ref. Guo Fa [1985]19, 08/02/1985)
/32/	Revising Interim Regulation on Education Surcharge issued by State Council (State Council Order [2005]448, dated 20/08/2005)
/33/	China Electric Power Yearbook 2012, 2011, 2010, 2009
/34/	Loan interest rates issued by the Bank of China on 26/12/2010, http://www.boc.cn/finadata/lilv/fd32/201012/t20101225_1247524.html
/35/	China State Council issued the Notice on Issuing Electric Power Sector Reform Program
/36/	Guidelines on common practice version 2, EB69 Annex 8.
/37/	Yearbook of China Water Resource 2003, 2006~2011
/38/	General Construction Contract, signed between Guizhou Zhongshui Energy Co., Ltd and Guiyang Branch of China Water Conservancy and Hydropower Construction Consulting Company, Guizhou Hydropower Mechanical Industry Company, in September 2009.
/39/	Notice of Clarifying Enforcement Time of Adjustment of Residual Value Ratio of Enterprise Fixed Assets issued by State Administration of Taxation of China (Guo Shui Han [2005]883,14/09/2005)
/40/	Regulations for the Implementation of the Law of the People's Republic of China on Enterprise Income Tax, issued by State Council (State Council Decree No. 512, dated 06/12/2007 and valid 01/01/2008)
/41/	Verification Regulation of Electrical Energy Meters with Electronics" (JJG596-1999)
/42/	Clean Development Mechanism Validation and Verification Standard (version 05.0)

APPENDIX A: RESOLUTION OF CORRECTIVE ACTION REQUESTS AND CLARIFICATION REQUESTS

No.	CAR/CL/FAR	Response by Project Participants/ CCSC's conclusion of assessment
CAR 1	As the Methodology of ACM0002 is applied and the baseline scenario has been described in the methodology. In accordance with Para. 115 of VVS (Version 05.0), "Where the baseline scenario is prescribed in the approved methodology, no further analysis is required.". Therefore, there is no need for demonstrate the alternatives. The VCS-PD need to be corrected	<u>Response by Project Participants:</u> In accordance with Para. 115 of VVS (Version 05.0)/42/,The demonstrate the alternatives has been deleted. <u>CCSC's conclusion of assessment:</u> The description of VCS-PD version 03 has been corrected, therefore CAR1 is closed.
CAR 2	New version of ACM0002 shall be applied.	<u>Response by Project Participants:</u> The correction has been done. <u>CCSC's conclusion of assessment:</u> The new version VCS-PD has been checked and confirmed correct. CAR2 is closed
CAR 3	The CM value shall be corrected according to the latest version from the NDRC website, and the annual emission reduction shall be corrected in the VCS-PD.	<u>Response by Project Participants:</u> The correction has been done. <u>CCSC's conclusion of assessment:</u> The new version VCS-PD has been checked and confirmed correct. CAR3 is closed
CAR 4	According the Para.3 of "Guidance on the Assessment of Investment Analysis" (Version 5.0)/7/, if the project participants choose a renewable crediting period and if the technical lifetime of the CDM project activity is more than 20 years, the	<u>Response by Project Participants:</u> The correction has been done. <u>CCSC's conclusion of assessment:</u> The new version VCS-PD and the IRR calculation have been checked and confirmed correct. CAR4

No.	CAR/CL/FAR	Response by Project Participants/ CCSC's conclusion of assessment
	investment analysis shall be conducted for 20 years and include the fair value of the project activity assets at the end of the assessment period. Hence, for operation period, in general a minimum period of 10 years and a maximum of 20 years of financial project lifetime will be appropriate.	is closed
CL1	The model number of the turbine shall be corrected in the Table1 in the VCS-PD.	<u>Response by Project Participants:</u> This was a clerical error. The correction has been done. <u>CCSC's conclusion of assessment:</u> The new version VCS-PD and the IRR calculation have been checked and confirmed correct. CL1 is closed
CL2	The financial parameter in the Table 4 in the VCS-PD shall be corrected according to the PDR.	<u>Response by Project Participants:</u> This was only a slip of pen. The correction has been done. <u>CCSC's conclusion of assessment:</u> The new version VCS-PD and the IRR calculation have been checked and confirmed correct. CL2 is closed
CL3	The PPA shall be provided to show the signed electricity tariff for cross check with the value in the PDR.	<u>Response by Project Participants:</u> The PPA has been provided already. Please refer to the documents. <u>CCSC's conclusion of assessment:</u> The PPA of 2011 have been checked and the tariff was cross checked. CL3 is closed

APPENDIX B: CERTIFICATES OF COMPETENCE



Approved by:

CERTIFICATE OF COMPETENCE

Date of Qualification: 10/03/2011

Mr. Rui Qiguang

Has been qualified in accordance with *CDM Personnel Competence Requirements and Professional Competence Evaluation Instructions (CDMI0301)* as

- ☒ CDM validator for Technical Area(s): TA2.2/TA3.1
- ☒ CDM verifier for Technical Area(s): TA2.2/TA3.1
- ☒ Technical expert for Technical Area(s): TA2.2/TA3.1
- ☒ Technical reviewer
- ☒ Financial expert
- ☒ Team leader
- ☐ CDM validation/verification trainee

Huang ShiYuan
CCSC General Manager



Appendix IX

CERTIFICATE OF COMPETENCE

Date of Qualification: 12/08/2013

Mr. Liu Dongsen

Has been qualified in accordance with *CDM Personnel Competence Requirements and Professional Competence Evaluation Instructions (CDMI0301)* as

- ☒ CDM validator for Technical Area(s): TA1.2
- ☒ CDM verifier for Technical Area(s): TA1.2
- ☐ Technical expert for Technical Area(s): _____
- ☒ Technical reviewer
- ☐ Financial expert
- ☒ Team leader
- ☐ CDM validation/verification trainee

Huang ShiYuan
CCSC General Manager



Appendix IX

CERTIFICATE OF COMPETENCE

Date of Qualification: 22/07/2013

Ms. Liang Miaomiao

Has been qualified in accordance with *GHG Personnel Competence Requirements and Professional Competence Evaluation Instructions (GHGI0302)* as

■ GHG validator for Technical Area(s): CDM TA1.2 / GHG TA 1.2

■ GHG verifier for Technical Area(s): _____

□ Technical expert for Technical Area(s): _____

■ Technical reviewer

□ Financial expert

■ Team leader

□ GHG validation/verification trainee

Huang ShiYuan
CCSC General Manager



Appendix III

CERTIFICATE OF COMPETENCE

Date of Qualification: 12/03/2013

Mr. Shi Weiwei

Has been qualified in accordance with *CDM Personnel Competence Requirements and Professional Competence Evaluation Instructions (CDMI0301)* as

- ☐ CDM validator for Technical Area(s): _____
- ☐ CDM verifier for Technical Area(s): _____
- ☒ Technical expert for Technical Area(s): TA1.2
- ☐ Technical reviewer
- ☒ Financial expert
- ☐ Team leader
- ☒ CDM validation/verification trainee

Huang ShiYuan
CCSC General Manager



Appendix D

CERTIFICATE OF COMPETENCE

Date of Qualification: 13/05/2013

Mr. Guo Kai

Has been qualified in accordance with *CDM Personnel Competence Requirements and Professional Competence Evaluation Instructions* (CDMI0301) as

- ☐ CDM validator for Technical Area(s): _____
- ☐ CDM verifier for Technical Area(s): _____
- ☒ Technical expert for Technical Area(s): TA1.2
- ☐ Technical reviewer
- ☒ Financial expert
- ☐ Team leader
- ☒ CDM validation/verification trainee

Huang ShiYuan
CCSC General Manager