

Project Title	Madushan Hydropower Project on Honghe River in Yunnan Province, China
ERM CVS Project Reference	1808.v1
Report Date	06 June 2011
Client Name	CF Carbon Fund II Limited
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Version Control	Date
Version 01	22 June 2010 (Draft Validation Report)
Version 02	17 February 2011 (Final Validation Report)
Version 02.1	06 June 2011 (Revised according to Request for Review)

Madushan Hydropower Project on Honghe River in Yunnan Province, China			
Project reference:	1808.v1		
Project Location	The proposed project is located on Honghe River in Honghe Hani and Yi Autonomous State, Yunnan Province.		
Country:	People's Republic of China		
Project Parties	People's Republic of China and the Netherlands		
Project Participants	Honghe Guangyuan Madushan Hydropower Development Co., Ltd. from People's Republic of China and CF Carbon Fund II Limited from the Netherlands		
Methodology used	ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"		
Methodology version number	11		
Estimated Annual Average Emission Reductions	906,656 tCO ₂ e		
Crediting Period	01 July 2011 to 30 June 2018		
GSP PDD Version	Date: 24 March 2010	Final PDD Version	Date: 18 May 2011
	Version Number: 01		Version Number: 05
	Start date of GSP: 27 March 2010		

Summary:

ERM CVS was commissioned by CF Carbon Fund II Limited to validate the Madushan Hydropower Project on Honghe River in Yunnan Province, China (hereafter referred to as 'the project' or 'the project activity') on the basis of UNFCCC criteria for the Clean Development Mechanism (CDM), as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to Article 12 of the Kyoto Protocol, the CDM modalities and procedures and the subsequent decisions by the CDM Executive Board, including the Validation and Verification Manual.

The validation included the following three phases: i) a desk review of the project design documents, ii) site assessment and follow-up interviews with project stakeholders and iii) the resolution of outstanding issues and the issuance of the final validation report and opinion.

Based on the work performed, ERM CVS concluded that the project as described in the Project Design Document Version 05, dated 18 May 2011, meets all necessary criteria and requirements of the CDM, correctly applies the methodology ACM0002 version 11, and is expected to result in real, measurable and long term emission reductions. The DNA of the host Party has confirmed that the project assists in meeting sustainable development criteria.

ERM CVS therefore requests that the CDM Executive Board registers the project as a CDM project activity.

Client:	CF Carbon Fund II Limited		
Client Representative:	Mr Dominic Coyne		
Report approved by:			Signature 
Name Melanie Eddis			
Date: 06 June 2011			

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Abbreviations

BM	Build Margin
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction
CH ₄	Methane
CL	Clarification request
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
COP	Conference of Parties
DNA	Designated National Authority
FAR	Forward Action Request
DOE	Designated Operational Entity
DRC	Development and Reform Committee
EB	Executive Board
EIA	Environmental Impact Assessment
EPB	Environmental Protection Bureau
FSR	Feasibility Study Report
GHG	Greenhouse Gas
GSP	Global Stakeholder Process
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
IRR	Internal Rate of Return
LoA	Letter of Approval
MOP	Meeting of Parties
MP	Monitoring Plan
NCV	Net Calorific Value
NDRC	National Development and Reform Committee
NGO	Non-governmental Organisation
ODA	Official Development Assistance
OM	Operating Margin
PDD	Project Design Document
PPA	Power Purchase Agreement
SCE	Standard coal equivalent
SCPG	South China Power Grid
UNFCCC	United Nations Framework Convention on Climate Change
VAT	Value-added tax
VVM	Validation and Verification Manual

1 Introduction

1.1 Validation Objective

The purpose of a validation is to provide a thorough independent third party assessment of proposed CDM project activities to ensure that the proposed CDM project activity meets all the identified and applicable criteria for registration of projects under the Clean Development Mechanism. In particular, the project's baseline, additionality demonstration, applicability to an approved CDM methodology, monitoring plan (MP), and the project's compliance with relevant UNFCCC and host country criteria are validated in order to confirm that the project design as documented is sound and reasonable and meets the stated requirements and identified criteria. Validation is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of Certified Emission Reductions (CERs). UNFCCC criteria refer to the Kyoto Protocol criteria and the CDM rules and modalities and related decisions by the COP/MOP and the CDM Executive Board. The validation will result in a conclusion as to whether the project should be submitted to registration. The final decision on whether to register the project rests with Executive Board and the Parties involved.

1.2 Scope

The validation scope is defined as an independent and objective review of the Project Design Document (PDD) and associated documentation. The PDD and associated documentation is reviewed against the criteria and requirements stated in the CDM Validation and Verification Manual (CDM-VVM) Version 1.2 (EB 44, updated at EB 51 and EB55) and Article 12 of the Kyoto Protocol, the CDM modalities and procedures as agreed in the Marrakech Accords, as well as relevant decisions by the CDM Executive Board. The validation scope also included an assessment of completeness and accuracy of documentation, evaluation of evidences, information and assumptions made in the PDD and supporting documentation.

1.3 CDM Project Description

The Madushan Hydropower Project (the 'project' or 'project activity') is a 288 megawatt (MW) grid-connected hydroelectric project located in Honghe River in Honghe Hani and Yi Autonomous State, Yunnan Province, in the People's Republic of China /4//20/. The Project Activity is developed and operated by Honghe Guangyuan Madushan Hydropower Development Co., Ltd.

The project activity consists of three units each with a unit capacity of 96 MW /20/. The project activity includes a dam, diversion system, power house, and substation facilities. The submerged area of the reservoir at normal water level will be 19,180,000 m², making the power density of the project 15W/m² /4/. The annual net electricity exported to the grid is expected be 1,217,569 MWh (from the 4th operational year onwards – for an explanation of why the electricity generation is higher from the 4th operational year onwards please refer to the investment analysis section in section 3.6 of this report, under 'plant load factor') /4/.

The power output will be delivered to the South China Power Grid (SCPG) /4//17/, via the County level power grid, which is part of the Yunnan Power Grid, displacing power generated by the SCPG which is dominated by fossil fuel fired power plants – in 2008 fossil fuel generation made up 63.93% of total electricity generation in the grid /36/. This will lead to a reduction of greenhouse gas (GHG) emissions through avoiding CO₂ emissions produced by fossil fuel combustion in power plants connected to the SCPG, as described in the combined margin grid emissions factor calculations. The estimated annual average emission reduction is 906,656 tCO₂e /4/.

The baseline scenario, which is the situation existing prior to the development of the project activity, is that electricity would have otherwise been generated by power plants connected to SCPG and by the addition of new generation sources to the SCPG. This baseline is in accordance with the baseline scenario specified in the methodology ACM0002 v11.

The project description has been validated against the detailed Feasibility Study Report (FSR) of the project activity, developed by an independent third party accredited by the Chinese Government to develop FSRs for hydro electric projects - the 'China Pearl River Water Resources Planning, Design and Survey Co., Ltd' in November 2007 /4/. The FSR was approved by the National Development and Reform Commission on 31 December 2008 /4/. The project description was also cross checked against the physical layout of the project during the site visit, which included a tour of the site area including the location of the dam, water diversion tunnel, and power house. The description was further cross checked against the Environmental Impact Assessment Report (EIA) prepared by Pearl River Water Resource Conservation Science Institute /5/ and against the key contracts for construction of the project activity /19/20/.

All project components were covered during the validation process. ERM CVS confirms that the project description provided in the final PDD is accurate and complete and complies with the CDM requirements.

1.4 Validation Personnel

Validation Team	Role	Coverage of sectoral scope	Coverage of technical area	Financial Expertise	Host country experience	Participated in site visit?
Jia Tang	Lead Validator	√	√		√	Yes

Validation Team	Role	Coverage of sectoral scope	Coverage of technical area	Financial Expertise	Host country experience	Participated in site visit?
Nan Dong	Validator	√	√		√	Yes
Angus McEwin	Financial expert			√		No

Technical Review	Role	Coverage of sectoral scope	Coverage of technical area	Participated in site visit?
Jonathan Avis	Technical Reviewer	√	√	No

Jia Tang is a Lead Auditor based in Guangzhou, having over 8 years experience in Environmental Health and Safety (EHS), in particular conducting energy efficiency projects and EHS assessment work in the energy sector. Ms Tang holds a Masters in Environmental Impact Assessment from the University of East Anglia and a Bachelor of Science in Business Management Engineering from Kunming University of Engineering & Science. Ms Tang has passed the ERM CVS CDM validation and verification training course. She has conducted more than 10 CDM validation and verification projects, including the industries of hydropower, N₂O Abatement, Coal Mine Methane (CMM) and biodiesel; and has also been involved in several World Commission on Dams (WCD) Assessments for hydropower projects.

Nan Dong is a Lead Auditor based in Beijing with experience in the validation and verification of more than 30 CDM projects, including wind power, hydro power and energy efficiency projects. He holds a Master's Degree in Environmental Science and Engineering and has practical experience in the fields of environmental impact assessment (including assessment for a nuclear power plant, railway, urban planning), planning and design of urban wastewater treatment, urban water supply and urban solid waste treatment, and environmental management, resource conservation and cleaner production in various industries. Nan Dong has passed the ERM CVS CDM validation and verification training course, and has also received training in financial analysis including a course on "Engineering Budgetary Estimates".

Angus McEwin is a financial expert for ERM CVS and has over ten years experience of economic analysis and environmental auditing in the UK, Australia and Vietnam. In his previous work experience as an independent contractor, Angus worked in a range of roles in the financial services and investment banking sector in London, including carrying out analytical and operational roles for several large financial sector clients. Over the last six years Angus has worked as an environmental and socio-economist for ERM within the natural resources and environment sector in Southeast Asia, where his financial experience includes economic impact assessments in Australia and Singapore and numerous environmental assessments in Vietnam.

Jonathan Avis is CDM Business Manager for ERM CVS, and a GHG Auditor and Technical Reviewer with over 5 years experience in the carbon market. His previous work experience includes screening and due diligence of carbon projects, Project Design Document (PDD) development, quality assurance and technical review of CDM project documentation, the development of carbon monitoring plans, and management of carbon projects through the validation, registration and verification stages. He has worked on the development and quality control of carbon projects in numerous sectors including hydroelectricity, wind energy, landfill gas, waste gas and heat, coal mine methane, biomass-to-energy and composting. Since joining ERM CVS Jonathan has worked as a Technical Reviewer and GHG auditor on numerous CDM validations.

2 Methodology

The validation was carried out in accordance with the CDM Validation and Verification Manual (VVM), version 01.2 published at EB 55. The validation process employed standard auditing techniques and undertook necessary cross-checks and follow-up actions to ascertain the correctness of the information. The validation team included staff with experience in the relevant sectoral scopes and technical areas within the sectoral scope, and included local host country expertise, sectoral knowledge, and financial expertise. The validation report and associated documents have undergone a thorough technical review by ERM CVS before being submitted to the CDM Executive Board for registration. The validation consisted of the following key phases:

- Upload of the PDD for Global Stakeholder Consultation (GSP), for receipt of any comments from stakeholders (GSP started on 27 March 2010)
- Desk review of documentation including PDD, methodology and key supporting documents and references
- A visit to the project site, including interviews with personnel responsible for developing the project (the site visit took place on 19 to 22 April 2010)
- Development of a draft validation report, identifying non-compliances including Corrective Action Requests (CARs) and Clarification Requests (CLs), taking into account findings of the GSP, desk review and site visit / interviews
- Resolution of outstanding issues (CARs and CLs) and development of a final validation report including validation opinion

2.1 Global Stakeholder Period consultation

The PDD version 01 dated 24 March 2010 - was uploaded for global stakeholder comments /1/.

The Global stakeholder period was 27 March 2010 - 25 April 2010.

Relevant information can be found at

<http://cdm.unfccc.int/Projects/Validation/DB/OD7S9WIL867UOESL5TM47VIMZG6RVN/view.html>

During the global stakeholder period, no comments were received.

2.2 PDD and Additional Documentation Review

A detailed document review of the PDD, methodology and all other associated documentation and references took place in advance of the site visit, and additional documents that were not available for the desk review were requested for review during the site visit.

The document review includes:

- A review of data and information to verify the correctness, credibility and interpretation of presented information;
- Cross checks between information provided in the PDD and information from sources other than that used,

Where the review of the PDD at the document review stage raised issues, these were further reviewed and validated through supporting documentation and cross-checking from other sources and interviewing relevant personnel involved in the project activity during the site visit. During the document review the project team also compared the proposed project activity with available information relating to projects or technologies similar to the proposed CDM project activity under validation. Where appropriate, the validation team assessed the appropriateness of formulae and the correctness of calculations presented by the project participants.

A list of all documents reviewed or referred to in the course of this validation is included in Appendix A.

2.3 Site visit and Interviews

The site visit took place on the 19 to 22 April 2010. ERM CVS staff attending the site visit included Jia Tang (lead validator) and Nan Dong (validator). The site visit included a tour of the physical project site, including the dam, water diversion tunnel and power house. The site visit also included a visit to the main office of the project owner, Honghe Guangyuan Madushan Hydropower Development Co., Ltd. Site visits and interviews provide additional and background to the project as well as cross checks with project documentation. Interviews were undertaken with relevant stakeholders in the host country, as well as personnel with knowledge of the project design and implementation;

Project owner staff and the CDM consultant were interviewed, and document review took place at the conference room at a hotel.

The site visit was designed to enable the validation team to

- undertake a detailed review of additional project documentation and verify the supporting documentation;
- inspect the project site and confirm the validity of the project description in the PDD;
- assess the validity of the project boundary;
- cross-check the validity of the project information from other sources of information; and
- interview relevant stakeholders involved in the project activity.

A list of interviewees, and the main topics discussed with each can be found in appendix A.

2.4 Reporting

A validation protocol checklist of the key requirements for validation is included as Appendix B. The validation protocol serves the following purposes:

- It organises, details and clarifies the requirements a CDM project is expected to meet.
- It ensures a transparent validation process where the validator will document how a particular requirement has been validated and the result of the validation.
- It must also list project components/issues not covered in the validation engagement

The protocol describes the following:

CDM Validation Protocol Checklist

Checklist Question	Reference	Comment	Draft Conclusion	Final Conclusion
The requirements that the project should meet	The documents used to check the answer to the checklist question	This section is used to elaborate and discuss the conformance to the checklist question, and to explain the conclusion reached. It includes the means of validation, which explains how conformance with the checklist is justified. For example document review (DR) or interview (I). N/A means not applicable	This is either acceptable based on evidence provided (OK), or a <i>Corrective Action Request</i> (CAR) is required due to non-compliance with the checklist question. A request for <i>Clarification</i> (CL) is used when the validation team has identified a need for further clarification. A 'Minor Issue' may be recorded for typographical errors or similar minor errors that do not have an impact on the compliance of the project to the CDM rules but nevertheless should be corrected to improve clarity. A <i>Forward Action Request</i> (FAR) could be raised for issues to be addressed during first verification that do not form part of the registration requirements	Indicates whether the CAR or CL has been closed out (OK).

Remediation Form: Clarification Requests (CL), Corrective Action Requests (CAR) and Forward Action Requests (FAR), plus minor issues

CARs, CLs, and FARs are raised in the draft validation protocol and detailed in a separate form using Table 3 (Appendix C). In this form, note is made of actions taken by the Project Proponent to close outstanding CARs and respond to CLs and Forward Action Requests:

Draft report corrective action, clarification, or forward action requests, or minor issues	Reference to CDM Validation Protocol Checklist	Summary of project participants' response	Final conclusion
List of CARs, CLs and FARs (and minor issues)	Reference to the validation protocol checklist question	Summary of response during the communication with the validation team	Summary of validation team responses and final conclusion.

Clarification Requests (CL): Where insufficient or unclear information is available and clarification or new information is required, A CL is raised specifying what additional information is required.

Corrective Action Requests (CAR): Where a non-conformance arises the Assessor shall raise a Corrective Action Request (CAR). A CAR is issued, where:

- Mistakes have been made that will influence the ability of the project activity to achieve real, measurable additional emission reductions;
- The CDM requirements have not been met; or
- There is a risk that emission reductions cannot be monitored or calculated.

The validation process may be put on hold until this information has been made available to the assessors' satisfaction. Failure to address a CL may result in a CAR. Information or clarifications provided as a result of a CL may also lead to a CAR.

Forward Action Requests (FAR): FARs shall be raised during validation to highlight issues related to project implementation that require review during the first verification of the project activity. FARs shall not relate to the CDM requirements for registration.

A 'Minor Issue' may be recorded for typographical errors or similar minor errors that do not have an impact on the compliance of the project to the CDM rules but nevertheless should be corrected to improve clarity.

2.5 Internal Quality Control

The process of validation and decision of the validation team has been subject to an independent Technical Review. The scope of the Technical Review process is to independently assess that all procedures have been followed, necessary requirements have been met, and all conclusions are justified. The final validation decision is based on the findings and conclusions of the validation team, assessing the compliance of the project activity with the CDM requirements, and the technical evaluation of the independent technical reviewer. The final report is then approved and signed off by the qualified signatory / final decision maker within ERM CVS.

3 Validation Findings

3.1 Main changes between the PDD version published for the global stakeholder comment period and the final version submitted for registration:

- Project and technology description revised to provide more details on the project design, for example the load factor and transformers
- The Annex I Party was changed from United Kingdom to the Netherlands
- The difference in electricity generated in different years of operation has been justified
- Changes to the monitoring plan, for example monitoring frequency of A_{PJ} and CAP_{PJ} stated, further details provided on the location of meters, further details of the emergency plan, documentation control, and calibration requirements presented
- Prior consideration of CDM elaborated
- Additional financial analysis input parameters are described in the PDD for transparency
- Common practice analysis revised to provide more information on similar projects and the essential distinctions between previous projects and the proposed project

3.2 Approval and Participation Requirements

The project participants are Honghe Guangyuan Madushan Hydropower Development Co., Ltd, authorised by PR China, and CF Carbon Fund II Limited, authorised by the Netherlands. The host Party, China, and Annex I Party, the Netherlands, have both ratified the Kyoto Protocol. Both Parties have established their respective Designated National Authorities (DNA) as per the participating requirements for CDM under the Kyoto Protocol.

The host country Letter of Approval (LoA) has been issued by the DNA of China, on December 2009/8/. The LoA was received from the project participants but the authenticity of the LoA has been confirmed by cross-checking by ERM CVS against the list of approved projects on the web-site of the Chinese DNA /69/. The letter confirms that:

- China ratified the Kyoto Protocol on 30 August 2002;
- Honghe Guangyuan Madushan Hydropower Development Co., Ltd. is authorised as a project participant by the PR China to voluntarily participate in the project activity;
- The project complies with the permission requirements provided for in the Measures for Operation and Management of CDM projects in PR China, and assists PR China in achieving sustainable development;
- The LoA references the precise project title 'Madushan Hydropower Project on Honghe River in Yunnan Province, China ', which is consistent with the project title in the PDD.

The Chinese LoA does not reference a specific version of the Validation Report or PDD.

The Annex I Party Letter of Approval (LoA) has been provided by the Netherlands Ministry of Housing, Spatial Planning and the Environment, which is the DNA of the Netherlands, dated 18 November 2010 /6/. The LoA was received from the project participants, and the authenticity was confirmed. It was signed by the Manager of Climate, Enterprises and International Affairs, Joop Van Meel. The approval of the project by the LoA from the Netherlands has been checked and clearly states:

- Ratification of the Kyoto Protocol on 31 May 2002;
- Voluntary Participation;
- Reference to the precise project title in the PDD.

The Netherlands LoA does not reference a specific version of the validation report or PDD.

The validation did not reveal any information that indicates that the project can be seen as a diversion of official development assistance (ODA) funding towards P. R. China.

3.3 Project Design

Conformance of the PDD with EB guidelines

The PDD has been checked against the latest 'Guidelines for developing the Project Design Document' (version 7)/67/ and the latest template for the Project Design Document (version 03) available on the CDM website/68/. It is confirmed that the final PDD is in compliance with the template and guidelines.

Conformance of the project design in the PDD with source documents such as the FSR

The project design and technical description of the project activity has been cross checked against the approved third party Feasibility Study Report (FSR) and concluded to be consistent. The FSR was developed by China Pearl River Water Resources Planning, Design and Survey Co., Ltd. in November 2007 /4/, an independent third party qualified by the NDRC to perform FSRs. The FSR was approved by the National Development and Reform Commission on 31 December 2008. The project design in the PDD and FSR was also cross checked against the physical layout of the project during the site visit, and against the details of the project and technology contained in the EIA /5/. It was further confirmed by cross-checking and assessing key equipment purchase, installation and construction contracts for the project activity /20/19/.

The project will have a total installed capacity of 288 MW, consisting of 3 units each with a unit capacity of 96 MW. Each unit consists of a vertical Francis turbine with a rated output of 96 MW and a generator with a rated output of 96 MW, hence the output capacity is 96 MW. The generators and turbines were manufactured by Tianjin Tianfa Hydropower Equipment Production Co., Ltd /20/.

The expected annual power delivered to the grid is 1,217,569 MWh. The power output will be delivered to the SCPG via the Yunnan Power Grid /4/17/. The power station will deliver electricity by an 110kv transmission line to a local power substation and supply the generated electricity to Jinping County level power grid, which is a part of the Yunnan provincial grid, which is in turn part of the SCPG. This information has been validated against the FSR of the project activity /4/ and cross checked during the site visit. After the project activity is put into operation, the power generated will substitute a part of the power supplied by the SCPG which is dominated by fossil fuel fired power plants /25/.

Timeline and operational status of the project The construction permission letter was issued by Guangdong Keyuan Engineering Supervision and Consultancy Company /18/.

At the time of the validation site visit, the construction of the dam, water diversion tunnel, and powerhouse were underway, and this was observed on site by ERM CVS. Construction started on 25 January 2009, this has been validated against the construction permission letter /18/. The progress of the construction was further cross checked with the construction plan of the proposed project co-issued by project owner, the construction company and the construction supervision company, as stated in the construction permission letter and the construction contract/18/19/. No factors were identified during the site visit that could have unmanageable adverse delays on the construction of the project.

The starting date of the project activity is 06 January 2009, which is the date when the purchase contract for equipments and technical specifications was signed between Honghe Guangyuan Madushan Hydropower Development Co., Ltd. and Tianjin Tianfa Hydropower Equipments Production Co., Ltd, /20/ and represents the start of real action on the project activity. The start date is assessed in more detail in section 3.5 below, and in the validation protocol checklist.

The expected operational lifetime of the project activity is 30 years, and the construction period is approximately 4 years. The project lifetime has been clearly stated in section C.1.2 of the PDD/1/, and is consistent with the FSR and the financial analysis./4//2/ The operational lifetime has also been cross checked against the lifetime of the equipment stated in the equipment purchase contract /20/and was found to be consistent. Based on ERM CVS local and sectoral knowledge, this lifetime is considered reasonable for a large scale hydroelectric project in PR China.

Permits and approvals:

ERM CVS has ensured that the project activity has all the relevant permits and approvals needed to be developed as a hydroelectric project in the host country. ERM CVS has checked relevant permits and approvals including:

- FSR for Madushan Hydropower Project on Honghe River in Yunnan Province, China, prepared by China Pearl River Water Resources Planning, Design and Survey Co., Ltd. dated November 2007 /4/
- FSR Approval of Madushan Hydropower Project on Honghe River in Yunnan Province, China, issued by National Development and Reform Commission, 31 December 2008 /4/
- EIA Report for Madushan Hydropower Project on Honghe River in Yunnan Province, China, prepared by Pearl River Water Resource Conservation Science Institute dated January 2007 /5/
- EIA Approval of Madushan Hydropower Project on Honghe River in Yunnan Province, China, issued by National Environmental Protection Bureau, 27 September 2007 /5/
- Business license of Honghe Guangyuan Madushan Hydropower Development Co., Ltd, dated 20 October 2008 /38/

All the necessary permits and approvals were found to be in place, and also in accordance with host country requirements and applicable national laws and regulations. Furthermore, the project description was found to be consistent between the final PDD and the approvals.

Project location

The project activity is located in Jinping County, Gejiu City, Honghe Hani and Yi Autonomous State, Yunnan Province, in the People's Republic of China /4/. The dam and the power house of the Project Activity lie on Honghe River. The power output by the project activity will be delivered to the SCPG via Jinping County level power grid, which is part of the Yunnan Power Grid. The location described in the final PDD accurately reflects the location of the project and has been validated during the site visit, and is consistent with the location of the project in other documents including the FSR /4/ and EIA /5/.

3.4 Baseline

The project activity applies approved baseline and monitoring methodology ACM0002 “Consolidated baseline methodology for grid-connected electricity generation from renewable sources”, version 11. The methodology also refers to the “Tool for the demonstration and assessment of additionality” (Version 05.2) and the “Tool to calculate the emission factor for an electricity system” (Version 02), which are both valid and applicable at the time of validation. The chosen methodology is considered appropriate for the project activity and is found to be correctly applied based on the following aspects:

- The project activity is a new hydroelectric installation. This was verified during the onsite inspection, and by review of the FSR/4/. The FSR was approved by the National Development and Reform Commission on 31 December 2008;
- It is a large scale (288 MW) hydroelectric plant connected to the SCPG via the Yunnan Power Grid;
- The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available. This data is published by the NDRC acting as the DNA of PR China. The characteristics of the grid were cross checked against the information published by the NDRC /25/.

Table 1: Applicability conditions of the applied methodology

Applicability conditions	Reference	Means of validation
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).	Site Visit /4/	The project activity is a grid-connected renewable power generation project to install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity. This was confirmed based on the FSR and site visit.
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	Site Visit /4/	The project activity is the new installation of a hydro power plant with a reservoir. This was confirmed based on the FSR and site visit.
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	Site Visit /4/	Not applicable. The project activity is a Greenfield project. This was confirmed based on the FSR and site visit.
In case of hydro power plants, one of the following conditions must apply: • The project activity is implemented in an existing reservoir, with no change in the volume of reservoir; or • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m^2; or ▪ The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m^2	/4/	The project activity results in a new reservoir. The installed capacity of the project is 288MW. The submerged area of the reservoir at normal water level will be $19,180,000 \text{ m}^2$, making the power density of the project activity 15 W/m^2 so this is greater than 4 W/m^2 . This was confirmed based on the FSR.
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;	Site Visit /4/	The project activity does not involve switching from fossil fuels to renewable energy sources at the site of the project activity. This was confirmed based on the FSR and site visit. The project is not a biomass project.

Hydro power plants that result in new reservoirs or in the increase in existing reservoirs where the power density of the power plant is less than 4 W/m²		The power density is greater than 4W/m ² , as discussed above.
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The conformance of the project activity to the methodology was cross checked against the design of the project contained in the FSR/4/, and also during the site visit.

The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the Project is connected to, i.e. the SCPG. This is correctly defined in the PDD in accordance with the methodology. The sources and gases included in the PDD are in accordance with the methodology ACM0002 v11. The project boundary has been confirmed against the detailed design of the project in the FSR/4/, and during the site visit. The identified and selected sources and gases included in the project boundary are considered to be justified for the project activity and are in accordance with the applied methodology.

The project activity is a hydroelectric project, and there is no fossil-fuelled backup generator for power supply to the grid as part of the project. This has been verified against the FSR/4/. In addition, although the project was still under construction, no evidences of any fossil-fuelled backup generator for power supply to the grid were found during the site visit. The project activity is not expected to result in emissions other than those allowed by the methodology, and there are no greenhouse gas emissions occurring within the proposed CDM project boundary as a result of the implementation of the proposed CDM activity which are expected to contribute more than 1% of the overall expected average annual emissions reductions, which are not addressed by the applied methodology.

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

Table 2: Emission sources and gases included in the project boundary

	GHGs involved	Source
Baseline emissions	CO ₂	SCPG
Project emissions	CH ₄	Project emissions are estimated ex-ante as zero as the project is a renewable energy (hydro) project with a power density above 10 W/m ² . However the power density will be monitored during the crediting period.
Leakage	n/a	No leakage needs to be considered when applying this methodology for hydro projects.

The project activity is the installation of a new grid-connected renewable power plant, thus the baseline scenario for the project activity is, in accordance with the methodology ACM0002 (Version 11): Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of power plants connected to SCPG and by the addition of new generation sources to the SCPG. Electricity generated by the project activity will be delivered to the SCPG. This has been verified through:

- The information and project activity details given in the PDD and FSR; and
- The layout of the project activity including the transmission line and transformer station observed on site.

The baseline is considered to be a true representation of what would otherwise take place in the absence of the project activity. The SCPG is dominated by coal-fired power plants /25/, and it is reasonable to expect that coal-fired power plants will continue to dominate the grid due to the availability of low-cost coal in the region. The combined margin calculations have been checked by ERM CVS see section 3.6.

The project boundary is clearly defined as the site of the project activity and SCPG is defined as the project electricity system boundary. According to the "Tool to calculate the emission factor for an electricity system" if the DNA of the host country has published a delineation of the project electricity systems, these delineations should be used. Therefore, in accordance with the delineation given by the Chinese DNA /25/, SCPG is the project electricity system as well as the project boundary of the project activity.

3.5 Monitoring Plan

The project activity applies approved monitoring methodology ACM0002 v11. The methodology is applied correctly and transparently, and provides for accurate measurement of the emission reductions ex-post. The monitoring plan has been confirmed to be in accordance with the methodology. For a newly built hydroelectric project, ACM0002 v11 requires the net quantity of electricity supplied by the project activity to the grid to be monitored, as well as the surface area of the reservoir after the implementation of the project when the reservoir is full, and the installed capacity of the hydro plant after the project is implemented. In the PDD, the net quantity of electricity supplied by the project to the grid ($EG_{\text{facility},y}$) is based on measurements of electricity output and electricity input. $EG_{\text{facility to SCPG},y}$ (electricity delivered to the grid by the project activity) and $EG_{\text{SCPG to facility},y}$ (electricity imported from the grid to the project activity) are both measured and used as the basis for determining $EG_{\text{facility},y}$. This is considered a reasonable and transparent approach that provides for a conservative calculation of emission reductions, since electricity imported from the grid should be deducted from electricity delivered to the grid in order to determine the net quantity of electricity supplied by the project to the grid.

The following parameters are monitored:

Table3: Parameters Monitored

Parameter	Description	Measurement methods
$EG_{\text{facility},y}$	Net quantity of electricity supplied to the grid by the proposed project	Calculated as $EG_{\text{facility to SCPG},y}$ minus $EG_{\text{SCPG to facility},y}$
$EG_{\text{facility to SCPG},y}$	Quantity of electricity supplied by the proposed project to the grid in year y	Directly measured by a bidirectional electricity meter at the grid interface point of the proposed project. Continuous measurement and monthly recording.
$EG_{\text{SCPG to facility},y}$	Quantity of electricity imported from the grid in year y	Directly measured by a bidirectional electricity meter at the grid interface point of the proposed project. Continuous measurement and monthly recording.
CAP_{PJ}	Installed capacity of the hydro power plant after the implementation of the Project Activity	Checking the equipment name plate on site.
A_{PJ}	Area of the reservoir measured in the surface of the water, after the implementation of the Project Activity, when the reservoir is full	Measured by the qualified design institute

The parameters are clearly described in the PDD and the means of monitoring in the PDD complies with the requirements of the methodology ACM0002 v 11.

Equipment:

A bidirectional electricity meter will be installed at the grid interface point of the proposed project according to the Power Purchase Agreement signed between the project owner and the grid company /40/ to measure electricity delivered to the grid ($EG_{\text{facility to SCPG},y}$) and the electricity consumed by the project activity which is imported from the grid ($EG_{\text{SCPG to facility},y}$). The accuracy class of the meter will be no less than 0.5s, in compliance with the national standard 'Technical Code of Electric Energy Metering and Metering Devices (DL/T448-2000)' /41/ and will be maintained and calibrated annually according to 'Technical Administrative Code of Electric Energy Metering (DL/T448-2000)'. The information in the PDD is consistent with description in the developed monitoring manual /64/. This equipment setup is considered sufficient to carry out the monitoring requirements of the methodology, and the appropriate national standards have been followed. This has been cross checked against the 'Technical Code of Electric Energy Metering and Metering Devices' (DL/T448—2000) /41/ and "Verification Regulation of Electrical Energy Meters with Electronics (JJG 596-1999) /42/.

Data:

The project developer will implement a data management system. Data for $EG_{\text{facility to SCPG},y}$ and $EG_{\text{SCPG to facility},y}$ will be measured continuously and recorded monthly in accordance with the national standard 'Technical Code of Electric Energy Metering and Metering Devices' (DL/T448 - 2000)'. Readings will be taken by the Project Owner and the local Power Grid Company and be cross-checked with the invoice of electricity sales. Data will be archived at the end of each month, and will be kept for 2 years after the end of the crediting period or the last issuance of CERs, whichever occurs later. The data management procedures are considered appropriate to fulfil the monitoring requirements of the methodology and to ensure that emission reductions can be verified.

Organisation:

The PDD contains a diagram illustrating the organisational structure to be implemented by the project developer in order to implement the monitoring plan. A CDM manager will be in overall charge of the monitoring system and there will be separate roles for operation technician, internal auditor and data administrator in order to carry out the monitoring plan. The organisational structure is considered appropriate to fulfil the monitoring requirements of the methodology and to ensure that emission reductions can be verified.

Quality Assurance and Quality Control:

The PDD contains information on how quality will be controlled and assured in the monitoring of emission reductions. The meter will be calibrated at least once a year according to the 'Technical Administrative Code of Electric Energy Metering (DL/T448-2000) /41/ and data readings will be taken by the Project Owner and the local Power Grid Company together, and will be cross-checked using electricity sales invoices.

In the case of main meter malfunction, the meter records from the backup meters will be used for CER calculation, and the electricity transaction receipts will be kept for cross check. Problems occurring in the monitoring and measurement process will be recorded and reported to the project manager or CDM manager.

Feasibility of the monitoring plan:

The project developer has experience of monitoring electricity on other power plant projects, i.e. the Nansha Hydro Power Project in Yunnan Province China (CDM project number 2133), which was registered on 12 January 2009, and readings will be taken jointly with the grid company, that is very experienced in monitoring these type of projects. The monitoring plan is in line with national standards 'Technical Code of Electric Energy Metering and Metering Devices (DL/T448 – 2000)' /41/ and represents common practice in China. The monitoring plan within the PDD is therefore considered to be feasible.

Therefore the means of implementation of the monitoring plan, including the data management and quality assurance and quality control procedures, are sufficient to ensure that the emission reductions achieved by/resulting from the proposed CDM project activity can be reported ex post and verified.

3.6 Additionality

Start date

The starting date of the project activity is confirmed to be 06 January 2009, which is the date that the purchase contract of turbines and generators/20/ was signed between the project owner and Tianjin Tianfa Hydropower Equipments Manufacturer Co., Ltd. This was the earliest date of implementation, construction or real action on the project, which was confirmed by review of all key contracts: the purchase contract, construction permission and construction contract /20/18/19/. The contracts reviewed can be considered reliable third party sources since they are signed with third parties, and the documents have been verified by checking the correctness of the signatures and stamps. The start date is also consistent with the timeline of project implementation as evidenced by the third party documents listed in *Table 4* below. The purchase order of turbines and generators is considered a reasonable start date of the project activity because this indicates that the project will go ahead and that equipments will be purchased, thereby constituting the first real action on the project activity. The start date has been verified to be the earliest start of real action on the project (in accordance with the "Glossary of CDM terms"), by cross-checking the above documents /20/18/19/:

Table 4: Implementation timeline and start date of the project activity

Action	Date	Organisations involved	Notes	Document reference
The purchase agreement of turbines and generators	06 January 2009	Signed between the project owner and Tianjin Tianfa Hydropower Equipments Manufacturer Co., Ltd	Start date of the project activity: indicates that the project will go ahead and that equipments will be purchased, therefore constitutes the first real action on the project activity.	/20/
The construction contract	25 January 2009	Between Madushan Hydropower Project on Honghe River in Yunnan Province, China and Guangdong No.2 Hydropower Engineering Company, Ltd.	Construction contract signed	/19/
The construction permitting letter of the Project	25 January 2009	Issued by Guangdong province Keyuan Engineering Supervision and Consultancy Company	Construction started	/18/
The loan contract	23 February 2009	Signed between The Guangzhou Tianpingjia Branch Bank of Industrial and Commercial Bank of China and the project owner	Bank loan contract signed	/15/

Prior consideration of the CDM and timeline of real and continuing actions to secure CDM status

The project activity is a new project with a starting date after 02 August 2008. The start date was 06 January 2009, and the project proponent had not published its PDD for stakeholder comments prior to the start date. The project owner has informed the China DNA in writing of the commencement of the project and of their intention to seek CDM status on 03 June 2009. It was validated by reviewing the notification from Honghe Guangyuan Madushan Hydropower Development Co., Ltd to the DNA of China of the commencement of the Project and the intention to seek CDM status /22/, and the document was stamped by the DNA of China as evidence of the DNA receiving it. Therefore the consideration of CDM is in accordance with the 'Guidelines on the demonstration and assessment of prior consideration of the CDM' version 01 (EB 41) which was the version valid and applicable at the time of project start and at the time of submitting the notification to the Chinese DNA. In addition, ERM CVS has validated that serious consideration of CDM was taken before the start date, and that real and continuing actions were taken to secure CDM status on the basis of the analysis of other key documents in the project cycle. The CDM was first considered in the Feasibility Study Report /4/, written in November 2007, which showed that the project was financially unattractive in the absence of CDM, and therefore requires revenues from the sale of Certified Emission Reductions (CERs) in order to become financially attractive. The FSR was written by an independent third party (China Pearl River Water Resources Planning, Design and Survey Co., Ltd) for the project developer. Given that the FSR is a third party reference and was used as the basis for the decision to invest in the proposed project, this can be considered sufficiently strong evidence to show that the benefits of the CDM were a decisive factor in the decision to proceed with the project.

The PDD contains a timeline of real actions to secure CDM status in section B.5. Each of the relevant documents has been checked by the audit team. A list of the documents used to demonstrate real and continuing actions to secure CDM status is given in *Table 5* below.

Therefore it has been demonstrated that the CDM benefits were considered necessary in the decision to undertake the project as a CDM project activity.

Table 5: Prior consideration of CDM

Document	Date	Document Reference
The Feasibility Study Report (FSR) of Madushan Hydropower Project on Honghe River in Yunnan Province, China prepared by China Pearl River Water Resources Planning, Design and Survey Co., Ltd.	November 2007	/4/
The minutes of the board meeting of Honghe Guangyuan Madushan Hydropower Development Co., Ltd decide to develop the project as a CDM project.	18 March 2008	/23/
Minutes of Stakeholders' meeting held to collect opinions and suggestions for CDM Application.	6 April 2008	/7/
The Certified Emission Reduction Purchase Agreement (ERPA) between Honghe Guangyuan Madushan Hydropower Development Co., Ltd and CF Carbon Fund II Limited	18 May 2009	/21/
The notification from Honghe Guangyuan Madushan Hydropower Development Co., Ltd to DNA of China of the commencement of Madushan Hydropower Project on Honghe River in Yunnan Province, China and the intention to seek CDM status.	3 June 2009	/22/
Letter of Approval for Madushan Hydropower Project on Honghe River in Yunnan Province, China issued by DNA of China (NDRC)	December 2009	/8/
GSP (Global Stakeholder Process)	27 March 2010 to 25 April 2010	
Validation site visit	20 to 22 April 2010	

It has therefore been validated that the project proponents undertook continuing and real actions to secure CDM status for the project activity in parallel with its implementation.

Identification of alternatives:

In accordance with ACM0002 v11, the baseline for a new grid-connected hydroelectric project activity is electricity delivered to the grid by the proposed project 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 02).

The methodology does not require several alternative scenarios to be considered in the identification of the most reasonable baseline scenario. Following the requirement of the applied methodology as well as in accordance with the guidance in paragraph 105 of version 1.2 of the VVM, and paragraph 4 of the additionality tool, ERM CVS has not undertaken further assessment of various alternative baseline scenarios. ERM CVS has determined that the baseline scenario identified in the PDD is reasonable by validating the assumptions, calculations and rationales used in the determination of the combined margin emissions factor (see section 3.6). The selected baseline is also in compliance with host country regulations and no national and/or sectoral policies and circumstances contradict the selected baseline scenario.

Furthermore, 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. The makeup of the SCPG is unlikely to shift away from being dominated by fossil fuel

sources within the first crediting period /25/. The PDD provides a verifiable description of the identified baseline scenario, including a description of the technology that would be employed and/or the activities that would take place in the absence of the proposed CDM project activity – details of the grid are given, and have been cross checked against the information provided by the DNA of PR China /25/.

Additionality determination:

Investment analysis is used to demonstrate additionality of the proposed CDM project activity. The project activity correctly adopts the 'Tool for the demonstration and assessment of additionality' (version 5.2) as required by ACM0002 v11. The PDD demonstrates that the project activity is not economically or financially feasible without the revenue from the sale of certified emission reductions (CERs) and thus the financial returns of the proposed CDM project activity would be insufficient to justify the required investment. The financial analysis was assessed by the validation team, including assessment of the spreadsheet and evidences relating to the input values to the financial analysis. The analysis was also assessed in detail against the 'Guidelines on the assessment of investment analysis' (version 03.1) by a financial expert contracted by ERM CVS, who has specific expertise in the assessment of financial analysis for CDM projects.

Investment analysis:

Determine appropriate analysis method

The PDD adopts the benchmark analysis (option III), which is appropriate, since there are other economic benefits associated with the project activity in addition to CER revenues (i.e. from selling electricity), hence option I is not applicable. Option II is also not applicable as the alternative to the project activity, continuation of electricity supply by the existing generation mix operating in the grid, does not represent a comparable investment opportunity to the proposed project. The alternative to the project is to 'do nothing' i.e. the project developer would make no investment. Therefore investment comparison analysis cannot be carried out.

Apply Benchmark Analysis

- The financial indicator most suitable for the project type and decision context is the Internal Rate of Return (IRR). This is correctly identified in the PDD. 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;
- A project IRR is calculated, as opposed to an equity IRR. This is considered appropriate as this is the common practice in the host country, based on ERM CVS's local and financial expertise. This is also in line with the benchmark selected.

Determination of the benchmark

According to the Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects /26/, in China a project IRR of 8% (after tax) for the total investment of a project is regarded as a benchmark for investing in large scale hydropower plants, fossil fuel fired plants as well as wind farm projects. The benchmark of 8% (after tax) is therefore appropriate for this project.

ERM CVS was able to confirm this is suitable and reasonable based on the following:

1. This benchmark was determined by the national administration of this industry in China /26/;
2. This benchmark is for comparison with project IRR and is after tax, and the investment analysis for this project is also for project IRR and is after tax, which is consistent.

Given the benchmark is determined by the government taking into consideration circumstances in the country and sector, 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 for large hydro projects in PR 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 FSR /4/.

Since a post-tax benchmark is applied ERM CVS has ensured that actual interest payable is taken into account in the calculation of income tax. In the IRR spreadsheet /2/, 'total cost', which includes the cost of financial interest, is used to calculate income tax, hence leading to a lower income tax burden (and higher IRR). The interest rate and loan amount are specified in the FSR of the project activity, which was developed by an independent third party using information on the prevailing interest rates in the region and the prevailing debt equity ratio for a project of this type developed by the project developer. The interest rate of 7.56% has been cross checked against the benchmark interest rate issued by the People's Bank of China on 22 August 2007 /43/, which stipulates the same interest rate for loans longer than 5 years, effective as of 15 September 2007, therefore the interest rate applied in the FSR was the same as the interest rate actually applicable to the loan for the project activity. The interest rate considered in the FSR was considered as the basis for the investment decision in the proposed project, as evidenced by the completed FSR and the FSR approval by the local government /4/.

In summary, based on ERM CVS's local, sectoral and financial expertise, the benchmark is widely adopted in the host country and is considered appropriate for evaluating this type of project in PR China.

Calculation and comparison of financial indicators

The PDD presents the key input parameters and results of the assessment of the IRR of the project. ERM CVS also reviewed the final spreadsheet calculations (IRR spreadsheet calculations) /2/ and found that the computations are correctly presented, traceable, and consistent with the information presented in the PDD. The calculations were carried out over an assessment period of 34 years, including 4 years of construction time. The operational lifetime of the project in the FSR and PDD is 30 years, hence the lifetime of the analysis is appropriate. Based on ERM CVS local and sectoral knowledge this lifetime is reasonable for a large scale hydroelectric project in PR China. The calculations and analysis include all relevant costs and revenues, and by making use of ERM CVS's local, sectoral and financial knowledge, this has been cross checked against the approved third party FSR /4/, and the equipment purchase contracts and construction contracts /19/20/. The IRR of the project without CDM income is 6.57%, which is below the benchmark of 8%, and hence it can be concluded that the project is additional.

Assessment of parameters and assumptions

All input parameters to the analysis are referenced to, and have been cross checked against, the approved third party FSR for the project /4/. The values are found to be consistent. The key input parameters to the financial analysis were also cross checked against a number of other references, and were found to be reasonable. For further details please refer to the table below and to section 7 of the validation protocol.

Financial analysis checklist: the financial analysis has been assessed by the validation team, including a financial expert subcontracted by ERM CVS to assess the accuracy and conservativeness of the analysis. The following checklist highlights the key points that were checked:

Table 6: Validation of financial analysis

Issue	Notes	Check	Cross check
Financial analysis method	Additionality tool followed benchmark analysis used	Consistent with additionality tool	Consistent with Guidelines on the assessment of investment analysis
Benchmark type	Benchmark is appropriate for Project IRR	Project IRR calculation is used /2/	Consistent with host country guidelines /26/
Benchmark source & value	The benchmark is based on a publicly available data source, the Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects Beijing: China Electric Power Press /26/.	Consistent with host country best practice. 3 rd party government source.	Used by other similar projects in the host country
Is the benchmark also applied in the FSR?		Yes. Consistent with 3 rd party FSR	Used by other similar projects in the host country
Are the assumptions in the financial analysis consistent with the assumptions implicit in the chosen benchmark?	Benchmark in /26/ is correctly adopted	Yes. Assumptions are consistent.	Financial analysis is done in accordance with national regulations: the 'Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects' Beijing: China Electric Power Press/26/
If the benchmark is after tax, is actual interest payable taken into account in the calculation of income tax? Is this properly referenced and justified?	The benchmark is after tax.	Yes, interest payments are included in the IRR spreadsheet. The loan amount and interest rate are referenced to the third party FSR, and are consistent with the reference.	The interest rate has been checked against the interest rate from the People's Bank of China issued on 22 August 2007 (7.56%) /43/.
Assessment period	30 years + 4 years construction /4/	Consistent with 3 rd party FSR	Cross checked against the lifetime of the equipment in purchase contract for equipments which includes the equipment technical specifications /20/
Inclusion of all costs and		Yes. All relevant costs and	This is realistic based on

Issue	Notes	Check	Cross check
revenues		revenues were included. No other potential revenue streams were identified for this type of project.	sectoral and local knowledge. Local accounting practices were followed /26/44/
Annual electricity generation	The plant load factor was determined by a third party contracted by the project participants –China Pearl River Water Resources Planning, Design and Survey Co.,Ltd., who wrote the FSR.	Consistent with 3 rd party FSR, which was provided to the government for approval and was the basis for the investment decision in the proposed project. The annual power generated of the project was calculated by China Pearl River Water Resources Planning, Design and Survey Co.,Ltd., the independent third party that conducted the feasibility study report, based on 50 years of hydrological data from Manhao hydrological monitoring station, as stated in the FSR /4/.	The annual power generated has been cross checked against similar projects in the region: the average electricity generated, per MW of installed capacity of previously registered hydro projects within a similar range i.e. +/-50% of the project activity (144MW~432MW) in the province is 4,384; for the project activity, the figure is 4,564. This is higher than average, and well within the range (4,101 to 4,682) of similar projects in the province, therefore was considered as conservative.
Static total investment	The static total investment is 2000.762 million RMB	Consistent with 3 rd party FSR	The signed equipment purchase contract and the construction contract were reviewed by ERM CVS. For generators and turbines, the investment costs were estimated to be 207 million RMB in the FSR, whereas the correspondingly contracted prices are 244 million RMB. The actual costs incurred by the project for these key components are therefore higher than the costs estimated in the FSR. For those elements already covered in the reviewed contracts (turbines and generators), the actual costs incurred by the project as stated in the signed contracts were higher than the expected costs in the FSR, indicating the values in the FSR are conservative.
Fixed assets investment value – correct?		Consistent with 3 rd party FSR/4/	Calculated correctly in line with Host country Accounting Practices /26/
Depreciation		Consistent with 3 rd party FSR/4/	Calculated correctly in line with Host country Accounting Practices /26/
Operation and Maintenance (O&M) costs (total)		Consistent with 3 rd party FSR /4/	O&M costs have been cross checked against similar projects in the region. Since reliable data on O&M costs is not available in the databases already published by UNEP Risoe /54/ or IGES /55/, ERM CVS has carried out its own comparison against previously registered hydro projects in the region.

Issue	Notes	Check	Cross check
			The average annual O&M costs per MW of 61 previously registered hydro projects in the province is 0.14 million RMB per MW, for projects over 50MW the figure is also 0.14 million RMB/MW, and for projects within a similar range i.e. +/- 50% of the project activity (144MW~432MW) the average is 0.15 million RMB/MW. The range for the 61 previously registered projects is between 0.07 and 0.4 million RMB/MW, for projects over 50MW it is 0.11-0.19 million RMB/MW, and for projects between 144 and 432 MW it is 0.13-0.19. For the project activity, O&M costs are 0.156 RMB/MW for the first three years of operation period, and 0.158 for the remaining operation years, which is slightly higher than the average but well within the range of previously developed projects. The break down of the O&M costs into the various components was found to be in line with the national Guidelines in the <i>Methods and Parameters for Economic Assessment of Construction Projects /56/</i>, and <i>Notice of Financial Evaluation Interim Provisions of Hydropower Projects /45/</i>, and the values for the components of the O&M costs were validated
Insurance fee		Consistent with 3 rd party FSR	Calculated correctly in line with Host country Accounting Practices /26/. O&M costs have been cross checked against similar projects in the region and are found to be consistent.
Material fees		Consistent with 3 rd party FSR	Calculated correctly in line with Host country Accounting Practices /26/. O&M costs have been cross checked against similar projects in the region and are found to be consistent.
Other fees		Consistent with 3 rd party FSR	Cross checked against the 'Notice of Financial Evaluation Interim Provisions of Hydropower Projects' /45/ which specifies the level of other fees for hydro projects.

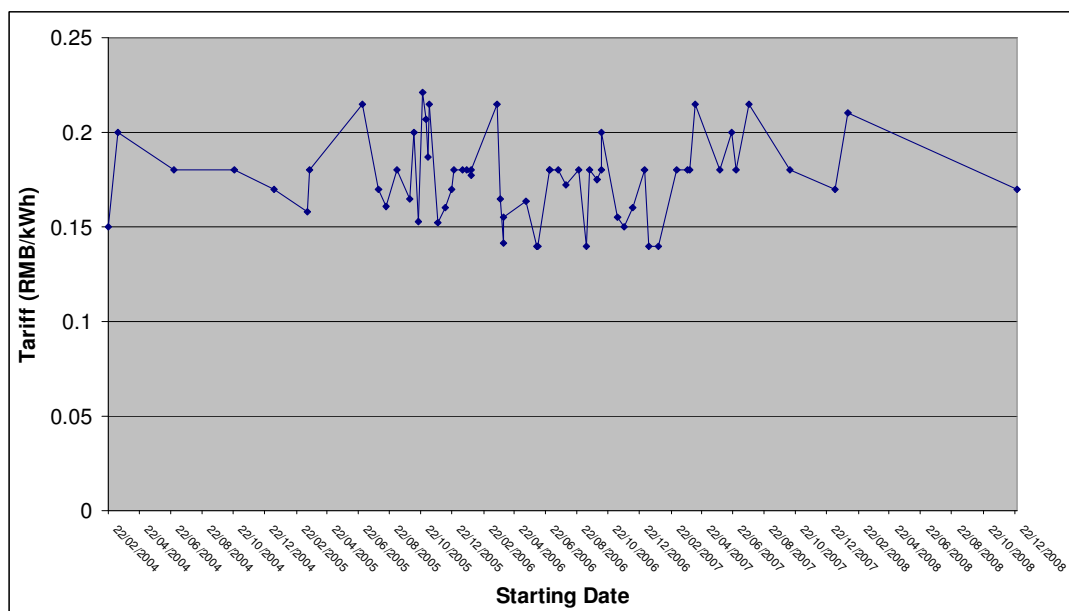
Issue	Notes	Check	Cross check
Electricity tariff	RMB 0.215 /kWh is indicated in the electricity connection agreement, which is consistent with data used in the PDD and IRR calculation.	Consistent with 3 rd party FSR	Consistent with the tariff regulations in Yunnan Province /39//46/. The electricity tariff is validated in more detail below.
Residual value	A residual value of 4% is considered in the final year in the IRR calculation, and the depreciation rate is 3.2%, which is in line with the government document of Decree No. 70 of Guoshuifa [2003] issued by the State Administration of Taxation, /24/ and the value is within a reasonable range.	Consistent with 3 rd party FSR	Consistent with Host country Accounting Practices /26/.
Income tax	Taxation is only included as an expense in the IRR calculation since the benchmark is intended for post-tax comparisons. The method of the income tax calculation was sourced from FSR, and the actual interest payable is taken into account in the calculation of income tax, which is considered by ERM CVS to be in line with the Guidelines on the Assessment of Investment Analysis version 03 of 4 December 2009 /28/.	Consistent with the Law of the People's Republic of China on Enterprise Income Tax (issued on 16 March 2007) /47/	The rate of 25% used in the PDD is in line with host country regulation, and the treatment of taxation is in line with the UNFCCC guidelines.
Sensitivity analysis		PDD shows variation needed to reach benchmark	Justification is provided for why such variation is unlikely, and is considered sufficient. See below.
Spreadsheet		Traceable spreadsheet provided /2/	Calculation is consistent with PDD and FSR.

Further details of the cross checks carried out can be found in Appendix B (CDM Validation Protocol Checklist) below.

Electricity tariff:

The electricity tariff in the PDD and financial analysis is the same as that used in the FSR. The power tariff for the project is considered to be appropriate and conservative. The power price in the FSR (0.215 RMB per kWh, including VAT) is consistent with the actual tariff that the project will receive as agreed in the electricity connection agreement /40/.

An examination of previous tariffs available in the province indicates that there has been no decline in hydro power tariffs in the region since the first CDM hydro projects in the province were registered, which further demonstrates that the tariff selected for the proposed project is appropriate. The following graph illustrates the electricity tariff (including VAT) for previously registered hydroelectric projects in Yunnan province, using data published by IGES on the financial analysis of registered CDM projects /55/. The x (horizontal) axis refers to the starting date of each project activity, and the Y (vertical) axis refers to the electricity tariff cited in the registered PDD of each project. The projects where IGES data on the electricity tariff (including VAT) is available represent 61 projects. Based on the analysis the maximum tariff of the previously registered projects in the database was 0.2208 RMB per kWh (including VAT) and the minimum was 0.14 RMB/kWh. However most projects received a tariff below 0.2 RMB per kWh and the average tariff was 0.176 RMB/kWh, which is well below the tariff applied in the investment analysis for the proposed project activity. Even applying the highest recorded tariff in the region the IRR of the project remains below the benchmark.



According to the Grid-Connection Agreement with the grid company signed in 2009 /17/, the actual tariff that the project will receive is fixed at 0.18 RMB/kWh (including VAT), indicating that the assumed tariff in the FSR is conservative.

Furthermore, the 'Information note on the highest tariffs applied by the Executive Board in its decisions on registration of projects in the People's Republic of China' (version 01) was reviewed. The highest tariff in the province applied by the Executive Board in its decisions and recorded in the list is 0.215 RMB/kWh including VAT, which demonstrates that the tariff applied in the proposed project is not lower than previous tariffs in the region and can be considered appropriate.

Therefore the tariff used in the investment analysis is considered to be conservative.

Operation and maintenance costs: The operation and maintenance (O&M) costs had been reviewed by ERM CVS, including the breakdown of these costs in the FSR. The breakdown of costs was found to be reasonable and in line with the third party FSR. Because the project is still under construction, no contracts or receipts were available to cross check the values for O&M costs. However, the values have been cross checked against other similar projects in the region. ERM CVS carried out a comparison against 61 previously registered hydro projects in the province, and the data is from the publicly available registered PDDs on the UNFCCC website. This number included all registered projects for which information was available at the time of validation start, and the installed capacity of the compared projects ranged from 5MW to 210MW. The average annual O&M cost per MW of previously registered hydro projects in the province is 0.14 million RMB per MW and for projects over 50MW the figure is 0.14 million RMB/MW. The range is between 0.07 and 0.4 million RMB/MW. For the project activity, O&M costs are 0.156 million RMB/MW for the first three years of operation period, and 0.158 million RMB/MW for the remaining operation years, which is slightly higher than the average but well within the previously developed projects. The inclusion of 'other fees' (or miscellaneous costs) had also been assessed. It covers a variety of costs that are not accounted for in the main operation and maintenance costs, for example transport, insurance, back office management, etc. It is considered reasonable to include other fees in the financial analysis in China, given that this is standard practice in financial assessments, including the third party feasibility study report for the proposed project activity.

The project was further compared to registered hydro projects with an installed capacity within a similar range i.e. +/-50% of the project activity (144MW~432MW) in Yunnan Province (there are no other projects as large as 288MW but projects between 50 and 300MW are all classified as medium scale projects in China, and projects within +/-50% of the installed capacity are considered comparable based on ERM CVS's local and sectoral knowledge). These are listed as follows:

Ref.	Title	Installed capacity (MW)	Total O&M costs / yr (Million RMB)	O&M costs per MW	Data source
2580	Yunnan Yunpeng Hydropower Project	210	29.43	0.14	Registered PDD
2877	Yunnan Sinanjiang Hydropower Project	201	27.29	0.14	Registered PDD
2133	Nansha Hydro Power Project in Yunnan Province China	150	23.46	0.16	Registered PDD

Ref.	Title	Installed capacity (MW)	Total O&M costs / yr (Million RMB)	O&M costs per MW	Data source
3390	Yunnan Baoshan Songshanhekou Hydropower Station	168	31.47	0.19	Registered PDD
1930	Yunnan Dehong Nongling Hydropower Project	180	22.77	0.13	Registered PDD
AVERAGE		181.8	26.89	0.15	
The proposed project	Madushan Hydropower Project on Honghe River in Yunnan Province, China	288	45.47	0.16	FSR

The comparison shown in the table above indicates that, when compared to projects of a comparable scale, the O&M costs of the proposed project are within the range of previous projects, and are very close to the average level. The comparison indicates that based on cross checks against publicly available data, in line with the VVM v1.2 paragraph 111(b), the O&M costs of the project are found to be reasonable.

The breakdown of the O&M costs into the various components was found to be in line with the national Guidelines in the *Methods and Parameters for Economic Assessment of Construction Projects* /56/, and *Notice of Financial Evaluation Interim Provisions of Hydropower Projects* /45/. Considering that the O&M costs are based on the approved independent third party FSR, based on the cross checks above, and furthermore considering that a 73.5% decrease in O&M costs would be needed for the IRR to reach the benchmark, ERM CVS can conclude that the O&M costs are justified and reasonable.

Plant load factor: ERM CVS has cross checked the value of the plant load factor in the financial analysis calculations with the third party approved FSR, and found that the estimate in the PDD is consistent with the estimate in the FSR that was submitted to the government while applying for implementation approval. The expected annual electricity generation of the project was determined by a third party contracted by the project participants (China Pearl River Water Resources Planning, Design and Survey Co.,Ltd) and based on 50 years of hydrological data. Therefore the plant load factor is considered reliable and in line with the 'Guidelines for the reporting and validation of plant load factors' issued by the EB (EB 48 Annex 11).

The reason for the different annual generated electricity between the first three operational years and the remaining years is as follows:

According to the approval letter of the Comprehensive Planning Report of the Middle Reaches of Hong River issued by the Ministry of Water Resources on 16 January 2005, three reservoirs are planned to be constructed upstream of the proposed project. The three reservoirs are planned to start operation in the fourth operational year of the proposed project (year 8 in the project timeline, which includes 4 years' construction period). With the regulation of these reservoirs, the water flow from the river upstream of the proposed project will be distributed more evenly compared with the natural conditions, therefore the annual generated electricity of the proposed project will increase. According to the analysis results in the approved third party FSR, in the absence of the regulation improvement of these three reservoirs, the annual generated electricity is 1,256,820MWh; after the regulation improvement, the annual generated electricity is 1,314,380MWh. Therefore, the annual generated electricity of the first three operational years is 4.6% less than the remaining years.

Even if the annual generated electricity of 1,314,380MWh is also adopted for the first three operational years in IRR calculation, the IRR of the proposed project is 6.67%, which is still much lower than the benchmark of 8%.

The above mentioned discussion and information justified the difference between the electricity generated in the first 4 operating years and the following years stated in the PDD and approved FSR. The validation team consider the estimated annual net electricity generation is reliable.

The annual power generated has been cross checked against similar projects in the region as described in table 6 above. The average electricity generated, per MW of installed capacity is higher than average, and well within the range of similar projects in the province. Given the long series of hydrological data on which the load factor was calculated by the independent third party design institute, /4/ the load factor is considered reliable.

The key input values were cross checked against other similar projects in the region. These cross checks found that the values used in the FSR for the project activity are within the range of previously developed projects. The investment costs, operation and maintenance costs, electricity tariff and operating hours / electricity generation are all well within the range of values for other previously developed projects, therefore the values are considered to be reasonable. For further details see section 7.30 of the validation protocol checklist.

Coefficient of effective electricity

Based on ERM CVS's local and sectoral knowledge, as well as review of previously registered CDM projects, the use of an effective electricity coefficient is common practice for hydroelectric projects in China, since not all of the electricity produced by the project will ultimately be purchased by the grid company. Effective electricity coefficients in China normally vary between 70 and 95%, hence the project activity has selected a value towards the upper end of this range. The effective electricity coefficient in China is calculated based on the estimated capacity of the electricity grid to absorb the generated electricity (for example during the wet season), and the regulating capacity of the hydroelectric plant. The effective electricity coefficient has been determined by the independent third party responsible for developing the FSR, and approved by the National Development and Reform Commission /4/.

According to the 'Hydroenergy Design Code for Hydro Power Projects' (SL76-94) approved by the Ministry of Water Resources (http://www.chinawater.net.cn/guifan/bz_pdf/SL76-94/05.pdf) /63/, there are no legal regulations dictating what the effective electricity coefficient for large scale hydro projects (>50MW) should be, and the effective electricity coefficient should be calculated by the design institute based on the characteristics of the project and the electricity balance of the local grid.

In the absence of specific guidance for large projects, in estimating the factor the design institute referred to the official host country guidelines for small scale hydropower projects: 'Economic evaluation code for small hydropower projects' /63/ which defined a range of effective electricity coefficient values for small projects depending on the type of hydropower station. The Project Activity is a type of incomplete yearly regulation hydropower station, and according to Section 3.2.1 of the 'Economic evaluation code for small hydropower projects' /63/, the range of effective electricity coefficient values is between 0.9 -1. In the absence of specific guidelines for large scale projects, ERM CVS cross checked the effective electricity coefficient against the guidelines for small scale projects in order to determine whether the estimation by the independent design institute is reasonable and conservative in comparison with other similar projects in the host country. The design institute has chosen a value in the middle of the range of values for the effective coefficient, confirming that the value is reasonable and conservative based on host country practices.

Line Loss Rate = 2%

Line loss is estimated based on the length of the transmission line and the voltage. The value comes from the FSR and has no obvious impact on the IRR calculation even if a value of 0 is adopted. The value applied comes from the FSR, which is designed by a qualified design institute. In addition, another third party expert team, who was appointed by the government and responsible for examining the suitability of the FSR /4/, also confirmed the suitability of the value adopted.

Furthermore, according to statistical data published by the China Electricity Council (<http://www.cec.org.cn/tongjixinxibu/tongji/yuedushuju/2011-02-23/44224.html>), the average rate of transmission loss for power stations around the country is between 5.5% and 5.72%. Therefore, the rate of transmission loss of 2% adopted by the proposed project is considered to be reasonable and conservative.

Power Consumption Rate = 0.5%

According to the paper entitled "The relationship between House Service System and Power Generation Output in Hydraulic Power Plants" published in 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 Power Consumption Rate of the project is 0.5% which is in the range of 0.3% ~ 2% and towards the lower end of the range, therefore the data is considered valid and appropriate.

Furthermore, according to recent statistical data issued by the China Electricity Council, the average rate of auxiliary consumption for hydropower projects between 2010 and the first quarter of 2011 (<http://www.cec.org.cn/tongjixinxibu/tongji/yuedushuju/2010-11-17/142.html>; and <http://www.cec.org.cn/tongjixinxibu/tongji/yuedushuju/2011-04-15/53057.html>) is in the range of 0.36 – 0.54%, therefore, the rate of auxiliary consumption of 0.5% adopted by the proposed project is within the range of recorded values from this source and is therefore considered reasonable.

In order to further validate the effective coefficient, line loss rate and power consumption rate, the comprehensive coefficient (combination of the coefficient of effective electricity, line loss rate and power consumption rate) of the proposed project has been cross-checked against the other registered projects with the similar installed capacity + - 50% (144MW~432MW) in Yunnan Province as follows:

Ref.	Installed capacity (MW)	Annual generated electricity(MWh)	Annual grid-in electricity(MWh)	Comprehensive coefficient	Data source
2580	210	895,000	803,500	89.78%	Registered PDD
2877	201	919,600	825,600	89.78%	Registered PDD
2133	150	702,280	616,314	87.76%	Registered PDD
3390	168	689,000	618,000	89.70%	Registered PDD
1930	180	774,000	637,000	82.30%	Registered PDD
The proposed project	288	1,314,380	1,217,569	92.63%	FSR

Compared with the similar registered projects, it is clearly shown that the comprehensive coefficient of the proposed project is conservative. Furthermore, even if an effective electricity coefficient of 1 and not taking into account for the line loss and power consumption is applied in the financial analysis, the IRR would be 7.30% which does not cross the benchmark. Therefore the effective electricity coefficient, line loss rate and power consumption rate of the proposed project were validated as reasonable. Even if the annual generated electricity of 1,314,380MWh is adopted for all the operational years in IRR calculation, and the effective coefficient of 1 is adopted and not taking into account for the transmission loss and auxiliary consumption in the most conservative approach, the IRR of proposed project is 7.41%, which is still much lower than the benchmark of 8%.

Use of values from Feasibility Study Reports

In accordance with paragraph 54 of the report of the thirty-eighth meeting of the CDM Executive Board, in cases where project participants rely on values from Feasibility Study Reports (FSR) that are approved by national authorities for proposed project activities, DOEs are required to ensure the following:

- (a) *The FSR has been the basis of the decision to proceed with the investment in the project, i.e. that the period of time between the finalization of the FSR and the investment decision is sufficiently short for the DOE to confirm that it is unlikely in the context of the underlying project activity that the input values would have materially changed;*

The FSR was finalised in November 2007, approved on 31 December 2008, and the start date of the project was 6 January 2009. Given the sustained increases in price trends in the host country for commodities and raw materials, investment and operation & maintenance costs are only likely to have increased in the time between FSR finalisation and project start. This was confirmed by reviewing price indices for the host country /48/. To confirm that the values taken from the FSR were still applicable ERM CVS reviewed the construction and purchase contracts /19/20/ and the compensation agreement /32/. The contracts show that actual main investment costs were higher than those estimated. For generators and turbines, in the FSR, the cost was estimated to be 207million RMB, whereas the correspondingly contracted prices are 244 million RMB. The equipment purchase and construction contracts represent more than 50% of the total investment costs of the project activity. Given that the project is still under construction, cross checks of actual expenditure for 100% of the investment costs are not available, however the investment costs are found to be conservative in comparison with the contracts. Therefore, the validation team concludes that the project costs used in the investment analysis in the PDD were conservatively low.

- (b) *The values used in the PDD and associated annexes are fully consistent with the FSR, and where inconsistencies occur the DOE should validate the appropriateness of the values;*

ERM CVS has confirmed that the values used in both the PDD and the spreadsheet and supporting documentation are fully consistent with the FSR /4/.

Details of any clarifications and corrections relating to the GSP PDD are provided in Appendix B (CDM Validation Protocol Checklist).

- (c) *On the basis of its specific local and sectoral expertise, confirmation is provided, by cross-checking or other appropriate manner, that the input values from the FSR are valid and applicable at the time of the investment decision.*

ERM CVS has confirmed on the basis of its local and sectoral expertise that the values are valid and applicable at the time of the investment decision, and are consistent with local accounting practices in China. Further details are provided in Appendix B (CDM Validation Protocol Checklist) below.

Sensitivity Analysis

A sensitivity analysis has been carried out to demonstrate the impact on the IRR of variations on the key input values to the financial analysis. All costs and revenues greater than or equal to 20% of total costs / revenues have been included in the analysis. The results are presented in the PDD. ERM CVS has reviewed the calculations for the sensitivity analysis which are presented in the Madushan IRR Spreadsheet /2/, and the computations are found to be correct and in accordance with the information presented in the PDD.

The variation in each parameter needed in order for the IRR to reach the benchmark is stated, and explanations given as to the likelihood of each variation taking place. The analysis is considered reasonable.

Static total investment: a 14.6% decrease in the total static investment would be needed in order for the IRR to reach the benchmark. The signed Equipment Purchase Contract and Construction Contract have been reviewed /19/20/. For generators and turbines, the investment costs were estimated to be 207 million RMB in the FSR, whereas the correspondingly contracted prices are 244 million RMB. The actual costs incurred by the project for these key components are therefore higher than the costs estimated in the FSR. The equipment purchase and construction contracts represent more than 50% of the total investment costs of the project activity. Given that the project is still under construction, cross checks of actual expenditure for 100% of the investment costs are not available, however the investment costs are found to be conservative in comparison with the contracts available. Therefore, it is unlikely that total investment will decrease by 15% to reach the benchmark.

Annual net electricity generation: a 16.2% increase in annual electricity generation would be needed in order for the IRR to reach the benchmark. This is considered unlikely because annual electricity generation was calculated by the independent third party design institute based on a long time-series (50 years) of hydrological data from the Manhao Hydrology Station, which is a local hydrology station in Honghe River. ERM CVS has been confirmed against this in the FSR. The annual electricity generation is based on a load factor, calculated by the design institute, that was also presented to the government for approval and to investors (the FSR).

Electricity tariff: a 15.3% increase in the electricity tariff would be needed in order for the IRR to reach the benchmark. Electricity tariffs are regulated by the government in China, and the tariff for similar projects to the project activity in Yunnan province is set by the local government. ERM CVS has reviewed the government notification of the tariff in Yunnan province /22/ and cross checked with the IGES data base /55/ on the highest recorded tariff in the province, which is 0.2208 RMB/kWh. The IRR will not be able to reach the benchmark even the highest recorded tariff is applied. The tariff used in the IRR calculation is well within the range of tariffs previously applied in registered projects in the region: the lowest recorded tariff is 0.132 RMB/kWh, and the highest recorded tariff is 0.2208 RMB /kWh, all including VAT, according to data published by IGES /55/. Therefore the tariff is considered to be reasonable. Furthermore it should be noted that the actual tariff received by the project is lower, not higher, than the value expected in the FSR. ERM CVS has reviewed the Grid-Connecting Agreement /17/ with the grid company signed in 2009, which shows that the actual tariff that the project will receive is fixed at 0.18 RMB/kWh (Including VAT).

Annual O&M costs: Only a reduction in O&M costs by more than 73.5% will make the IRR reach the benchmark. Based on local and sectoral knowledge, such a rate of reduction is not considered plausible, and therefore the sensitivity analysis is considered reasonable.

Common Practice Analysis

A common practice analysis has been carried out in order to complement the investment analysis presented in the PDD. The scope of the analysis is limited to projects in Yunnan province which started construction after 2002 and with an installed capacity between 144MW and 432MW. This is considered justified based on the following considerations:

- Provinces in China are very large in terms of both geographical area and population size. Tariffs and regulatory environment vary significantly between provinces in China;
- Projects developed before 2002 are not considered to be similar and applicable for the analysis given that they were developed before the reform of the power sector in China when the China State Power Corporation was diversified into five separate regional grids. This reform changed the tariff mechanisms and amounts of electricity allowed to be supplied to the grid /57/; and
- Only projects between 144MW and 432MW are assessed. This is considered reasonable given that it covers the range of +/- 50% of the installation capacity of the project, and based on CDM project activity registration review form for Tianquan Shiyang Hydro Power Project (2195) /58/, a common analysis covering a range of +/- 50% of the installed capacity of the proposed project was required by the CDM EB. In addition, projects between 50 and 300 MW are categorised as medium scale hydropower projects in China and the proposed project installation capacity is 288 MW, which is closer to the top range of the medium scale hydropower projects category. Projects between 144 MW and 432 MW represent a wide range of different project sizes, and the selection is therefore considered to be appropriate.

ERM CVS has used official sources, such as the Yearbook of China Water Resources /66/, the China Energy Statistical Yearbook /29/ and the China Electric Power Yearbook/30/, as well as local and industry expertise to determine to what extent similar and operational projects (i.e. hydropower projects), other than CDM project activities, have been undertaken in Yunnan. Based on publicly available information, and with reference to other CDM project documentation available on the UNFCCC website, it is confirmed the projects shown in table below are all the operational projects in the region that are similar to the project activity. The analysis has been based on all projects between 144 MW to 432 MW capacity.

Table 7: Hydropower projects similar to the proposed project in Yunnan Province

No.	Project Name	Installed Capacity (MW)	Largest Shareholder	Operation Date	Doc Ref
1	Yanshuigou Hydropower Station	144	Unknown	1966	/29//30/
2	Xiaojiangkou Hydropower Station	144	Unknown	1970	/29//30/
3	Tukahe Hydropower Station	165	China Datang Corporation	2007	/51/

Projects 1 and 2 were constructed before 2002 (based on review of the publicly available information /29/30/), therefore are excluded from the common practice analysis. According to the China Datang Corporation website/51/, which is the owner of

Tukahe hydropower station, project 3 is a special project that is part of the government program of 'west-east electricity transmission projects' therefore has the privilege to supply electricity to Guangdong province at a higher price of 0.333 yuan/kWh, which is significantly higher than the tariff of 0.215 RMB/kWh used in the investment analysis for the proposed project activity. Therefore the investment conditions for the Tukahe hydropower station were very different to those of the proposed project, including that the revenues from electricity sales are considerably higher per unit of electricity produced. This demonstrates that the proposed project has essential distinctions with the Tukahe hydropower station project.

Based on above confirmed common practice analysis, ERM CVS concludes that the project is not common practice.

3.7 Calculation of GHG Emissions

The GHG emission reductions ($ER_{\text{facility}, y}$) achieved by the project activity are calculated in accordance with the methodology ACM0002 v11. ER_y is equal to baseline emissions (BE_y), minus project emissions (PE_y) minus leakage emissions (Ly).

Baseline emissions: baseline emissions (BE_y in tCO_2) are calculated as the quantity of electricity supplied by the project ($EG_{P,J,y}$, in MWh) multiplied by the baseline emissions factor of the SCPG (EF_y in tCO_2/MWh). This has been cross checked against the FSR and is based on a long time series (50 years) of hydrological data /4/.

Grid emissions factor:

The grid emission factor of the SCPG is determined *ex-ante* for the 7 years crediting period following the tool to calculate the emission factor for an electricity system, version 02, dated 16 October 2009. In accordance with the tool the weights of the operating margin and the build margin are 0.5:0.5.

The PDD, version 01, was published on 27 March 2010, and the calculation of the grid emission factor is calculated based on the latest data available published by the DNA of China at the time of validation start. The most recent three years of data at the time of PDD submission (2006-2008) is used based on the China Electric Power Yearbook and the China Energy Statistical Yearbook and applied in the NDRC guideline /25/

Operating Margin (OM): Method (a) (Simple OM) is used. This is appropriate since low-cost/must run resources constitute less than 50% of total grid generation in the average of the five most recent years (2004-2008). The Simple OM emission factor is calculated as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, excluding low operating cost and must-run power plants. The data on fuel consumption and net electricity generation of each power plant /unit in the SCPG is not publicly available; therefore the simple OM is calculated based on data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system (option C). Aggregated generation and fuel consumption data are used as more disaggregated data are not available. Low-cost/must run power resources in the SCPG include only renewable power generation, and the quantity of electricity supplied to the grid by these sources is known. Therefore, Option C is appropriate for calculating the Simple OM emission factor. Net calorific values of each fuel type were obtained from the China Energy Statistical Yearbook, and IPCC 2006 default values /49/ were used for the oxidation factor and emission factor of each type of fossil fuel. The values used and the calculation of the simple OM is considered to be reasonable, and is in line with official data published by the Government of China /25/. The OM is calculated to be $0.9987 tCO_{2e}/MWh$.

Build Margin (BM): 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 build margin (BM) emission factor for this project /50/. 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 , and the aggregate incrementally installed capacity of all generation sources in year $y-n$, where n represents the number of years of historical data that need to be considered in order for the sample group to comprise 20% of the total system generation capacity (in MW). The emissions factor of fossil fuel fired power generation in SCPG 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, the BM emission factor is calculated as the product of this emission factor of fossil fuel fired power generation and the proportion of fossil fuel fired power plants in the newly installed 20% capacity, based on data for years 2004-2006, contained in the power yearbooks 2005-2007. The BM is calculated as $0.5772 tCO_{2e}/MWh$.

Combined Margin (CM): The combined margin emissions factor is calculated as $0.5 * EF_{\text{grid}, OM, y} + 0.5 * EF_{\text{grid}, BM, y} = 0.78795 tCO_{2e}/MWh$. Therefore baseline emissions are calculated as $1,217,569 MWh * 0.78795 tCO_{2e}/MWh = 959,382 tCO_{2e}$ per annum.

Project emissions: In accordance with methodology ACM0002 version 11, there are no emissions from the project as it is a renewable energy (hydropower) project. No sources of GHG emissions not covered by the methodology were identified during the validation.

Leakage: In accordance with methodology ACM0002 version 11, no leakage has to be considered for the proposed project activity.

The assumptions and data used to determine the emission reductions are listed in the PDD and all the sources have been checked and confirmed by ERM CVS, and the calculations can be replicated. Based on the information reviewed it can be confirmed that the sources used are correctly quoted and interpreted in the PDD, the calculations are complete, and that the numbers are reasonable and accurate, and that the methodology ACM0002 version 11 has been correctly applied.

Parameters determined ex-ante

The emissions factor of the electricity grid is determined ex-ante, and is described in detail above. The parameters set ex ante in the PDD have been validated in detail in section 8.15 of the validation protocol checklist below. The correct parameters are specified as per the methodology and the Tool to calculate the emissions factor of an electricity system. Data units and descriptions for the parameters are appropriate, and the correct sources are referenced. The parameters for determining the grid emissions factor have been checked against the data provided by the NDRC /25/.

3.8 Environmental and Sustainable Development Impacts

An Environmental Impact Assessment (EIA) Report has been performed according to Chinese regulations. The EIA report was conducted by Pearl River Water Resource Conservation Science Institute in January 2007, and the document has been reviewed by ERM CVS. The EIA was approved, as per Chinese regulations, by Ministry of Environmental Protection of People's Republic of China on 27 September 2007. The EIA report concludes that no significant environmental impacts are expected from the project. Impacts that are identified are subject to mitigation measures, and these are accurately described in the final PDD.

The letter of approval by the DNA of China confirms the contribution of the proposed CDM project activity to the sustainable development of the host Party.

3.9 Comments by Local Stakeholders

Local stakeholders were invited to comment on the proposed project activity before the submission of the project to validation. Although the project is located in a remote area, appropriate stakeholders were identified that might be impacted by the development of the hydropower project. A survey was carried out by sending 125 questionnaires to local residents, as part of the Environmental Impact Assessment /5/ process conducted by qualified independent third party. A total of 100 questionnaires were completed, and the summary of the completed questionnaires were included in the EIA report /5/, which has been reviewed by ERM CVS. The PDD includes a summary of the public consultation. The information has been checked against the summary of 100 copies of returned survey questionnaires /52/. Stakeholders made comments on the construction of the proposed project concerning compensation paid to resettled and affected people, impacts on water, air and noise during the construction, as well as water, soil and vegetation conservation.

Project proponents took the due account of comments received from local stakeholders and implemented certain measures to ensure the concerns of the stakeholders were addressed, which included making compensation payments in accordance with national regulations and under the supervision of the local government, and ensuring that the environmental protection measures in the EIA are carried out.

In summary, it can be concluded that CDM and host country requirements for local stakeholder consultation were fulfilled.

3.10 Additional Findings

None

4 Conclusion and Validation Opinion

Name of Project	Madushan Hydropower Project on Honghe River in Yunnan Province, China
Basis of validation	ERM CVS based its validation work on: • CDM approved monitoring methodology, ACM0002 v11 • Project Design Document version 05 dated 18 May 2011 • CDM Validation and Verification Manual Version 1.2 (EB 55) • ERM CVS's internal CDM validation methodologies and protocols • CDM decisions and guidance issued by the CDM Executive Board • UNFCCC criteria for the Clean Development Mechanism • Host Country criteria for the Clean Development Mechanism
Responsibilities of ERM CVS	ERM CVS is responsible to provide a thorough independent third party assessment of the proposed CDM project activity to ensure that the proposed CDM project activity meets all the identified and applicable criteria for registration of projects under the CDM.
Responsibilities of Project Participants	CF Carbon Fund II Limited and Honghe Guangyuan Madushan Hydropower Development Co., Ltd, County are responsible for preparing the PDD, supporting documentation and providing all necessary evidences to support the information included in the PDD.
Activities performed	ERM CVS conducted its activities in accordance with the CDM Validation and Verification Manual Version 1.2 (EB 55). The validation consisted of a review of project documentation, a site visit, interviews with relevant personnel, cross checking and ascertaining information through other reliable sources and on its sectoral, regional and local expertise and resolution of CLs and CARs pertaining to the project activity.
ERM CVS Conclusion	ERM Certification and Verification Services has performed the validation of the Madushan Hydropower Project on Honghe River in Yunnan Province, China against the criteria for the Clean Development Mechanism as set out by the Conference of the Parties and the UNFCCC CDM Executive Board, and host country criteria. The validation employed standard auditing techniques, and a validation protocol checklist was used to carry out the validation. The project is a grid connected hydropower project in Yunnan Province, People's Republic of China. The Annex 1 Party for the project activity is the Netherlands. The Party fulfils the criteria for participation in the CDM, and has issued a letter of approval for the project and authorised the project participants. The host Party LoA confirms the contribution of the project towards sustainable development. The validation has provided sufficient evidence to demonstrate that the project activity is not the baseline scenario, and that emission reductions would be additional to what would have taken place in the absence of the CDM project activity. The project meets the applicability criteria and correctly applies the approved methodology ACM0002 v11, and is therefore expected to result in real, measurable and long term reductions in greenhouse gas emissions. The monitoring plan provides for the collection and archiving of data sufficient to ensure that emission reductions can be verified. Nothing came to our attention to suggest that the project, if implemented as described, would not result in emission reductions of 906,656 tCO₂e per year on average over the first 7 year crediting period. In summary, it is the opinion of ERM CVS that the Madushan Hydropower Project on Honghe River in Yunnan Province, China, as described in the PDD version 05 of 18 May 2011, meets all stated criteria of the CDM, correctly applies the methodology ACM0002 version 11, and is expected to result in real, measurable and long term emission reductions, and the DNA of China has confirmed that the project assists in meeting sustainable development criteria. ERM CVS therefore requests registration of the project activity.
Signed on behalf of ERM CVS	
Name:	Melanie Eddis
Date:	06 June 2011

Appendix A: DOCUMENTS & INTERVIEWEES

DOCUMENT LIST

Reference	Document Title	Date
/1/	Project Design Document for Madushan Hydropower Project on Honghe River in Yunnan Province, China prepared by Beijing Haohua Rivers International Water Engineering Consulting Co. Ltd., version 01.	Version 01 dated 24 March 2010 Version 02 dated 16 July 2010 Version 03 21 October 2010 Version 04 dated 17 December 2010 Version 05 dated 18 May 2011
/2/	IRR calculation spreadsheet prepared by Beijing Haohua Rivers International Water Engineering Consulting Co. Ltd	26 April 2010.
/3/	<i>Emission Reduction Calculation spreadsheet prepared by Beijing Haohua Rivers International Water Engineering Consulting Co. Ltd.</i>	26 April 2010
/4/	The Feasibility Study Report (FSR) of Madushan Hydropower Project on Honghe River in Yunnan Province, China. prepared by China Pearl River Water Resources Planning, Design and Survey Co.,Ltd. dated November 2007 and approval of the FSR issued by National Development and Reform Commission	31 December 2008
/5/	The Environmental Impact Assessment (EIA) Report of Madushan Hydropower Project on Honghe River in Yunnan Province, China. prepared by Pearl River Water Resource Conservation Science Institute dated January 2007 and approval of the EIA report issued by Ministry of Environmental Protection of People's Republic of China	27 September 2007
/6/	Letter of Approval for Madushan Hydropower Project on Honghe River in Yunnan Province, China issued by DNA of Netherlands	18 November 2010
/7/	Minutes of Stakeholders' meeting held to collect opinions and suggestions for CDM Application.	6 April 2008
/8/	Letter of Approval for Madushan Hydropower Project on Honghe River in Yunnan Province, China issued by DNA of China (NDRC)	December 2009
/9/	EB 51 Report Annex 3: Validation and Verification Manual Version 1.1. http://cdm.unfccc.int/EB/051/eb51_repan03.pdf	
/10/	CDM Executive Board: ACM0002 "Consolidated methodology for grid-connected electricity generation from renewable sources", version 11.	12 February 2010
/11/	CDM Executive Board: Information on additionality (Attachment A to Appendix B of 4/CMP.1 Annex II)	
/12/	CDM Executive Board: Guideline for the reporting and validation of plant load factors version 01	11 July 2009
/13/	CDM Executive Board: Guideline on the demonstration and assessment of prior consideration of the CDM version 01 of 2 August 2008, version 02.	17 July 2009
/14/	CDM Executive Board: Tool to calculate the emission factor for an electricity system (version 2)	16 October 2009
/15/	The bank loan contract of Madushan Hydropower Project on Honghe River in Yunnan Province, China between the project developer and Guangzhou Tianpingjia Branch of Industrial and Commercial Bank of China	23 February 2009
/16/	The CDM consulting agreement between Honghe Guangyuan Madushan Hydropower Development Co., Ltd and Beijing Haohua Rivers International Water Engineering Consulting Co. Ltd,	28 May 2008
/17/	The grid connecting agreement between the project developer and Yunnan Power Grid Company	September 2009
/18/	The construction permission letter issued by Guangdong Keyuan Engineering Supervision and Consultancy Company.	25 January 2009
/19/	The construction contract between Madushan Hydropower Project on Honghe River in Yunnan Province, China and Guangdong No.2 Hydropower Engineering Company, Ltd .	25 January 2009
/20/	The purchase contract for equipments and technical specification between Honghe Guangyuan Madushan Hydropower Development Co., Ltd. and Tianjin Tianfa Hydropower Equipments Production Co., Ltd .	6 January 2009
/21/	The Certified Emission Reduction Purchase Agreement (ERPA) between Honghe Guangyuan Madushan Hydropower Development Co., Ltd and CF Carbon Fund II Limited.	18 May 2009
/22/	The notification from the project developer to the DNA of China of the	3 June 2009

	commencement of Madushan Hydropower Project on Honghe River in Yunnan Province, China and the intention to seek CDM status.	
/23/	The minutes of board meeting of Honghe Guangyuan Madushan Hydropower Development Co., Ltd decide to develop the project as CDM.	18 March 2008
/24/	Decree No. 70 of Guoshuifa [2003] issued by the State Administration of Taxation	18 June 2003
/25/	China NDRC, the emission factor calculation for each power grid of China, published on 2 July 2009, NDRC official website: http://qhs.ndrc.gov.cn/qj/zjz/t20090703_289357.htm	2 July 2009
/26/	Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects. Beijing: China Electric Power Press,.	2003
/27/	CDM Executive Board: Tool for the demonstration and assessment of additionality, version 5.2	16 May 2008
/28/	CDM Executive Board: the Guidelines on the Assessment of Investment Analysis version 03	4 December 2009
/29/	China Energy Statistical Yearbook	2006-2008
/30/	China Electric Power Yearbook	2004-2008
/31/	IPCC: Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories Reference Manual,	2006.
/32/	Compensation agreement for land submergence and immigrant between Honghe Guangyuan Madushan Hydropower Development Co., Ltd and Honghe prefecture government.	15 May 2008
/33/	The explanation letter to the bank to state the pay debt ability prepared by Honghe Guangyuan Madushan Hydropower Development Co., Ltd	25 December 2008
/34/	Consent to Loan letter from the Guangzhou Tianpingjia branch bank of Industrial and Commercial Bank of China	30 December 2008
/35/	Reply letter for question; 'The reason of different electricity generated in the first 4 years' by China Pearl River Water Resources Planning, Design and Survey Co., Ltd	7 July 2010
/36/	China Electric Power Yearbook Committee, China Electric Power Yearbook	2009
/37/	Notification of close small scale thermal power generator unit issued by National Council of PR China	20 January 2007
/38/	Business license of Honghe Guangyuan Madushan Hydropower Development Co., Ltd,	20 October 2008
/39/	<i>Notice on Adjustment of Grid-connected Power Price, Yun Fa Gai Jia Ge</i> [2004] No. 589, issued by Yunnan DRC; accordingly the power price is RMB 0.215 per kWh for newly-built hydropower stations.	30 July 2004
/40/	Power Purchase Agreement signed between the project owner and the grid company	September 2009
/41/	<i>Technical Code of Electric Energy Metering and Metering Devices</i> (DL/T448-2000), issued by the Ministry of Power Industry	2000
/42/	<i>Verification Regulation of Electrical Energy Meters with Electronics</i> (JJG 596-1999), issued by National Bureau of Quality and Technical Supervision	21 October 1999
/43/	Historical loan benchmark interest rate for longer than 5 years loan, published by the People's Bank of China http://www.pbc.gov.cn/publish/zhengcehuobisi/631/1269/12693/12693_.html	22 August 2007
/44/	Average Wage of Staff and Workers and Related Indices, published by National Bureau of Statistics of China http://www.stats.gov.cn/tjsj/ndsj/2007/html/E0522e.htm	2007
/45/	<i>Notice of Financial Evaluation Interim Provisions of Hydropower Projects</i> , Shui Guigui [1994] No. 0026, prepared by General Planning and Design Institute of Water Resources and Hydropower	14 June 1994
/46/	<i>Notice of Implementation of Time of Use Electricity Pricing for Hydropower Stations</i> , Yun Fa Gai Jia Ge [2005] No. 792, Issued by Yuannan DRC	30 August 2005
/47/	The Law of the People's Republic of China on Enterprise Income Tax	16 March 2007
/48/	<i>Historical price indices for years 1989-2007</i> , published by National Bureau of Statistics of China http://www.stats.gov.cn/tjsj/ndsj/2008/html/I0801e.htm	2008
/49/	<i>2006 IPCC Guidelines for National Greenhouse Gas Inventories</i> , Volume 2, Chap 1, Page 1.21-1.24	2006
/50/	Deviation from methodology AM0005 to calculate the building Margin emission factor	

	http://cdm.unfccc.int/UserManagement/FileStorage/6POIAMGYOEDOTKW25TA20EHEKPR4DM and http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_QEJWJEF3CFBP1OZAK6V5YXPQKK7WYJ	
/51/	China Datang Corporation website http://cdm.unfccc.int/Projects/DB/TUEV-SUED1218474812.98/view	Accessed on 29 October 2010
/52/	100 copies of received stakeholders consultation questionnaires.	
/53/	EB 55 Report: Validation and Verification Manual Version 1.2. http://cdm.unfccc.int/EB/051/eb51_repan03.pdf	
/54/	UNEP RISOE Centre CDM Pipeline database http://uneprisoe.org/	20 September 2010
/55/	IGES CDM Investment Analysis database http://www.iges.or.jp/en/cdm/report_cdm.html	20 September 2010
/56/	Methods and Parameters for Economic Assessment of Construction Projects (v3) issued by the Ministry of Construction. Version 3 was the current version at the time the FSR was drafted in December 2008.	1993
/57/	Electricity Reform Program, published by National Development and Reform Commission http://www.ndrc.gov.cn/xwfb/t20050708_28096.htm	11 April 2002
/58/	CDM project activity registration review form for Tianquan Shiyang Hydro Power Project (2195)	6 January 2009
/59/	The purchase contract for 220V transformers signed between And Jiangxi Transformers Technology Co., Ltd.	30 April 2009
/60/	News regarding Sanjiangkou hydro station project commence operation on 22 September 2010 on Chinese news website http://www.sina.com.cn	Accessed 26 September 2010
/61/	News regarding Pre-FSR approval was granted for Daheigong hydro station project on 30 July 2010 on Yunnan local Electricity Power Website http://www.yunnanpower.cn/	Accessed 6 August 2010
/62/	News regarding the construction process of Qiaotou hydro project on Ministry of Commerce of PRC website http://www.mofcom.gov.cn/	19 October 2010
/63/	The training plan for operation developed by Honghe Guangyuan Madushan Hydropower Development Co., Ltd.	March 2010
/64/	CDM Monitoring Manual developed by Honghe Guangyuan Madushan Hydropower Development Co., Ltd.	May 2010
/65/	Hydroenergy Design Code for Hydro Power Projects (SL76-94) approved by the Ministry of Water Resources (http://www.chinawater.net.cn/quifan/bz_pdf/SL76-94/05.pdf).	1994
/66/	Yearbook of China Water Resources, 2006, issued by China Water Conservancy and Hydro Power Press	2006
/67/	Guidelines Project Design Document (CDM-PDD) and the Proposed new baseline and monitoring methodologies (CDM-NM) version 7	
/68/	CDM-PDD - Project Design Document form version 3	
/69/	China DNA, http://cdm.ccchina.gov.cn/web/index.asp	
/70/	The Relationship between House Service System and Power Generation Output in Hydraulic Power Plant, issue No. 1, Northeast Electric Power Technology	2007
/71/	Statistical data issued by the China Electricity Council	2010 and 2011

List of Interviewees

Date	Name	Position	Subject Discussed
20-21 April 2010	Jing An	Vice manager of Migration office of Honghe Guangyuan Madushan Hydropower Development Co., Ltd.	➤ Project background information ➤ Project technology, operation, maintenance and monitoring capability ➤ Project additionality ➤ Project monitoring and management plan. ➤ Project approval status (incl. EIA approval, CDM project approval status) ➤ Stakeholder consultation process
20-21 April 2010	Zhifu Xie	Financial manager of Honghe Guangyuan Madushan Hydropower Development Co., Ltd.	
20-21 April 2010	Wei Chen	Vice manager of Honghe Guangyuan Madushan Hydropower Development Co., Ltd.	
20-21 April 2010	Yuejie Li	Office of Honghe County Environmental Protection Bureau	➤ Project approval status (incl. EIA approval, CDM project approval status) ➤ Stakeholder consultation process ➤ Environmental Impact ➤ Society and Sustainable Development
20-21 April 2010	Wen Su	Office of Honghe County Forestry Bureau	
20-21 April 2010	Hang Li	County Migration Development Bureau	
20-21 April 2010	Chunmin Li	President of Beijing Haohua Rivers International Water Engineering Consulting Co. Ltd.	➤ Applicability of selected methodology. ➤ Baseline determination. ➤ Emission reductions calculation. ➤ Emission reduction ➤ Monitoring plan
20-21 April 2010	Yingying Wang	Project Manager of Beijing Haohua Rivers International Water Engineering Consulting Co. Ltd.	

Appendix B: CDM Validation Protocol Checklist

	Checklist Question	Reference	Comment	Draft Conclusion	Final Conclusion
1.	PDD Format (CDM VVM)	PDD		OK/CAR/CL	OK/ NOT OK
1.1	Is the PDD prepared in accordance with the latest template and guidance by the CDM EB? http://cdm.unfccc.int/Reference/PDDs_FORMS/PDDs/index.html	/1/	The PDD is prepared in accordance with the latest template, Version 03 - in effect as of 28 July 2006.	OK	OK
1.2	Does the language make sense and is it clear?		Yes	OK	OK
2.	Project Title	PDD A.1			
2.1	Does the project title enable the identification of the unique CDM project activity?	/1/4/	Yes. The title of the proposed project activity is "Madushan Hydropower Project on Honghe River in Yunnan Province, China", which is consistent with the PDD and the LoA from China.	OK	OK
2.2	Is the version number and date of the PDD clearly indicated? Is this consistent with the project's timeline?	/1/8/	Yes. CL 1 The serious consideration of CDM should be addressed in the PDD.	CL 1	OK
3.	Project Description (CDM VVM)	PDD A.2			
3.1	Does the PDD contain a clear description of the project activity, with regard to its nature and technical implementation? Does Section A2 include: a. A brief summary of A4, particularly A4.3, b. A summary of B.3, sources and gases c. The PP's opinion regarding the contribution of the project to sustainable development	/1/4/20/	A clear description of the project is given. The description has been cross checked against the site observations, and also against the FSR and FSR approval, and equipment purchase contracts. a. A summary of the technology to employed is stated CL 2 The difference between the electricity generated in the first 4 operating years and the following years should be justified. CL 3 The type of hydropower project should be included in the description b. A brief summary of the sources and gases is given – Greenhouse gas (GHG) emission reductions will be achieved by displacing fossil fuel-dominated power generation attached to the SCPG c. The sustainable development benefits of the project are listed, such as (1) Reduce the GHG emission to mitigate	CL 2 CL 3	OK

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	Checklist Question	Reference	Comment	Draft Conclusion	Final Conclusion
			the global warming and air pollution trend by providing clean electric power, (2) Mitigate the shortage of power in local area, (3) The project activity can create some job opportunities during the construction period and operation period. The project will also promote the local development in industry, agriculture and service trade. The sustainable development benefits are consistent with the FSR and on the conclusions of the validation site visit. The project description is consistent with the FSR and other supporting documents, and the project description has been verified against conditions on site.		
3.2	Does the description deliver a transparent overview of the project activity and does it cover all relevant elements?	/1/	Yes	OK	OK
3.3	Has a physical site inspection been undertaken to confirm that the description in the PDD reflects the proposed CDM project activity?	SV	Yes, A site inspection was undertaken from 19 to 22 April 2010 to confirm that the description in the PDD reflects the proposed CDM project activity.	OK	OK
3.4	Does section A.2 also indicate the baseline situation, and the historical situation at the facility, if this is different to the baseline? If the proposed CDM activity involves the alteration of an existing installation or process, does the description clearly state the differences to the pre-project situation?	/1/4/	The baseline situation is clearly described as the continuation of electricity supply from the grid. Details of the grid, the purpose of the project and its contribution of GHG emissions reduction and sustainable development are included in the PDD. The proposed CDM project activity does not involve the alteration of an existing installation or process, this has been validated during the physical site visit undertaken from 19 to 22 April 2010.	OK	OK
3.5	Is all information provided in the project description consistent with information provided in later sections of the PDD?	/1/4/	Yes. The project description is consistent with the information provided in later sections of the PDD.	OK	OK
4.	Technical Description	PDD A.4			
	Location of Project	PDD A.4.1			
4.1	Does the information provided on the location of the project activity allow for a clear identification of the site(s)? How was the site location confirmed? (e.g. site visit, planning documents)	SV /1/4/5/	Yes. The project is located on the Honghe River in Honghe Hani and Yi Autonomous State, Yunnan Province, P.R. China, and this has been confirmed during the site visit as well as verifying the FSR and EIA.	OK	OK
	Category/ Sectoral Scope	PDD A.4.2			
4.2	Is the category (sectoral scope) of the project activity indicated and correct?	/24/	The PDD references approved methodology ACM0002, which clearly states that the category is sectoral scope 1	OK	OK

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	Checklist Question	Reference	Comment	Draft Conclusion	Final Conclusion
			(energy industries).		
	Technology to be Employed by the Project Activity	PDD A.4.3			
4.3	Is there a clear description of the baseline scenario, as identified in section B.4? This should include: a. An indicative list of the equipment(s) and systems that would have been in place in the absence of the project activity (if any) b. Information about the age and average lifetime of the baseline facility based on manufacturer's specifications and industry standards (if applicable) c. Installed capacities, load factors and efficiencies of the baseline facility (if applicable) d. An explanation of how the same types and levels of services provided by the project activity would have been provided in the baseline scenario.	SV	A clear description of the baseline scenario is provided. a. Not applicable because the baseline scenario is to supply power from the grid. In the absence of the project activity, electricity would continue to be supplied by the grid, details of which are given in the PDD. The site visit confirmed that the project is not based on a pre-existing hydro plant at the site before the development of the project development. b. Not applicable, since there is no baseline facility. c. Not applicable, since there is no baseline facility. d. The PDD states that in the absence of the project, equivalent electricity will be supplied by the SCPG.	OK	OK
4.4	If the scenario existing prior to the start of the implementation of the project activity is different from the selected baseline scenario, is there a clear description of the pre-existing scenario, with a list of the equipment(s) and systems in operation at that time?	/24/	Not applicable.	N/A	N/A
4.5	Is the technology to be employed by the project activity clearly described and is it consistent with information provided elsewhere in the PDD? The description should include: a. List of main technologies involved b. List of main equipment and installations c. The lifetime of the project equipment d. Capacities, load factors and efficiencies (where relevant) e. The emissions sources and the greenhouse gases involved in the project activity f. Existing and forecast energy and mass flows and balances g. Interaction with processes/equipment outside the project boundary, if any, is stated.	SV, DR /1/4/20/24/	a. The main technologies involved are listed and the information has been verified against the site visit and FSR. CL 4 The percentage of coal-fired generation in the grid for 2008 should be stated in the PDD b. Main equipments are described in accordance with the equipment purchase contract. Monitoring equipment is described in section B.7. CL 5 It should be clearly stated how many meters will be installed for monitoring, with the location, accuracy and calibration frequency. c. The Lifetime of the project equipments was not stated in the PDD, CL 6: The Lifetime of the project equipment should be further substantiated.	CL 4 CL 5 CL 6	OK

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	Checklist Question	Reference	Comment	Draft Conclusion	Final Conclusion
			d. Turbine type, number and technical parameters are given for the turbines in the PDD; whilst the generator type, number, and technical parameters are provided for the generators in the PDD. CL 7 The annual operating hours and load factor of the proposed project should be addressed in the PDD, and the annual electricity generation and annual electricity supply to the grid should be stated, with explanation/justification for any difference. CL 8 transformers should be included in table 1, parameters of equipments e. The FSR was verified to confirm that the normal surface area of the reservoir is 19 180 000 m², and the installed capacity of the proposed project is 288 MW, which was verified to be consistent with FSR and purchase contract for equipments. So the power density of the proposed project can be calculated to be 15 W/m² (288 MW/19,18km²). Since the power density of the proposed project is greater than 10 W/m², the project emissions can be neglected as per ACM0002 version 11. f. The load factor and estimated annual electricity generation and supply to the grid is not stated in section A.4.3. g. Not applicable since the project boundary includes the connected regional power grid.	CL 7 CL 8	
4.6	Does the description of the technology to be applied provide sufficient and transparent input/ information to evaluate its impact on the greenhouse gas balance?	/1/	Yes, with the exception of the issues noted above.	CL4-CL8	OK
4.7	Does the implementation of the project activity require any technology transfer from annex-I-countries to the host country(ies)?	/1/20/	No, the main equipments will be produced domestically. This has been verified against the equipment purchase contract	OK	OK
4.8	Does the project use state of the art technology and / or does the technology result in a significantly better performance than any commonly used technologies in the host country? Is the technology implemented by the project activity environmentally safe?	/1/8/20	Yes, the equipment is supplied by Tianjin Tianfa Hydropower Equipments Production Co., Ltd, who are experienced in producing hydro turbine technology in China. The technology is hydro technology. The project has conducted an EIA by a licensed entity and obtained the approval issued by the National Environmental Protection Bureau. In addition, the Letter of Approval issued by the China DNA confirms the project meets the sustainable	OK	OK

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	Checklist Question	Reference	Comment	Draft Conclusion	Final Conclusion
			development criteria of the host country.		
4.9	Is the project technology likely to be substituted by other or more efficient technologies within the project period?	/1/8/20/	No, hydropower technology is considered as mature in the host country. It is not likely to be substituted by other or more efficient technologies within the project period.	OK	OK
4.10	Does the project require extensive initial training and maintenance efforts in order to be carried out as scheduled during the project period? Is information available on the demand and requirements for training and maintenance?	/4/	CL 9 A training plan for operation and CDM monitoring should be provided.	CL 9	OK
4.11	Is a schedule available for the implementation of the project and are there any risks for delays?	SV, IV	CL 10 The construction plan of the proposed project should be provided to confirm the implementation schedule of the project.	CL 10	OK
	Public Funding from Annex I country	PDD A.4.5			
4.12	Is the information provided on public funding provided in compliance with the actual or planned situation, based on the available evidence?	/1/15/	No public funding from Parties included in Annex 1 has been identified to be involved in the project activity. This was also cross-checked against the FSR and the bank loan contract.	OK	OK
4.13	If the project involves public funding from an Annex 1 country, have the annex 1 parties involved provided an affirmation that such funding does not result in a diversion of official development assistance?		Not applicable	N/A	N/A
5.	Approval and Participation (CDM VVM EB 55)	PDD A.3			
5.1	Are project participants listed in tabular form in section A.3 of the PDD? Is this information consistent with the contact details provided in Annex 1 of the PDD and other project documentation (Letters of Approval and Modalities of Communication)?	/1/	Yes, The project participants are Honghe Guangyuan Madushan Hydropower Development Co., Ltd. and CF Carbon Fund II Limited. The project participants are listed consistently in A.3 and Annex 1 of the PDD.	OK	OK
5.2	Has the Host Party provided a Letter of Approval (LoA) with clear referencing and supporting documentation? Does the LoA confirm: - o Ratification of the Kyoto Protocol - o Voluntary Participation - o Contribution to Sustainable Development - o Reference to the precise project title in the PDD	/8/	Yes. The letter of Approval for Madushan Hydropower Project on Honghe River in Yunnan Province, China issued by DNA of China dated December 2009 has been provided. The letter confirms that: a. China ratified the Kyoto Protocol on 30 th Aug 2002; b. Honghe Guangyuan Madushan Hydropower Development Co., Ltd is authorized as a project participant by China to voluntarily participate in the project activity; c. The project complies with the permission requirements provided for in the Measures for Operation and	OK	OK

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	Checklist Question	Reference	Comment	Draft Conclusion	Final Conclusion
			Management of CDM projects in China, and assists China in achieving sustainable development; d. The LoA references the precise project title 'Madushan Hydropower Project on Honghe River in Yunnan Province, China '. This is consistent with the project title in the PDD.		
5.3	Was the LoA received directly from the DNA or from the project participants? Has the Host Party LoA been issued by the respective DNA? How has this been confirmed?	/8/	The LoA was received from the project participant. The authenticity of the LoA for the proposed project can be found on the website of the China DNA as approved.	OK	OK
5.4	Has the Annex I Party provided a Letter of Approval (LoA) with clear referencing and supporting documentation? Does the LoA confirm: a. Ratification of the Kyoto Protocol b. Voluntary Participation c. Contribution to Sustainable Development d. Reference to the precise project title in the PDD	/1/	CAR 1 The LoA from Annex I Party has not been provided yet.	CAR 1	OK
5.5	Was the LoA received directly from the DNA or from the project participants? Has the Annex I Party LoA been issued by the respective DNA? How has this been confirmed?	/1/	Refer to CAR 1	CAR 1	OK
5.6	If either LoA contains additional specification or conditions of the project activity, then has the request for registration been based on the documents specified in the LoA?	/1/	Refer to CAR 1	CAR 1	OK
5.7	If the LoA references a specific version of the Validation Report or PDD and this version cannot be submitted, then has either of the following been submitted? a) a statement indicating final LoA has not been received, or b) an updated Validation Report/ PDD	/1/	Refer to CAR 1	CAR 1	OK
6.	Baseline and Monitoring Methodology (CDM VVM EB 55)	PDD B			
	Title and reference of the approved baseline and monitoring methodology?	PDD B.1			
6.1	Are the number, version and title of the methodology clearly and correctly stated? Is the version of the methodology valid at the time of validation submission?	/10/	Yes. The GSP PDD adopts the methodology ACM0002, version 11 of 12 February 2010, and it is valid at the time of validation submission.	OK	OK
6.2	Are the Tools applicable to the methodology correctly referenced, including the correct version number(s) valid at the	/1/14/	The 'tool to calculate the emission factor for an electricity system' (version 2) dated 16 October 2009, and the 'Tool for	OK	OK

Validation Report



	Checklist Question	Reference	Comment	Draft Conclusion	Final Conclusion
	time of registration submission?		the demonstration and assessment of additionality' v 5.2 are applied in the PDD, which are correctly referenced and valid at the time of validation.		
	Justification for the choice of methodology and why it is applicable	PDD B.2			
6.3	Have any sources of greenhouse gas emissions been identified by the DOE ,within the project boundary following project implementation, which are expected to contribute more than 1% of the overall expected average annual emissions reductions, and which are not addressed by the applied methodology?	SV /9/	The FSR was verified to confirm that the normal surface area of the reservoir is 19,180,000 m², and the installed capacity of the proposed is 288 MW, which was verified to be consistent with FSR and purchase contract for equipments. So the power density of the proposed project can be calculated to be 15 W/m² (288 MW/19,180,000 m²). Since the power density of the proposed project is greater than 10 W/m², hence the project emissions can be neglected as per ACM0002 version 11. No project emission or leakage sources contributing more than 1% which are not addressed by the methodology have been found by ERM CVS.	OK	OK
6.4	Is the methodology fully applicable to the proposed project? For each of the applicability criteria: a. Is the criterion discussed in the PDD? b. Is compliance provable? c. Is evidence provided in the PDD to prove applicability? d. Has compliance with the criterion been verified (by checking evidence provided, sector/ local knowledge etc)?	SV /4/17/20/25	Yes. a. The applicability criteria of the applied methodology are justified in section B.2 of the PDD. The project meets all the applicability criteria stated in methodology ACM0002: (1) The project makes use of renewable water resources to generate electricity to SCPG, which is dominated by fossil fuel-fired power plants /4/17/; (2) The installed capacity of the project is 288 MW. This has been verified by review of the FSR /4/ and purchase contract for equipments/20/ (3) The SCPG has a clear boundary, which can be verified against the emission factor calculation for each power grid of China which has been published by NDRC on 2 July 2009/25/. (4) The project activity results in a new reservoir and the power density of the power plant is 15 W/m²/4/20/, greater than 4 W/m². b. All the evidences mentioned above have been provided to ERM CVS to verify c. Yes, the information provided has been cross checked against the detailed design of the project in the approved third party FSR, and during the site visit. However appropriate references are not cited in section B.2 of the	CL 11	OK

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	Checklist Question	Reference	Comment	Draft Conclusion	Final Conclusion
			PDD. CL 11: Appropriate references, such as the FSR, should be cited in the PDD for the information on applicability of the project to the methodology in section B.2 d. Compliance with the applicability criteria has been validated by reviewing the approved third party FSR and through the site visit.		
6.5	Was there a request for clarification, revision or deviation made for the adopted methodology in relation to the proposed project activity? If so, were the correct procedures provided by the CDM EB followed?		Not applicable	N/A	N/A
	Description of sources and gases included in the project boundary	PDD B.3			
6.6	Does the PDD correctly describe the project boundary, including the physical delineation of the proposed CDM project activity, in compliance with the requirements of the selected baseline methodology, and is this consistent with site observations and other documentation provided?	/10/25/	Yes. The spatial extent of the project boundary is clearly defined as the site of project activity and all power plants connected physically to South China Power Grid (SCPG) including Guangdong Power Grid, Guangxi Power Grid, Guizhou Power Grid and Yunnan Power Grid, to which the project is connected. This is in line with the delineation of grid boundaries as provided by the DNA of China /25/. The defined project boundary is in line with ACM0002 of version 11/10/.	OK	OK
6.7	Baseline emissions: Have all sources and GHGs required by the methodology been included within the project boundary? For each potential source: a. Are source(s) and gases discussed by the PDD? b. Is inclusion / exclusion justified? c. Is explanation/ justification sufficient? d. Is the inclusion/ exclusion consistent with the monitoring plan?	/10/	Yes. The description of sources and GHGs is in accordance with ACM0002. For each potential source the following is confirmed: a. All sources and gases identified in the methodology are discussed in the PDD b. Yes. CO₂ emissions from electricity generated from fossil fuel fired power plants that are displaced due to the project included are included. This inclusion is considered as justified. CH₄ and N₂O emissions are excluded since these are minor emissions sources. The exclusion is considered as justified. c. Yes d. Yes, the inclusion/exclusion of GHG sources is consistent with the provisions of the monitoring plan	OK	OK

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	Checklist Question	Reference	Comment	Draft Conclusion	Final Conclusion
6.8	Project emissions: Have all sources and GHGs required by the methodology been included within the project boundary? For each potential source: a. Are source(s) and gases discussed by the PDD? b. Is inclusion / exclusion justified? c. Is explanation/ justification sufficient? d. Is the inclusion/ exclusion consistent with the monitoring plan?	/4/10/	The FSR was verified to confirm that the normal surface area of the reservoir is 19.18 km², and the installed capacity of the proposed project is 288 MW, which was verified to be consistent with FSR and purchase contract for equipments. So the power density of the proposed project can be calculated to be 15 W/m² (288 MW/19180000 m²), Since the power density of the proposed project is greater than 10 W/m², hence the project emissions can be neglected as per ACM0002. However: CAR 2, In the table of emissions sources included in the project boundary in section B.3 of the PDD, the CH₄ emission source should be included, even if emissions from this source are expected to be zero, since the power density of the project will be monitored throughout the crediting period.	CAR 2	OK
6.9	For large scale projects, is a diagram given to illustrate the project boundary, including all the key equipment, systems and flows of mass and energy, as well as the emissions sources and gases included in the project boundary?	/4/	Yes. The diagram is consistent with the detailed design of the project given in the FSR.	OK	OK
	Description of how the baseline scenario is identified and description of the identified baseline scenario	PDD B.4			
6.10	Does the PDD clearly identify the baseline, a scenario that represents the anthropogenic emissions by sources of GHG that would occur in the absence of the proposed CDM project activity?	/10/	As per the methodology of ACM0002, the baseline emissions are the product of electrical energy baseline EG _{BL, y} expressed in kWh of electricity produced by the renewable generating unit, multiplied by an emission factor calculated using option (a): combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the 'Tool to calculate the Emission Factor for an electricity system'. The PDD correctly identifies the baseline. For the project activity, the baseline scenario is the equivalent amount of annual electricity would be supplied by the SCPG.	OK	OK
6.11	a. Have the procedures/ steps to identify the most reasonable baseline scenario, as required by the methodology and applicable tools, been documented clearly in the PDD? Are all feasible and credible alternatives identified, including but not limited to all the potential scenarios listed in the methodology? b. Are all considered alternatives assessed for consistency with (enforced) mandatory laws and	/10/	The baseline is specified by the methodology. No further assessment is required.	OK	OK

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	Checklist Question	Reference	Comment	Draft Conclusion	Final Conclusion
	regulations? c. Does the list of alternatives include the project activity undertaken without being registered as a CDM project? d. If alternatives are excluded: ▪ Is sufficient evidence/ justification provided to support every exclusion of alternatives? Is it reasonable? ▪ Is it shown that at least one credible and feasible alternative does not face a barrier? Is this reasonable? e. If Investment Analysis is used to exclude baseline alternatives, has it been correctly applied? Are assumptions and input values reasonable and sufficiently justified?				
6.12	Have all relevant national and/or sectoral policies and circumstances been taken into account? Are they listed in the PDD?	/10/	The chosen baseline is in compliance with all applicable laws and regulations in the host country.	OK	OK
6.13	Does the PDD provide a verifiable description of the baseline scenario, including a description of the technology/ activities that would have been employed in the absence of the CDM project?	/10/	Yes, a verifiable description of the baseline scenario is provided. Electricity delivered to the grid by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations in B.6.1.	OK	OK
6.14	Does the identified baseline scenario reasonably represent what would occur in the absence of the proposed project activity?	/10/	Yes, the baseline scenario is provided in the approved baseline methodology and reasonably represents what would occur in the absence of the proposed project activity. It represents the continuation of the current situation.	OK	OK
7.	Additionality (CDM VVM EB 55)	PDD B.5			
	a) Prior consideration of the CDM	PDD C.1.1			
7.1	Is the start date defined in accordance with the "Glossary of CDM terms"? What evidence is provided to verify that this was the official start date? Is this considered reliable and reasonable?	/18/19/20/	The starting date was determined to be 06 January 2009, which was the earliest date of implementation, construction or real action on the project, which was confirmed by review of all key contracts: the purchase contract, construction permission and construction contract /18/19/20/. The construction contract signed between the project developer and Guangdong No.2 Hydropower Engineering Company, Ltd. is dated 25 January 2009; the purchase contract for equipments signed between Honghe Guangyuan Madushan Hydropower Development Co., Ltd	OK	OK

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	Checklist Question	Reference	Comment	Draft Conclusion	Final Conclusion
			and Tianjin Tianfa Hydropower Equipments Production Co., Ltd is dated 06 January 2009; and the construction permission letter issued by Guangdong Keyuan Engineering Supervision and Consultancy Company is dated 25 January 2009. All of these documents have been provided and verified by ERM CVS /18/19/20/ The starting date of the project activity is therefore considered reliable and reasonable.		
7.2	Is it a new project activity (start date on or after August 2008) or an existing project?	/18/19/20/	The proposed project is a newly built project with a starting date after August 2008.	OK	OK
7.3	For a new project which does not require a new methodology and has not published its PDD for stakeholder comments prior to the start date, then: a. Have the project proponents informed the DNA and/or UNFCCC secretariat in writing? How has this notification been verified? (i.e. confirmation from the DNA or UNFCCC) b. Was the notification made within 6 months of the project activity start date? c. Does the letter/ notification indicate the precise geographic location and provide a brief description of the proposed project? d. Have the project proponents informed the DNA and/ or UNFCCC secretariat of the progress of the project activity every subsequent two years after the initial notification?	/19/20/	The project owner has informed the China DNA in writing of the commencement of the project and of their intention to seek CDM status on 03 June 2009. It was validated by reviewing the notification from Honghe Guangyuan Madushan Hydropower Development Co., Ltd to the DNA of China of the commencement of the Project and the intention to seek CDM status /22/, and the document was stamped by the DNA of China as evidence of the DNA receiving it. Therefore the consideration of CDM is in accordance with the 'Guidelines on the demonstration and assessment of prior consideration of the CDM' version 01 (EB 41) which was the version valid and applicable at the time of project start and at the time of submitting the notification to the Chinese DNA.	OK	OK
7.4	For an existing project which has a start date prior to the publication of the PDD for global stakeholder comments, has the project proponent provided the following: a. Evidence of awareness of the CDM prior to the project activity start date and that the benefits of the CDM were a decisive factor in the decision to proceed with the project? (e.g. Board minutes, notes etc) Is this sufficient? b. Reliable evidence that demonstrates real actions were taken to secure CDM status in parallel with the project's implementation? (e.g. contracts with consultants for CDM/PDD/methodology services, ERPAs, correspondence with CER buyers, DOEs, DNAs or the UNFCCC). Is this sufficient?	/19/20/	Not applicable	N/A	N/A

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	Checklist Question	Reference	Comment	Draft Conclusion	Final Conclusion
	b) Identification of alternatives (Additionality Tool)	<i>PDD B.5</i>			
7.5	Is the assessment of alternatives in compliance with the requirements of the methodology and the relevant tool(s) (e.g. the Tool for the demonstration and assessment of additionality)? Is the assessment consistent with section B.4?	/10/	The methodology does not require an assessment of alternatives. According to clause 105 of the VVM, "The PDD shall identify credible alternatives to the project activity in order to determine the most realistic baseline scenario, unless the approved methodology that is selected by the proposed CDM project activity prescribes the baseline scenario and no further analysis is required".	OK	OK
	c) Investment Analysis				
7.6	Has an investment analysis been used to demonstrate additionality?	/11/	Yes. Investment analysis has been used to demonstrate additionality.	OK	OK
7.7	Has the appropriate analysis Option been chosen? (as per the <i>Guidance on the Assessment of Investment Analysis</i>)? - If Option I is chosen (simple cost analysis), is it demonstrated that the alternatives produce no economic benefits other than CDM income? - If Option II is chosen (investment comparison analysis), does the proposed baseline scenario leave the PP no other choice than to make an investment to supply the same and (or substitute) products or services? - If Option III is chosen (benchmark analysis), is it appropriate in this case?	/10/11/27/	Since the proposed project generates financial and economic benefits other than CDM-related income through the sale of electricity, and the baseline alternative does not involve any investment, a benchmark analysis is applicable. CL 12: Further justification should be provided for the statement that 'thermal power generator unit with installed capacity per set lower than 300 MW is strictly controlled in places' and associated evidence should be provided Minor issue 1: the language should be corrected in the discussion of Sub-step 1b	CL 12 Minor issue 1	OK
7.8	Is the most suitable financial indicator clearly identified (Project or Equity IRR, NPV, cost benefit ratio, or (levelised) unit cost)?	/10/11/26/27/	Yes. According to the Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects /26/, in China a project IRR of 8% (after tax) for the total investment of a project is regarded as a benchmark for investing in large scale hydropower plants, fossil fuel fired plants as well as wind farm projects. The benchmark of 8% (after tax) is therefore appropriate for this project. ERM CVS was able to confirm this is suitable and reasonable as following: 3. This benchmark was determined by the national administration of this industry in China /26/; 4. This benchmark is for comparison with project IRR and is after tax, and the investment analysis for this project is also for project IRR and is after tax, which is consistent;	OK	OK

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	Checklist Question	Reference	Comment	Draft Conclusion	Final Conclusion
7.9	If Option I is chosen (simple cost analysis), is it demonstrated that the activity produces no economic benefits other than CDM income?		Not applicable	N/A	N/A
7.10	If Option II is chosen: Is the most suitable financial indicator clearly identified (Project IRR, Equity IRR, NPV, cost benefit ratio, or (levelised) unit cost)?		Not applicable	N/A	N/A
7.11	Benchmarks - If Option III is chosen: a. Does the proposed baseline scenario leave the project participant no other choice than to make an investment to supply the same (or substitute) products or services? b. Is the most suitable financial indicator clearly identified (Project IRR, Equity IRR, NPV, cost benefit ratio, or (levelized) unit cost)? Is the suitability of the selection reasonable and adequately justified? c. Is an appropriate benchmark chosen that is relevant for the project activity (sector, investment, investor, country, risk of project, time of investment decision)? d. Is the choice of benchmark appropriate to the type of IRR calculated? (e.g. a Project IRR benchmark is appropriated for a WACC or Project IRR analysis; an Equity IRR benchmark is appropriate for an Equity IRR analysis) e. Is the chosen benchmark appropriate in comparison with other publicly available comparable benchmarks? f. Is the chosen benchmark appropriate and in line with other benchmarks used in current or previous projects by the same investor?	/11/28/29/	a. No, the proposed baseline scenario does not leave the project participant no other choice than to make an investment to supply the same products or services. The project participant has the option of making no investment. b. Yes, the most suitable financial indicator, project IRR, is identified in accordance with Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects /26/ c. Yes, According to the Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects /26/, in China a project IRR of 8% (after tax) for the total investment of a project is regarded as a benchmark for investing in large scale hydropower plants, fossil fuel fired plants as well as wind farm projects. The benchmark of 8% (after tax) is therefore appropriate for this project. d. Yes. ERM CVS was able to confirm this is suitable and reasonable as following: 1) This benchmark was determined by the national administration of this industry in China /26/; 2) This benchmark is for project IRR and after tax and the investment analysis for this project is also for project IRR and after tax, which is consistent; e. Yes. According to the Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects /26/, in China a project IRR of 8% (after tax) for the total investment of a project is regarded as a benchmark for investing in large scale hydropower plants, fossil fuel fired plants as well as wind farm projects.. f. Yes. As mentioned in section e, the benchmark is widely accepted and applied in the hydropower industry in China. Therefore ERM CVS is able to confirm this benchmark is suitable and reasonable. CL 13: the source of the values used in table 2 should be provided In the PDD	CL 13	OK

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	Checklist Question	Reference	Comment	Draft Conclusion	Final Conclusion
7.12	<i>Source of BM or DR</i> If an external BM or DR has been used: a. Is the BM or DR based on publicly available data sources? Have these data sources been validated? Are the assumptions underlying the referenced BM or DR also applicable to this project?	/4/11/28/	Yes. The benchmark is based on a publicly available data source, the Interim Rules on Economic Assessment of Electrical Engineering Retrofit Projects /26/. The source has been reviewed by ERM CVS, and is widely used for similar projects in the host country. The same assumptions underlying the benchmark have been used in the financial analysis for the proposed project. This has been validated by reviewing the FSR.	OK	OK
7.13	<i>Source of BM or DR</i> If an internal company BM or DR has been used: a. Is the project participant the only possible investor in the project? b. Is it sufficiently demonstrated that the internal benchmark has been used for similar projects with similar risk or would have been used for similar projects in the same sector and country/region? How has this been validated?		Not applicable.	N/A	N/A
7.14	If risk premiums are applied in the development of the benchmark, are they reasonable and justified?		Not applicable. A government benchmark is adopted and no additional risk premiums are applied.	N/A	N/A
	Has a lower benchmark been used in previous investment decisions by the project participant? If so, are there verifiable circumstances that have led to a change in the benchmark?		Not applicable. The chosen benchmark is applicable to all investments of this type in the host country.	N/A	N/A
	Overall, is the choice of benchmark reasonable? Is it reasonable to assume that no investment would be made at a rate of return lower than the benchmark?	/26/28/	Yes. The selection of the benchmark is in accordance with the regulations in China, is widely adopted, and is considered reasonable.	OK	OK
	Assumption and Input Values, calculations				
7.15	Is the period of assessment appropriate?	/26/28/	Yes. The operation period adopted for the IRR calculation is 30 years (excluding 4 years of construction period). This has been verified against the FSR, and it is in line with <i>Guidelines on the Assessment of Investment Analysis, version 3</i>. However: CL 14 Lifetime of the project equipment should be clearly stated in the PDD and supporting evidence should be provided	CL 14	OK
7.16	Is any residual value of the project activity assets included in the analysis? Are residual value calculations reasonable and justified and consistent with local accounting rules or international best practice?	/24/26/28/	A residual value of 4% is considered in the final year in the IRR calculation, and the depreciation rate is 3.2%, which is in line with the government document of Decree No. 70 of Guoshuifa [2003] issued by the State Administration of	OK	OK

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	Checklist Question	Reference	Comment	Draft Conclusion	Final Conclusion
			Taxation /24/ and the value is within a reasonable range.		
7.17	Are the depreciation and major maintenance costs consistent with the assessment period and the residual values?	/2/4/	Yes, the 3.2% of annual depreciation rate is included throughout the operation period of 30 years, which is consistent with the assessment period and residual values.\ CL 15 Further evidence should be provided to support the key input values to the financial analysis namely: (a) O&M costs, (b) investment costs, (c) loan amount and rate of interest, and (d) electricity tariff CL 16 Further explanation / justification should be provided for the following: (a) the difference between the electricity generated and supplied to the grid. (b) operating hours of the proposed project (c) tax rates	CL 15 CL 16	OK
7.18	Are depreciation and other non-cash items related to the project activity deducted from net profits used for calculating the financial indicator (e.g. IRR, NPV)?	/2/4/	Depreciation is only taken into account when calculating income tax. Depreciation is correctly accounted for.	OK	OK
7.19	Is the treatment of taxation consistent with the chosen benchmark? (i.e. taxation should only be treated as an expense in the IRR/NPV calculation if the chosen benchmark is intended for post-tax calculations?	/2/4/28/	Taxation is only included as an expense in the IRR calculation since the benchmark is intended for post-tax comparisons. The method of the income tax calculation was sourced from FSR, and the actual interest payable is taken into account in the calculation of income tax, which is considered by ERM CVS to be in line with the Guidelines on the Assessment of Investment Analysis version 03 of 4 December 2009 /28/. However, further evidence is required to substantiate the loan amount and rate of interest - see CL 15.	CL 15	OK
7.20	Recommended project: If the implementation of the project ceased and then recommenced due to consideration of the CDM, then: a. Are input values valid and applicable at the time of making the decision to recommence the project? b. Are capital costs incurred prior to the revised project activity start date input as the		Not applicable	N/A	N/A

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	Checklist Question	Reference	Comment	Draft Conclusion	Final Conclusion
	recoverable value of the assets (limited to the potential reuse/ resale of tangible assets)? c. How has the fair market value of the capital expenditures been calculated and validated? (e.g. by chartered specialists). Is this fair market value reasonable and justified?				
7.21	Has the project participant supplied unprotected and traceable spreadsheet versions of all investment analysis?	/2/	Yes, an unprotected and traceable calculation spreadsheet has been provided.	OK	OK
7.22	From the investment analysis provided, is it possible to reproduce the results?	/2/	Yes.	OK	OK
7.23	If a Project IRR has been used, are the costs of financing expenditures (i.e. loan repayments and interest) included in the calculation of project IRR?	/2/	The cost of financing expenditures (i.e. loan repayments and interest) is not included in the cash outflow of calculation of project IRR. Actual interest payable is only taken into account in the calculation of income tax.	OK	OK
7.24	If an Equity IRR has been used, is the debt portion of the investment cost included as a cash outflow? (i.e. as well as interest costs and principle repayments – double counting)		Not applicable	N/A	N/A
7.25	Sensitivity analysis: a. Are all variable and critical costs and revenues in the analysis included in the sensitivity analysis? b. Is the assessed range of variations reasonable in light of the reliability of the estimated input values and the likely range? c. If some variations create scenarios that change the conclusion/ result of the analysis, how likely/ probable is such a scenario (in the opinion of the DOE)? d. Is the sensitivity analysis possible to reproduce?	/1/2/	a. Yes, all key variables representing more than 20% of costs or revenues were subjected to variation. b. It is shown that the benchmark is reached only when the total investment and annual O&M costs decrease by 14.6% and 73.5%, respectively, while the on-grid tariff and power supplied to the grid would have to increase by 15.2% and 16.2%, respectively. Annual electricity generation: a 16.2% increase in annual electricity generation would be needed in order for the IRR to reach the benchmark. This is considered unlikely because electricity generated was calculated by the independent third party design institute based on a long time-series (50 years) of hydrological data from the Manhao Hydrology Station, which is a local hydrology station in Honghe River. ERM CVS has confirmed against this in the FSR. The annual electricity generation is based on a load factor, calculated by the design institute, that was also presented to the government for approval and to investors (the FSR). Electricity tariff: a 15.2% increase in the electricity tariff would be needed in order for the IRR to reach the benchmark. Electricity tariffs are regulated by the	CL 15 CAR 3	OK

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	Checklist Question	Reference	Comment	Draft Conclusion	Final Conclusion
			government in China, and the tariff for similar projects to the project activity in Yunnan province is set by the local government. ERM CVS has reviewed the government notification of the tariff in Yunnan province and cross checked with the IGES data base on the highest recorded tariff in the province, which is 0.2208 RMB/KWH /55/. The IRR will not able to reach the benchmark even the highest recorded tariff is applied. The tariff used in the IRR calculation is well within the range of tariffs previously applied in registered projects in the region: the lowest recorded tariff is 0.132 RMB/KWH, and the highest recorded tariff is 0.2208 RMB /KWH, all including VAT /55/. Therefore the tariff is considered to be reasonable. Investment costs (total static investment): a 14.6% decrease in the total static investment would be needed in order for the IRR to reach the benchmark. Further evidence is required to substantiate the investment costs – see CL 15 above. O&M costs: a 73.5% reduction in O&M costs would be needed in order for the IRR to reach the benchmark, which based on FSR and the economic growth in China is considered unlikely. Therefore, potential reductions of O&M costs will have minor impact on the IRR. CAR 3 In the sensitivity analysis section of the PDD, in the paragraph entitled 'As for Annual O&M cost', the first sentence of the discussion incorrectly refers to 'total static investment' rather than O&M costs. Please correct. c. The justification and evidences in sensitivity analysis are considered to be appropriate and reasonable however further evidence is required – see CL 15 above. d. Yes. The sensitivity analysis is able to be reproduced in the IRR calculations spreadsheet.		
7.26	Are input values used in all the investment analysis valid and applicable at the time of the investment decision taken by the project participant?	/4/	The input parameters used in the financial analysis of the proposed project are taken from the feasibility study report (FSR) prepared by China Pearl River Water Resources Planning Design and Survey Co.,Ltd. dated November 2007	OK	OK

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	Checklist Question	Reference	Comment	Draft Conclusion	Final Conclusion
			and approved by the National Development and Reform Commission on 31 December 2008 /4/. The input parameters used in the financial analysis can thus be considered information provided by an independent and recognized source. The FSR was approved on 31 December 2008 and the starting date of the proposed project was determined to be 6 January 2009 /18/19/20/. Given this short period of time between the approval of the FSR and the decision to proceed with the project activity, it is unlikely in the context of the project that the input values would have materially changed. It is thus reasonable to assume that the FSR has been the basis of the decision to proceed with the investment in the project.		
7.27	Have the listed input values been consistently applied in all calculations?	/4/	Yes. ERM CVS compared the input parameters for the financial analysis included in the PDD with the parameters stated in the FSR /4/ and was able to confirm that the values applied are consistent with the values stated in the FSR /4/.	OK	OK
7.28	Are all references made in the investment analysis correctly referenced/ sourced? Have these sources been verified?	/4/	Yes. ERM CVS compared the input parameters for the financial analysis included in the PDD with the parameters stated in the FSR /4/ and was able to confirm that the values applied are consistent with the values stated in the FSR /4/.	OK	OK
7.29	Have financial calculations been verified by: assessing all parameters and assumptions against the available evidence and expertise; cross-checking the parameters against 3 rd party or publicly available sources; reviewing feasibility reports, public announcements and annual financial reports; assessing the correctness of computations and the sensitivity analysis?	/2/4/	Further evidence is required to cross check the key input parameters to the financial analysis – please see CL 15.	CL 15	OK
7.30	Have values from a feasibility study report (FSR) approved by national authorities been used? If so: a. Has the FSR been the basis of the decision to proceed with the investment in the project? How has this been verified? b. Are the values used in the PDD and associated annexes valid and consistent with the FSR? c. At the time of the investment decision, are the input values from the FSR valid and applicable (based on specific local and sectoral expertise and knowledge)?	/4/	The input parameters used in the financial analysis of the proposed project are taken from the feasibility study report (FSR) prepared by the independent qualified third party China Pearl River Water Resources Planning Design and Survey Co.,Ltd. dated November 2007 and approved by the local government - National Development and Reform Commission - on 31 December 2008 /4/. The input parameters used in the financial analysis can thus be considered information provided by an independent and recognized source. ERM CVS compared the input parameters for the financial	CL 15	OK

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	Checklist Question	Reference	Comment	Draft Conclusion	Final Conclusion
			analysis included in the PDD with the parameters stated in the FSR /4/ and was able to confirm that the values applied are consistent with the values stated in the FSR /4/. However further cross checks are required – see CL 15. The FSR was approved on 31 December 2008 and the starting date was determined to be 6 January 2009 /18/19/20/. Given this short period of time between the approval of the FSR and the decision to proceed with the project activity, it is unlikely in the context of the project that the input values would have materially changed. It is thus reasonable to assume that the FSR has been the basis of the decision to proceed with the investment in the project.		
	d) Barrier Analysis (VVM)	<i>PDD Step 3</i>			
7.31	Has a barrier analysis been used?		Not applicable	N/A	N/A
7.32	Is a complete list of barriers that prevent the relevant alternatives and the proposed CDM project activity from occurring identified?		Not applicable	N/A	N/A
7.33	Is a complete list of barriers that prevent the alternatives and the proposed CDM project activity from occurring identified?		Not applicable	N/A	N/A
7.34	Do any such identified barriers have a clear and direct impact on the financial returns of the project activity? (these are not barriers and should be assessed in the investment analysis)		Not applicable	N/A	N/A
7.35	Are the identified barriers real and substantiated by independent sources of data such as relevant national legislation, surveys of local conditions and national or international statistics?		Not applicable	N/A	N/A
7.36	Does an identified barrier or set of barriers prevent the implementation of the proposed CDM project activity? How has this been validated?		Not applicable	N/A	N/A
7.37	Do the identified barriers not equally prevent at least one of the possible alternatives (i.e. the baseline scenario)? How has this been validated?		Not applicable	N/A	N/A
7.38	Is it clearly explained how the approval of the project in the CDM would enable the proposed project activity to surmount the barrier? Is the rationale reasonable and justified with evidence?		Not applicable	N/A	N/A
7.39	Overall, is the Barrier Analysis presented credible and compliant with the applicable Tools?		Not applicable	N/A	N/A
	e) Common Practice Analysis (VVM)	<i>PDD Step 4</i>			

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	Checklist Question	Reference	Comment	Draft Conclusion	Final Conclusion
7.40	Is the proposed project activity a 'first of its kind'? Has sufficient evidence been provided to validate this claim?		No, the project is not claimed to be first of its kind.	n/a	n/a
7.41	Has common practice analysis been undertaken?		Yes	OK	OK
7.42	Is the geographical scope of the common practice analysis appropriate for the assessment, considering the project activity's technology or industry type?		Yes, three comparable hydro projects have been chosen in Yunnan province, where the proposed project is based at. The selection of Yunnan province as the geographical region is acceptable due to the large size of the region and the large number of grid connected power projects in the province, and due to the fact that, based on ERM CVS's local and sectoral knowledge, the regulatory environment and investment climate varies significantly between provinces in China	OK	OK
7.43	Have all comparable projects been included in the common practice analysis? How was this assessed (by the DOE)? If some projects have been excluded as non-comparable, is the exclusion reasonable and justified?		CL 17 the PP should provide evidence to support the claim that there are only 3 other projects developed in the province without CDM financing. CL 18 further justification for excluding the previous projects should be demonstrated – i.e. the essential distinctions between these previous projects and the proposed project activity should be further substantiated.	CL 17 CL 18	OK
7.44	Have similar and operational projects, other than CDM project activities, been undertaken in the region?		No	OK	OK
7.45	Are these widely observed and commonly carried out? If so: b. How have the essential distinctions with the proposed CDM project activity been assessed? c. Are such distinctions justified with sufficient evidence? If inaccessibility of data is the reason why some projects have not been included in the analysis, is justification of this claim provided?		Please refer to CL 17 and CL 18	CL 17, CL18	OK
7.46	Overall, is the proposed CDM project activity considered common practice?		Refer to CL 17, CL 18	CL 17, CL 18	OK
8.	Emissions Reductions (CDM VVM)	PDD B.6			
	Explanation of methodological choices				
8.1	Is it explained how the procedures provided in the Methodology and applicable Tools are applied by the proposed project activity? (i.e. Are the required steps clearly followed?)	/1/14/	Yes. The procedures applied the PDD are in accordance with the methodology and the <i>Tool to Calculate Emission Factor for an Electricity System</i> version 02.	OK	OK
	<i>Project emissions:</i>				

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	Checklist Question	Reference	Comment	Draft Conclusion	Final Conclusion
8.2	Is every choice of options for calculating project emissions offered by the methodology correctly justified? Is this justification in line with the situation as evidenced by site visits, local knowledge and supporting documentation?	/4/	The FSR was verified to confirm that the normal surface area of the reservoir is 19.18 km ² , and the installed capacity of the proposed is 288 MW, which was verified to be consistent with FSR and purchase contract for equipments. So the power density of the proposed project can be calculated to be 15 W/m ² . Since the power density of the proposed project is greater than 10 W/m ² , hence the project emissions can be neglected as per ACM0002.	OK	OK
8.3	Are the formulae and parameters required for the determination of project emissions correctly presented, enabling a complete identification of parameters to be used and / or monitored?		Not applicable	N/A	N/A
	<i>Baseline emissions:</i>				
8.4	Is every choice of options for calculating baseline emissions offered by the methodology correctly justified? Is this justification in line with the baseline scenario?	/10/14/	Yes. Baseline emissions consist of the product of electrical energy baseline $EG_{BL,y}$ expressed in kWh of electricity produced by the renewable generating unit multiplied by an emission factor for the electricity grid, calculated ex-ante as a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the 'Tool to calculate the Emission Factor for an electricity system'.	OK	OK
8.5	Are the formulae and parameters required for the determination of baseline emissions correctly presented, enabling a complete identification of parameters to be used and / or monitored?	/10/14/	Yes. The PDD is in compliance with the methodology and the 'Tool to calculate the Emission Factor for an electricity system' version 02.	OK	OK
8.6	Are the applicable Tools and methods to calculate parameters correctly applied?	/10/14/	Yes	OK	OK
8.7	Are the applicable parameters and equations correctly applied?	/10/14/	Yes	OK	OK
	<i>Leakage:</i>	/10/			
8.8	Are all potential sources of leakage correctly identified in accordance with the applied Methodology?	/10/	Not applicable. According to the methodology, leakage does not need to be considered.	N/A	N/A
8.9	Are the formulae and parameters required for the determination of leakage emissions correctly presented, enabling a complete identification of parameters to be used and / or monitored?	/10/	Not applicable	N/A	N/A
8.10	Are the applicable Tools and methods for calculating leakage correctly applied?	/10/	Not applicable	N/A	N/A
8.11	Are the applicable parameters and equations correctly applied?	/10/	Not applicable	N/A	N/A
	<i>Emissions Reductions:</i>				
8.12	Are the parameters and equations used to calculate emission reductions correct?	/10/14/	Yes	OK	OK

Validation Report



	Checklist Question	Reference	Comment	Draft Conclusion	Final Conclusion																														
	Are the applicable parameters and equations correctly applied?																																		
	Data and Parameters	PDD B.6.2																																	
8.13	Is the list of parameters presented in chapter B.6.2 of the PDD considered to be complete with regard to the requirements of the applied methodology and any applicable tools?	/10/14/	Yes. This has been verified to be in accordance with ACM0002 and the 'Tool to calculate the Emission Factor for an electricity system'. The parameters listed are considered to be appropriate for the calculation of the grid emissions factor in China.	OK	OK																														
8.14	What evidence is available to validate the accuracy and appropriateness of assumptions, data and parameters used in the calculation of project emissions ? Are the values used considered reasonable in the context of the proposed CDM project activity?		Not applicable	N/A	N/A																														
8.15	For each parameter: a. Title in line with Methodology? b. Data unit correctly expressed? c. Appropriate description? d. Source clearly referenced? (and appropriate?) e. Correct value provided? f. Has this value been verified? g. Choice of data correctly justified? h. Measurement method correctly described?		<table><tr><td>$NCV_{i,y}$</td><td>The net calorific value (energy content) per mass or volume unit of fuel i in year y</td></tr><tr><td>a.</td><td>Yes, it is in line with the methodological tool.</td></tr><tr><td>b.</td><td>Yes, it is in line with the methodological tool.</td></tr><tr><td>c.</td><td>Yes, it is in line with the methodological tool.</td></tr><tr><td>d.</td><td>Yes, the data source is clearly referenced.</td></tr><tr><td>e.</td><td>Yes, the values are detailed provided in Annex 1 of the PDD and are consistent with the official data published by Chinese DNA.</td></tr><tr><td>f.</td><td>Yes, the data has been verified against official data.</td></tr><tr><td>g.</td><td>Yes, the data are from official statistics.</td></tr><tr><td>h.</td><td>Not applicable since the data are from official statistics.</td></tr></table> <table><tr><td>$EG_{Thermal,j,y}$</td><td>The electricity generated by fuel-fired power plants in province j in SCPG in year y</td></tr><tr><td>a.</td><td>Yes, it is in line with the methodological tool.</td></tr><tr><td>b.</td><td>Yes, it is in line with the methodological tool.</td></tr><tr><td>c.</td><td>Yes, it is in line with the methodological tool.</td></tr><tr><td>d.</td><td>Yes, the data source is clearly referenced.</td></tr><tr><td>e.</td><td>Yes, the values are detailed provided in</td></tr></table>	$NCV_{i,y}$	The net calorific value (energy content) per mass or volume unit of fuel i in year y	a.	Yes, it is in line with the methodological tool.	b.	Yes, it is in line with the methodological tool.	c.	Yes, it is in line with the methodological tool.	d.	Yes, the data source is clearly referenced.	e.	Yes, the values are detailed provided in Annex 1 of the PDD and are consistent with the official data published by Chinese DNA.	f.	Yes, the data has been verified against official data.	g.	Yes, the data are from official statistics.	h.	Not applicable since the data are from official statistics.	$EG_{Thermal,j,y}$	The electricity generated by fuel-fired power plants in province j in SCPG in year y	a.	Yes, it is in line with the methodological tool.	b.	Yes, it is in line with the methodological tool.	c.	Yes, it is in line with the methodological tool.	d.	Yes, the data source is clearly referenced.	e.	Yes, the values are detailed provided in	OK	OK
$NCV_{i,y}$	The net calorific value (energy content) per mass or volume unit of fuel i in year y																																		
a.	Yes, it is in line with the methodological tool.																																		
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c.	Yes, it is in line with the methodological tool.																																		
d.	Yes, the data source is clearly referenced.																																		
e.	Yes, the values are detailed provided in																																		

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	Checklist Question	Reference	Comment		Draft Conclusion	Final Conclusion
				Annex 1 of the PDD and are consistent with the official data published by Chinese DNA.		
			f.	Yes, the data has been verified against official data.		
			g.	Yes, the data are from official statistics.		
			h.	Not applicable since the data are from official statistics.		
			$IPC_{R_{i,y}}$	The internal power consumption rate of power plants in province j in SCPG in year y.		
			a.	Yes, it is in line with the methodological tool.		
			b.	Yes, it is in line with the methodological tool.		
			c.	Yes, it is in line with the methodological tool.		
			d.	Yes, the data source is clearly referenced.		
			e.	Yes, the values are detailed provided in Annex 1 of the PDD and are consistent with the official data published by Chinese DNA.		
			f.	Yes, the data has been verified against official data.		
			g.	Yes, the data are from official statistics.		
			h.	Not applicable since the data are from official statistics.		
			$EF_{CO_2, i, y}$	The CO ₂ emission factor per unit of fuel i in year y		
			a.	Yes, it is in line with the methodological tool.		
			b.	Yes, it is in line with the methodological tool.		
			c.	Yes, it is in line with the methodological tool.		
			d.	Yes, the data source is clearly referenced.		
			e.	Yes, the values are detailed provided in Annex 1 of the PDD and are consistent with the official data published by Chinese DNA.		
			f.	Yes, the data has been verified against official data.		
			g.	Yes, the data are from official statistics.		
			h.	Not applicable since the data are from official		

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	Checklist Question	Reference	Comment	Draft Conclusion	Final Conclusion																																						
			<table><tr><td></td><td>statistics.</td></tr></table> <table><tr><td>$FC_{i,y}$</td><td>The quantity of fuel i (in a mass or volume unit) consumed by SCPG in year y</td></tr><tr><td>a.</td><td>Yes, it is in line with the methodological tool.</td></tr><tr><td>b.</td><td>Yes, it is in line with the methodological tool.</td></tr><tr><td>c.</td><td>Yes, it is in line with the methodological tool.</td></tr><tr><td>d.</td><td>Yes, the data source is clearly referenced.</td></tr><tr><td>e.</td><td>Yes, the values are provided in detail in Annex 1 of the PDD and are consistent with the official data published by the Chinese DNA.</td></tr><tr><td>f.</td><td>Yes, the data has been verified against official data.</td></tr><tr><td>g.</td><td>Yes, the data are from official statistics.</td></tr><tr><td>h.</td><td>Not applicable since the data are from official statistics.</td></tr></table> <table><tr><td>$CAP_{j,y}$</td><td>Installed capacities of province j in SCPG in years y.</td></tr><tr><td>a.</td><td>Yes, it is in line with the methodological tool.</td></tr><tr><td>b.</td><td>Yes, it is in line with the methodological tool.</td></tr><tr><td>c.</td><td>Yes, it is in line with the methodological tool.</td></tr><tr><td>d.</td><td>Yes, the data source is clearly referenced.</td></tr><tr><td>e.</td><td>Yes, the values are detailed provided in Annex 1 of the PDD and are consistent with the official data published by Chinese DNA.</td></tr><tr><td>f.</td><td>Yes, the data has been verified against official data.</td></tr><tr><td>g.</td><td>Yes, the data are from official statistics.</td></tr><tr><td>h.</td><td>Not applicable since the data are from official statistics.</td></tr></table>		statistics.	$FC_{i,y}$	The quantity of fuel i (in a mass or volume unit) consumed by SCPG in year y	a.	Yes, it is in line with the methodological tool.	b.	Yes, it is in line with the methodological tool.	c.	Yes, it is in line with the methodological tool.	d.	Yes, the data source is clearly referenced.	e.	Yes, the values are provided in detail in Annex 1 of the PDD and are consistent with the official data published by the Chinese DNA.	f.	Yes, the data has been verified against official data.	g.	Yes, the data are from official statistics.	h.	Not applicable since the data are from official statistics.	$CAP_{j,y}$	Installed capacities of province j in SCPG in years y .	a.	Yes, it is in line with the methodological tool.	b.	Yes, it is in line with the methodological tool.	c.	Yes, it is in line with the methodological tool.	d.	Yes, the data source is clearly referenced.	e.	Yes, the values are detailed provided in Annex 1 of the PDD and are consistent with the official data published by Chinese DNA.	f.	Yes, the data has been verified against official data.	g.	Yes, the data are from official statistics.	h.	Not applicable since the data are from official statistics.		
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g.	Yes, the data are from official statistics.																																										
h.	Not applicable since the data are from official statistics.																																										

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	Checklist Question	Reference	Comment		Draft Conclusion	Final Conclusion
			<i>GEN</i> <i>E_{Coal}</i> <i>,Adv</i> The power supply efficiency of coal-fired power plants with best technology commercially available a. Yes, it is in line with the methodological tool. b. Yes, it is in line with the methodological tool. c. Yes, it is in line with the methodological tool. d. Yes, the data source is clearly referenced. e. Yes, the values are detailed provided in Annex 1 of the PDD and are consistent with the official data published by Chinese DNA. f. Yes, the data has been verified against official data. g. Yes, the data are from official statistics. h. Not applicable since the data are from official statistics.			
			<i>GEN</i> <i>E</i> <i>Oil,Adv,</i> <i>y</i> The power supply efficiency of oil/gas-fired power plants with best technologies commercially available a. Yes, it is in line with the methodological tool. b. Yes, it is in line with the methodological tool. c. Yes, it is in line with the methodological tool. d. Yes, the data source is clearly referenced. e. Yes, the values are detailed provided in Annex 1 of the PDD and are consistent with the official data published by Chinese DNA. f. Yes, the data has been verified against official data. g. Yes, the data are from official statistics. h. Not applicable since the data are from official statistics.			
8.16	Will the data and parameters result in a conservative estimate of emissions reductions?	/25/	By cross checking the emission factor calculation for each power grid of China, published by DNA of China on 2 July		OK	OK

GEN
E
Oil,Adv,
y

The power supply efficiency of oil/gas-fired power plants with best technologies commercially available

a.

Yes, it is in line with the methodological tool.

b.

Yes, it is in line with the methodological tool.

c.

Yes, it is in line with the methodological tool.

d.

Yes, the data source is clearly referenced.

e.

Yes, the values are detailed provided in Annex 1 of the PDD and are consistent with the official data published by Chinese DNA.

f.

Yes, the data has been verified against official data.

g.

Yes, the data are from official statistics.

h.

Not applicable since the data are from official statistics.

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	Checklist Question	Reference	Comment		Draft Conclusion	Final Conclusion
			2009 /25/, ERM CVS has confirmed that the data and parameters, used for emission reduction calculations are in line with the methodology and referred tool, and the data sources are most recent public available at the time of validation start and appropriate			
	Ex-ante calculation of emission reductions	PDD B.6.3				
8.17	Is the projection based on the same procedures as used for future monitoring?	/1/	Yes. The projection is based on the same procedures as used for future monitoring. This has been verified against the monitoring plan.		OK	OK
8.18	Are the GHG calculations documented in a complete and transparent manner?	/1/3/	Yes. The calculations are completely and transparently documented. This has been verified against the data used for the calculation.		OK	OK
8.19	Are detailed calculations provided in a traceable spreadsheet showing relevant information?	/3/	Yes, a traceable spreadsheet is provided for DOE’s review, and has been verified.		OK	OK
8.20	Can the calculation of baseline emissions be replicated using the data and parameters supplied in the PDD?	/1/3/	Yes. The calculation can be replicated using the data and parameters in the PDD.		OK	OK
8.21	Is the data provided in this section consistent with data as presented in other chapters of the PDD?	/1/3/	Yes, the data provided in this section are consistent with data presented in other chapters of the PDD.		OK	OK
	Summary of ex-ante estimation of emission reductions	PDD B.6.4				
8.22	Is the form/ table required for the indication of projected emission reductions correctly applied? And is the data provided in this section consistent with data as presented in other chapters of the PDD?	/1/	Yes		OK	OK
8.23	Is the projection in line with the envisioned time schedule for the project’s implementation and the indicated crediting period?	/1/4/	Yes		OK	OK
9.	Monitoring Plan (CDM VVM EB 55)	PDD B.7				
	<i>(a) Compliance of the MP with the methodology</i>					
9.1	Are all necessary parameters required for the type of project by the methodology and applicable tools contained in the monitoring plan?	/1/10/	Electricity supplied to the grid by the project and Power imported from power grid by the proposed project in year y will be monitored, also the installed capacity of the hydro power plant after the implementation of the project activity, and area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full will be monitored, which is consistent with the requirements in the methodology. However parameter EG _{facility,y} is not included.		CL 22	OK
9.2	For each parameter, is the: a. Title in line with methodology? b. Data unit correctly expressed?	/1/10/	EG _{facility} to SCPG,y	Electricity supplied to the grid by the project rid in year y.		OK
			a.	Yes, it is in line with the methodology.		

Validation Report

Checklist Question	Reference	Comment	Draft Conclusion	Final Conclusion
c. Parameter appropriately described? d. Source clearly referenced? e. Correct value provided for the purpose of PDD estimations? f. Has this value been verified? g. Measurement methods correctly described and in line with the methodology/tools? h. Correct reference to standards (i.e. for calibration and maintenance)? i. Indication of accuracy provided? j. QA/QC procedures described? k. QA/QC procedures appropriate?		b.	Yes, it is in line with the methodology.	CL 15 CL 16
		c.	Yes, it is in line with the methodology.	
		d.	Yes. The source was clearly referenced	
		e.	Further evidence is required to justify the operating hours / annual electricity supplied to the grid – please see CL 15 and CL 16.	
		f.	Further justification of the operating hours and electricity supplied to the grid by the project is required – see CL 15 and CL 16.	
		g.	CL 5 It should be clearly stated how many meters will be installed for monitoring, with the location, accuracy and calibration frequency.	
		h.	CL 5 It should be clearly stated how many meters will be installed for monitoring, with the location, accuracy and calibration frequency..	
		i	CL 5 It should be clearly stated how many meters will be installed for monitoring, with the location, accuracy and calibration frequency..	
		j	Yes.	
		k	Yes.	
		EG _{SCPG} to facility,y	Quantity of electricity imported from the grid in year y	CL 5
		a.	Yes, it is in line with the methodology.	
		b.	Yes, it is in line with the methodology.	
		c.	Yes, it is in line with the methodology.	
		d.	Yes. The source was clearly referenced (meters)	
		e.	Yes. 0 is provided for the purpose of PDD estimations.	
		f.	The value of zero is reasonable given that the PDD estimations already take into account the net quantity of electricity supplied to the grid. However further justification of the difference between	

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	Checklist Question	Reference	Comment		Draft Conclusion	Final Conclusion
				electricity generated and electricity supplied to the grid is required – see CL 15 and CL 16.	CL 19 CL 20	
			g.	CL 5 It should be clearly stated how many meters will be installed for monitoring, with the location, accuracy and calibration frequency.		
			h.	CL 5 It should be clearly stated how many meters will be installed for monitoring, with the location, accuracy and calibration frequency..		
			i	CL 5 It should be clearly stated how many meters will be installed for monitoring, with the location, accuracy and calibration frequency..		
			j	Yes.		
			k	Yes.		
			CapPJ	Installed capacity of the hydro power plant after the implementation of the project activity		
			a.	Yes, it is in line with the methodology.		
			b.	Yes, it is in line with the methodology.		
			c.	Yes, it is in line with the methodology.		
			d.	Yes. The source was clearly referenced		
			e.	Yes. 288 is provided for the purpose of PDD estimations.		
			f.	Yes, it is in line with the methodology.		
			g.	Yes, Purchase contract for equipments has been verified. And nameplate of equipments can be verified when operates. CL 19, The frequency of the measurement should be stated for parameter CAPpj.		
			h.	Yes, it is in line with the methodology.		
			i	Yes, it is in line with the methodology.		
			j	CL 20 QA/QC procedures should be stated for parameters CAPpj and Apj		

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	Checklist Question	Reference	Comment		Draft Conclusion	Final Conclusion
			k	Yes.	CAR 4 CL 19 CL 20	
			A _{PJ}	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full.		
			a.	Yes, it is in line with the methodology.		
			b.	Yes, it is in line with the methodology.		
			c.	Yes, it is in line with the methodology.		
			d.	Yes. The source was clearly referenced		
			e.	Yes. 19.18 km ² is provided for the purpose of PDD estimations.		
			f.	Yes, it is in line with the methodology.		
			g.	CAR 4 The measurement frequency of A _{PJ} should be in line with the requirement of methodology.		
			h.	Yes, it is in line with the methodology.		
			i	Yes, it is in line with the methodology.		
			j	CL 20 QA/QC procedures should be stated for parameters CAP _{pj} and Ap _j		
			k	Yes.		
9.3	Do all means/ methods of monitoring described in the plan comply with the requirements of the methodology?	/1/10/	Yes. The means/ methods of monitoring described in the plan comply with the requirements of the methodology		OK	OK
	<i>(b) Implementation of the MP</i>					
9.4	Are the arrangements described in the plan feasible and practical within the project design? How has this been verified (review procedures, interviews, project plans, and physical inspection)?	IV	CL 5 It should be clearly stated how many meters will be installed for monitoring, with the location, accuracy and calibration frequency.		CL 5	OK
9.5	Is the operational and management structure clearly described and in compliance with the envisioned situation? Are responsibilities and institutional arrangements for data collection and archiving clearly provided?	/1/	Management Structure for monitoring has been described in the PDD, and procedures and responsibilities have been addressed. CL 9 A training plan for operation and CDM monitoring should be provided.		CL 9	OK
9.6	Is necessary monitoring equipment in place or readily available?		CL 5 It should be clearly stated how many meters will be installed for monitoring, with the location, accuracy and calibration frequency.		CL 5	OK

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	Checklist Question	Reference	Comment	Draft Conclusion	Final Conclusion
9.7	Does the monitoring plan represent current good monitoring practice?	/1/	CL 5 It should be clearly stated how many meters will be installed for monitoring, with the location, accuracy and calibration frequency.	CL 5	OK
9.8	If applicable: Does annex 4 provide useful information enabling a better understanding of the envisioned monitoring provisions?		Not applicable.	N/A	N/A
9.9	Are the means of implementation of the monitoring plan, including data management and QA/ QC procedures, sufficient to ensure that the emission reductions achieved can be reported ex-post and verified?	/1/	CL 5 It should be clearly stated how many meters will be installed for monitoring, with the location, accuracy and calibration frequency. CL 21: Filing arrangements and documentation period should also be included in the PDD in accordance with the PDD guidelines.	CL 5 CL 21	OK
9.10	In the DOE's opinion, is the project participant able to implement the monitoring plan?		Refer to CL 5	CL 5	OK
10.	Sustainable Development (CDM VVM EB 55)				
10.1	Does the Letter of Approval from the Host Party confirm that the project activity contributes to the sustainable development of that country?	/8/	Yes. The LOA provided by DNA of China (NDRC) confirms that the project complies with the permission requirements provided in the Measures for Operation and Management of CDM projects in China, and assists China in achieving sustainable development.	OK	OK
11.	Environmental Impacts (CDM VVM EB 55)	PDD D.			
11.1	Has an analysis of the environmental impacts of the project activity been undertaken? Does the analysis conclude that the project will create any unacceptable adverse environmental impacts?	/1/5/	Yes, this has been crossed checked with the Environmental Impact Assessment report prepared by Pearl River Water Resource Conservation Science Institute dated January 2007 and approved by National Environmental Protection Bureau dated on 27 September 2007. No unacceptable adverse environmental impact was identified in the EIA. CL 22: The PP is required to include the ecological impacts identified in the EIA into the PDD, and mitigation measures required should also be included	CL 22	OK
11.2	In accordance with the laws and regulations in the Host Country, does this project require an EIA? If so, has a valid EIA been conducted? Has this EIA been approved?	/5/	Yes. The Environmental Impact Assessment report was prepared by Pearl River Water Resource Conservation Science Institute dated January 2007 and approved by National Environmental Protection Bureau dated on 27 September 2007. /5/.	OK	OK
11.3	Does the environmental analysis undertaken and presented for the project activity include an analysis of trans-boundary impacts?	/5/	There are no trans-boundary impacts identified in the EIA report.	OK	OK

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	Checklist Question	Reference	Comment	Draft Conclusion	Final Conclusion
11.4	Is the analysis in the PDD fully consistent with the findings of the EIA? Are all significant impacts and mitigation measures identified in the EIA mentioned in the PDD?	/5/	The impacts on the air, water, noise and solid waste have been discussed in the PDD for both of construction period and operation period. And environmental protection measures have been described in PDD. The environmental impact analysis section in the PDD is in consistent with the EIA and its approval.	OK	OK
11.5	Does the analysis conclude that the project will create any unacceptable adverse environmental impacts?	/5/	No, there is no unacceptable adverse environmental impacts identified.	OK	OK
12.	Local Stakeholder Consultation (CDM VVM EB 55)	PDD E.			
12.1	Have comments from relevant stakeholders been invited prior to the publication of the PDD on the UNFCCC website? How has this been verified?	/7/52	Yes, a local stakeholder consultation was carried out. ERM CVS has reviewed a summary report of the consultation and copies of questionnaires received from respondents.	OK	OK
12.2	Have all relevant local stakeholders been included in the consultation? a. Have appropriate media been used to invite comments by local stakeholders? b. Have stakeholder groups had access to information? c. Have stakeholder groups had a reasonable chance to comment?	/7/52/	a. Yes. Pearl River Water Resource Conservation Science Institute performed a sampling survey to invite the comments from stakeholders. A total of 125 questionnaires had been handed out and 100 questionnaires were returned b. Yes. The stakeholder consultation covered local residents and government officials, including different occupation, different ages and different education levels. c. Yes. All stakeholder groups had a reasonable chance to comment. In addition, ERM CVS interviewed several project stakeholders onsite and confirmed the feedback to be consistent with the summary and conclusion in the PDD.	OK	OK
12.3	Is the summary of comments received as provided in the PDD complete?	/1/7/52/	The summary of comments received is considered to be complete.	OK	OK
12.4	Has due account been taken of any stakeholder comments received and is this adequately and clearly described in the PDD?	/1/7/52/	Yes. According to the survey questionnaire, all surveyed stakeholders were reflected in the summary described in the PDD.	OK	OK
12.5	In the DOE's opinion, is the local stakeholder consultation process that has been conducted adequate?	/1/7/52/	It is ERM CVS's opinion that the local stakeholder consultation process has been conducted adequate	OK	OK

Appendix C: REMEDIATION FORM

Corrective Action Requests (CARs), Clarification Requests (CLs) Forward Action Requests (FARs) and Minor Issues

Corrective action requests	Reference to checklist question	Summary of project participants' response	Final conclusion
CAR 1 The LoA from Annex I Party has not been provided yet	5.4	The Annex I Party was changed from United Kingdom to the Netherlands. The LoA from Annex I Party has been provided.	The Annex I Party Letter of Approval (LoA) has been provided by the DNA of the Netherlands, dated 18 November 2010 /6/. ERM CVS confirmed the Annex I Party was changed from United Kingdom to the Netherlands. The LoA was received from the project participants and it was signed by Manager Climate, Enterprises and International Affairs Joop Van Meel from the NL Agency Ministry of Housing, Spatial Planning and the Environment. The approval of the project by the LoA from the Netherlands has been checked and clearly states: • Ratification of the Kyoto Protocol on 31 May 2002; • Voluntary Participation; • Reference to the precise project title in the PDD. The validation did not reveal any information that indicates that the project can be seen as a diversion of official development assistance (ODA) funding towards P. R. China. CAR closed
CAR 2 In the table of emissions sources included in the project boundary in section B.3 of the PDD, the CH ₄ emission source should be included according to the methodology.	6.8	The CH ₄ emission source has been included in B.3 of the PDD, please refer to it.	CH₄ emissions from reservoir have been updated from 'excluded' to 'included'. The added boundary diagram indicates the CH₄ emissions. CAR closed
CAR 3: In the sensitivity analysis section of the PDD, in the paragraph entitled 'As for Annual O&M cost', the first sentence of the discussion incorrectly refers to 'total static investment'. Please correct.	7.25	It was a written mistake. The 'total static investment' has been corrected to be 'Annual O&M cost'. Please refer to section B.5 of the PDD.	The PDD wording has been revised and now accurately presents the discussion of the sensitivity analysis. CAR closed

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CAR 4: The measurement frequency of A_{PJ} should be in line with the requirement of methodology.	9.2	The measurement frequency of A_{PJ} has been stated in line with the requirements of the methodology. Please refer to B.7 in PDD.	The measurement frequency of the parameter A_{PJ} has been corrected and it is consistent with the requirements of the methodology. CAR closed
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Clarification requests	Reference to checklist question	Summary of project participants' response	Final conclusion
CL 1 The serious consideration of CDM should be addressed in the PDD	2.2	The serious consideration of CDM has been addressed. Please refer to B.5 of PDD.	Evidence of notification to the DNA of China within 6 months of the starting date of the project activity was provided to ERM CVS and was described in the revised PDD. In addition, the milestones of the proposed CDM development of the project were included in table 2 in the PDD, which demonstrates serious consideration of the CDM during the design phase of the proposed project. Documents of each key stage of the project development were provided for validation team. Further details on the validation of CDM consideration are provided in section 3.5 of the validation report. CL closed
CL 2 The difference between the electricity generated in the first 4 operating years and the following years should be justified.	3.1	The difference between the electricity generated in the first 4 operating years and the following years has been justified in the revised PDD.	According to the approval letter of the Comprehensive Planning Report of the Middle Reaches of Hong River issued by the Ministry of Water Resources on 16/01/2005, three reservoirs are planned to be constructed upstream of the proposed project. The three reservoirs are planned to start operation in the fourth operational year of the proposed project (year 8 in the project timeline, which includes 4 years' construction period). With the regulation of these reservoirs, the water flow from the river upstream of the proposed project will be distributed more evenly compared with the natural conditions, therefore the annual generated electricity of the proposed project will increase. Based on a review of publicly available information, ERM CVS is able to confirm the following: 1. Sanjiangkou project was started to construct on 23 May 2007 with the installed capacity of 99MW/58/. 2. Qiaotou project began construction on 29 Dec 2008 with an installed capacity of 130MW/60/. 3. The pre-FSR of Daheigong project has been approved on 30 July 2010. It will be constructed in the near future /59/. According to the analysis results in the approved third party FSR, in the absence of the regulation improvement of these three reservoirs, the annual generated electricity is 1,256,820MWh; after the regulation improvement, the annual generated electricity is

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			1,314,380MWh. Therefore, the annual generated electricity of the first three operational years is 4.6% less than the remaining years. Even if the annual generated electricity of 1,314,380MWh is also adopted for the first three operational years in IRR calculation, the IRR of the proposed project is 6.67%, which is still much lower than the benchmark of 8%. CL closed
CL 3 The type of hydropower project should be included in the description	3.1	The type of hydropower project has been added in the description. Please refer to A.2 of PDD.	The type of the Project, which is newly built incomplete yearly regulation with type of diversion hydropower project, has been cross checked with the FSR /4/. CL closed
CL 4 The percentage of coal-fired generation in the grid for 2008 should be stated in the PDD	4.5	The percentage of coal-fired generation in the grid for 2008 has been stated in the PDD. Please refer to A.2 of PDD.	The percentage of coal-fired generation in the grid for 2008 has been crossed checked with China Electric Power Yearbook Committee, China Electric Power Yearbook 2009 /36/. CL closed
CL 6 It should be clearly stated how many meters will be installed for monitoring, with the location, accuracy and calibration frequency.	4.5	As there is no decisive scheme of meter installation at present, the detail information of meter installation will be complemented when available. The basic requirement of meter installation has been added in PDD. Please refer to A.4.3 and B.7 of PDD.	A bidirectional electrical meter will be installed at the grid interface point of the proposed project according to the Power Purchase Agreement signed between the project owner and the grid company /40/ to measure electricity delivered to the grid ($EG_{\text{facility to SCPG},y}$) and the electricity consumed by the project activity which is imported from the grid ($EG_{\text{SCPG to facility},y}$). The accuracy class of the meter will be no less than 0.5s, in compliance with the national standard 'Technical Code of Electric Energy Metering and Metering Devices (DL/T448-2000)' and will be maintained and calibrated annually according to 'Technical Administrative Code of Electric Energy Metering (DL/T448-2000)'. This equipment setup is considered sufficient to carry out the monitoring requirements of the methodology, and the appropriate national standards have been followed. This has been cross checked against the 'Technical Code of Electric Energy Metering and Metering Devices' (DL/T448—2000) /41/ and "Verification Regulation of Electrical Energy Meters with Electronics (JJG 596-1999) /42/. The information is consistent with description in the PDD and the developed monitoring manual /62/. CL closed
CL 6: The Lifetime of the project equipment should be further substantiated.	4.5	The lifetime of the project equipment has been further substantiated in the PDD. Please refer to section A.4.3 of the PDD.	The lifetime of the equipments were checked with the FSR /3/, and cross checked against the purchase contract for the equipment which includes the technical specifications of the equipment /20/. CL closed
CL 7: The annual operating hours and load factor of the proposed project should be addressed in the PDD, and the annual electricity	4.5	The annual operating hours and load factor of the proposed project have been addressed in the PDD, and the annual electricity generation and annual electricity supply to the grid have	ERM CVS has cross checked the value of the plant load factor and operation hours in the financial analysis calculations with the third party approved FSR/4/, and found that the estimate in the PDD is consistent with the estimate in the FSR that was submitted to the

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generation and annual electricity supply to the grid should be stated, with explanation/justification for any difference		been stated. Please refer to A.4.3 of PDD.	government while applying for implementation approval. The expected annual electricity generation of the project was determined by a third party contracted by the project participants (China Pearl River Water Resources Planning, Design and Survey Co.,Ltd) and based on 50 years of hydrological data. Therefore the plant load factor is considered reliable and in line with the 'Guidelines for the reporting and validation of plant load factors' issued by the EB (EB 48 Annex 11). CL closed
CL 8 transformers should be included in table 1, parameters of equipments	4.5	The parameters of transformers have been added in PDD, please refer to table1 in PDD.	The specification of the transformers was cross checked with the the purchase contract for 220V transformers signed between Honghe Guangyuan Madushan Hydropower Development Co., Ltd. And Jiangxi Transformers Technology Co., Ltd, on 30 April 2009 /57/ and ERM CVS has confirmed it is consistent with the approved FSR /4/ and updated PDD CL closed
CL 9 A training plan for operation and CDM monitoring should be provided	4.10	The training plan for operation has been provided and the training plan for CDM monitoring has been provided.	The training plan for operation and maintenance for the project developed in March 2010 /61/was provided for review. Training will be provided by the equipment supplier (Tianjin Tianfa Hydropower Equipments Production Co., Ltd.). This is described in the PDD. Also a CDM monitoring manual /62/ has been developed in May 2010, indicating the monitoring organization structure, data collection process, QA/QC procedures and so on, and the information was consistent with section B 7.2 in the PDD. The project developer has experience of monitoring electricity on other power plant projects, i.e. Nansha Hydro Power Project in Yunnan Province China (2133), which was registered 12 January 2009. CL closed
CL 10 The construction plan of the proposed project should be provided to confirm the implementation schedule of the project	4.11	The construction plan of the proposed project has been provided.	At the time of the validation site visit, the construction of the dam, water diversion tunnel, and powerhouse were underway, and this was observed on site by ERM CVS. Construction started on 25 January 2009, this has been validated against the construction commencement order /18/. The progress of the construction was further cross checked with the construction plan of the proposed project co-issued by project owner, the construction company and the construction supervision company / 63/. No factors were identified during the site visit that could have unmanageable adverse delays on the construction of the project. CL closed

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CL 11: Appropriate references, such as the FSR, should be cited for the information on applicability of the project to the methodology in section B.2	6.4	Appropriate references have been cited for the information on applicability of the project to the methodology in section B.2. Please refer to B.2 of PDD.	Appropriate references have been cited for the information on applicability of the project to the methodology in section B.2 Further details on the validation of Applicability conditions of the applied methodology are provided in section 1.3 of the validation report. CL closed
CL 12: Further justification should be provided for the statement that 'thermal power generator unit with installed capacity per set lower than 300 MW is strictly controlled in places' and associated evidence should be provided	7.7	In 'Notification of close up small scale thermal power generator unit', the thermal power generator unit with installed capacity per set lower than 300 MW is forbidden constructed in place which is covered by grid.	According to <i>Notification of close small scale thermal power generator units</i> issued by the National Council of PR China on 20th January 2007/37/, any thermal power generator unit with installed capacity per set lower than 300MW ¹ is strictly controlled in places which are within a large power grid. Therefore, scenario b) discussed in Section B4 is not consistent with China's existing laws and regulations and is therefore excluded from the project based scenario analysis. CL closed
CL 13: the source of the values used in table 2 should be provided In the PDD	7.11	The data source of the values used in table 2 have been provided in the PDD, please refer to B.5 of PDD.	ERM CVS has confirmed that the values used in both the PDD and the spreadsheet and supporting documentation are fully consistent with the FSR /4/. CL closed
CL 14: Lifetime of the project equipment should be clearly stated in the PDD and supporting evidence should be provided	7.15	Lifetime of the project equipments have been clearly stated in the PDD, please refer to A.4.3 of PDD. The supporting evidences have been provided.	The lifetime of the equipments were checked with the FSR /3/, and cross checked against the purchase contract for the equipment which includes the technical specifications of equipment /20/. CL closed

¹ *Notice on Banning the Development of small scale thermal generation issued by the General Office of the State Council*

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CL 15 Further evidence should be provided to support the key input values to the financial analysis namely: (e) O&M costs, (f) investment costs, (g) loan amount and rate of interest, and (h) electricity tariff	7.17	(a) The O&M costs, as a proportion of the total investment costs, were calculated to be 2.27% (4547.43/200076.2), which is lower than the average of 2.5%, so it is conservative. (b) The proposed project is still under construction, and the actual total investment is unavailable at present, but according to the available contracts such as the construction contract, equipments purchase contract and so on, the contract prices of equipments are already higher than the budgetary prices in the approved FSR. Furthermore, according to statistical data issued by National Bureau of Statistics of China, the prices of construction materials and fuels kept increasing in the construction period of the proposed project. It is impossible for the static total investment of the proposed project to be decreased. (c) The loan amount for the Madushan project is 1950 million yuan, which is larger than the amount in FSR of 1553.34 million yuan. The rate of interest in approved FSR is 7.56%, which is in consistent with the data at website of the people's bank of China. (d) The electricity tariff in FSR is RMB0.215/kwh (including VAT). The tariff is in accordance with the tariff approval document in Yunnan province, which is yunfagaijiage[2004]589 and yunfagaijiage[2006]28.	(a) O&M costs have been cross checked against similar projects in the region. Further details are provided in table 6 above. The O&M costs of the project are found to be close to the average of similar projects in the region. The break down of the O&M costs into the various components was found to be in line with the national Guidelines in the <i>Methods and Parameters for Economic Assessment of Construction Projects</i> /54/, and <i>Notice of Financial Evaluation Interim Provisions of Hydropower Projects</i> /45/ (b) Static total investment is consistent with the 3rd party FSR/4/ and has been cross checked against the equipment purchase contract and construction contract. For those elements where contracts were already available to cross check (turbines and generators), the actual costs incurred by the project were higher than the expected costs in the FSR, indicating that the values in the FSR are conservative. (c) The interest rate and loan amount are specified in the FSR of the project activity, which was developed by an independent third party using information on the prevailing interest rates in the region and the prevailing debt: equity ratio for a project of this type developed by the project developer. The interest rate of 7.56% has been cross checked against the benchmark interest rate issued by the People's Bank of China on 22 August 2007 /43/, which stipulates the same interest rate of 7.56% for loans longer than 5 years effective as of 15 September 2007, which was the interest rate actually applicable to the loan for the project activity. The interest rate considered in the FSR was considered as the basis for the investment decision in the proposed project, as evidenced by the completed FSR and the FSR approval by the local government /4/ (d) The electricity tariff in the PDD and financial analysis is the same as that used in the FSR. The power tariff for the project is considered to be appropriate and conservative. The power price in the FSR (0.215 RMB per KWh, including VAT) is higher than the actual tariff that the project will receive as agreed in the electricity connection agreement /40/. An examination of previous tariffs available in the province indicates that there has been no decline in hydro power tariffs in the region since the first CDM hydro projects in the province were registered, which further demonstrates that the tariff selected for the proposed project is appropriate. The electricity tariff is validated in further detail in section 3.5 of the validation report. CL closed
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CL 16: Further explanation / justification should be provided for the following: (a) the difference between the electricity generated and supplied to the grid. Please provide justification on why the effective electricity coefficient of the proposed project is 0.95. (b) operating hours of the proposed project (c) tax rates	7.17	(a) The effective electricity coefficient of the proposed project is 0.95, the self-consumption rate is 0.5%, and the line loss rate is 2%. So if the electricity generated is 1, the electricity supplied to the grid is calculated to be $1 \times 0.95 \times (1 - 0.5\%) \times (1 - 2\%) = 92.63\%$. (b) The operating hours of the proposed project is estimated to be 4564 hours per year, resulting in a load factor of 52% compared to the average of 44%, hence can be considered as conservative. (c) The data source of tax rates is attached.	(a) Based on ERM CVS's local and sectoral knowledge, as well as review of previously registered CDM projects, the use of an effective electricity coefficient is common practice for hydroelectric projects in China, since not all of the electricity produced by the project will ultimately be purchased by the grid company. Effective electricity coefficients in China normally vary between 70 and 95%, hence the project activity has selected a value towards the upper end of this range. The effective electricity coefficient in China is calculated based on the estimated capacity of the electricity grid to absorb the generated electricity (for example during the wet season), and the regulating capacity of the hydroelectric plant. The effective electricity coefficient has been determined by the independent third party responsible for developing the FSR, and approved by the National Development and Reform Commission /4/. According to the 'Hydroenergy Design Code for Hydro Power Projects' (SL76-94) approved by the Ministry of Water Resources (http://www.chinawater.net.cn/quifan/bz_pdf/SL76-94/05.pdf) /63/, there are no legal regulations dictating what the effective electricity coefficient for large scale hydro projects (>50MW) should be, and the effective electricity coefficient should be calculated by the design institute based on the characteristics of the project and the electricity balance of the local grid. In estimating the factor the design institute referred to the official host country guidelines for small scale hydropower projects: 'Economic evaluation code for small hydropower projects' /63/ which defined a range of effective electricity coefficient values for small projects depending on the type of hydropower station. The Project Activity is a type of incomplete yearly regulation hydropower station, and according to Section 3.2.1 of the 'Economic evaluation code for small hydropower projects' /63/, the range of effective electricity coefficient values is between 0.9 -1. In the absence of specific guidelines for large scale projects, ERM CVS cross checked the effective electricity coefficient against the guidelines for small scale projects in order to determine whether the estimation by the independent design institute is reasonable and conservative in comparison with other similar projects in the host country. The design institute has chosen a value in the middle of the range of values for the effective coefficient, confirming that the value is reasonable based on host country practices. Furthermore, even if an effective electricity coefficient of 1 is applied in the financial analysis (with line loss rate and power consumption rate unchanged), the IRR would be 7.06% which does not cross the benchmark. Therefore the effective electricity coefficient was validated as reasonable.
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			Line Loss Rate = 2% Line loss is estimated based on the length of the transmission line and the voltage. The value comes from the FSR and has no obvious impact on the IRR calculation even if a value of 0 is adopted. The value applied comes from the FSR, which is designed by a qualified design institute. In addition, another third party expert team, who was appointed by the government and responsible for examining the suitability of the FSR /4/, also confirmed the suitability of the value adopted. Furthermore, according to statistical data published by the China Electricity Council (http://www.cec.org.cn/tongjixinxibu/tongji/yuedushuju/2011-02-23/44224.html), the average rate of transmission loss for power stations around the country is between 5.5% and 5.72%. Therefore, the rate of transmission loss of 2% adopted by the proposed project is considered to be reasonable and conservative. Power Consumption Rate = 0.5% According to the paper entitled “The relationship between House Service System and Power Generation Output in Hydraulic Power Plants“ published in 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 Power Consumption Rate of the project is 0.5% which is in the range of 0.3% ~ 2% and towards the lower end of the range, therefore the data is considered valid and appropriate. In order to further validate the effective coefficient, line loss rate and power consumption rate, the comprehensive coefficient (combination of the coefficient of effective electricity, line loss rate and power consumption rate) of the proposed project has been cross-checked against the other registered projects with the similar installed capacity + - 50% (144MW~432MW) in Yunnan Province as follows: <table><tr><th>Ref.</th><th>Installed capacity (MW)</th><th>Annual generated electricity(MWh)</th><th>Annual grid-in electricity(MWh)</th><th>Comprehensive coefficient</th></tr><tr><td>2580</td><td>210</td><td>895,000</td><td>803,500</td><td>89.78%</td></tr><tr><td>2877</td><td>20</td><td>919,600</td><td>825,600</td><td>89.78%</td></tr></table>	Ref.	Installed capacity (MW)	Annual generated electricity(MWh)	Annual grid-in electricity(MWh)	Comprehensive coefficient	2580	210	895,000	803,500	89.78%	2877	20	919,600	825,600	89.78%		
Ref.	Installed capacity (MW)	Annual generated electricity(MWh)	Annual grid-in electricity(MWh)	Comprehensive coefficient																
2580	210	895,000	803,500	89.78%																
2877	20	919,600	825,600	89.78%																

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				1	0	00	%
			2133	15	702,2€	616,3	87.76
				0	0	14	%
			3390	16	689,0€	618,0	89.70
				8	0	00	%
			1930	18	774,0€	637,0	82.30
	0	0	00	%			
			The propo sed project	28	1,314,	1,217,	92.63
				8	80	569	%

Compared with the similar registered projects, it is clearly shown that the comprehensive coefficient of the proposed project is conservative. Furthermore, even if the effective coefficient of 1 is adopted and not taking into account for the transmission loss and auxiliary consumption, the IRR of proposed project is 7.30%, which is still much lower than the benchmark of 8%. Therefore ERM CVS was able to validate the difference between electricity generated and electricity supplied to the grid.

b) The operating hours of the proposed project is consistent with 3rd party FSR, which was provided to the government for approval and was the basis for the investment decision in the proposed project. The annual power generated of the project was calculated by China Pearl River Water Resources Planning, Design and Survey Co.,Ltd., the independent third party that conducted the feasibility study report, based on 50 years of hydrological data from Manhao hydrological monitoring station as stated in the FSR /4/, the plant load factor is considered reliable and in line with the 'Guidelines for the reporting and validation of plant load factors' issued by the EB (EB 48 Annex 11).

c) The interest rate and loan amount are specified in the FSR of the project activity, which was developed by an independent third party using information on the prevailing interest rates in the region and the prevailing debt: equity ratio for a project of this type developed by the project developer. The interest rate of 7.56% has been cross checked against the benchmark interest rate issued by the People's Bank of China on 22 August 2007 /43/, which stipulates an interest rate of 7.56% for loans longer than 5 years, effective as of 15 September 2007, which was the interest rate actually applicable to the loan for the project activity. The interest rate considered in the FSR was considered as the basis for the investment decision in the proposed project, as evidenced by the completed FSR and the FSR approval by the local government /4/

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			CL closed
CL 17: the PP should provide evidence to support the claim that there are only 3 other projects developed in the province without CDM financing Please justify the selection of the range +/- 50% installed capacity for the selection of projects taken into account in the common practice analysis. There are two projects discussed in the PDD, and there are more than three other projects included in the reference 17 provided, i.e. Daimahe (230 MW) , Tukehe (165MW), Yanshuigou (144) and Xiaojiangkou (144); please clarify.	7.43	The evidence of the 3 other projects developed in the province without CDM financing as been attached. There are four projects provided in the reference 17, they are Daimahe (230 MW), Tukehe (165MW), Yanshuigou (144) and Xiaojiangkou (144). Threerinto, Yanshuigou(144) was started construction in 1957 and started generation in 1966, Xiaojiangkou (144) was started construction in 1958 and started generation in 1970, all constructed before year 2002, so they were excluded. The actual installed capacity of Damahe is 13MW, out of the range of 144-432MW, so it was also excluded. Only Tukehe (165MW) was the similar project that is occurring.	Only projects between 144MW and 432MW are assessed. This is considered reasonable given that it covers the range of +/- 50% of the installation capacity of the project, and based on CDM project activity registration review form for Tianquan Shiyang Hydro Power Project (2195) /56/, common analysis covering a range of +/- 50% of the installation capacity of the proposed project was required by the CDM EB. In addition, projects between 50 and 300 MW are categorised as medium scale hydropower projects in China, the purposed project installation capacity is 288MW, which is closer to the top range of the medium scale hydropower projects category. Projects between 144MW and 432MW represent a wide range of different project sizes, therefore the selection is considered appropriate. ERM CVS has used official sources and local and industry expertise to determine to what extent similar and operational projects (i.e. hydropower projects), other than CDM project activities, have been undertaken in Yunnan. Based on publicly available information, and with reference to other CDM project documentation available on the UNFCCC website, it is confirmed that the projects shown in the revised PDD are similar to the project activity. The analysis has been based on all projects between 144MW to 432MW. The common practice analysis is validated in more detail in section 3.5 of the validation report. CL closed
CL 18: further justification for excluding the previous projects should be demonstrated – i.e. the essential distinctions between these previous projects and the proposed project activity should be further substantiated	7.43	The further justification for excluding the previous projects has been demonstrated. Please refer to B.5 of PDD.	Further justification for exclusion of previous projects has been provided in the PDD, and has been validated in detail in section 3.5 of the validation report. Projects 1 and 2 in the PDD were constructed before 2002 (based on review of the publicly available information), and according to the China Datang Corporation website/51/, which is the owner of Tukahe hydropower station, project 3 is a special project that is part of the government program of 'west-east electricity transmission projects' therefore has the privilege to supply electricity to Guangdong province in higher price of 0.333 yuan/kWh, which is significantly higher than the tariff of 0.215 RMB/kWh used in the investment analysis for the proposed project activity. Therefore the investment conditions for the Tukahe hydropower station were very different to those of the proposed project, and the revenues from electricity sales are considerably higher per unit of electricity produced, which demonstrates that the

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			proposed project has essential distinctions with the Tukahe hydropower station project. CL closed
CL 19: The frequency of measurement should be stated for parameter CAPpj	9.2	The frequency of measurement has been stated for parameter CAPpj in PDD. Please refer to B.7 in PDD.	The frequency of the measurement has been revised to yearly, which is consistent with the methodology. CL closed
CL 20: Filing arrangements and documentation period should also be included in the PDD in accordance with the PDD guidelines.	9.9	The filing arrangements and documentation period have been included in the PDD. Please refer to A.1 of PDD.	Data will be archived at the end of each month, and will be kept for 2 years after the end of the crediting period or the last issuance of CERs, whichever occurs later. The data management procedures are considered appropriate to fulfil the monitoring requirements of the methodology and to ensure that emission reductions can be verified. CL closed
CL 21: The PP is required to include the ecological impacts identified in the EIA into the PDD, and mitigation measures required should also be included	11.1	The ecological impacts identified in the EIA and mitigation measures required have been included in PDD. Please refer to D.1 and D.2 of PDD.	An Environmental Impact Assessment (EIA) Report has been performed according to Chinese regulations. The EIA report was conducted by Pearl River Water Resource Conservation Science Institute in January 2007, and the document has been reviewed by ERM CVS. The EIA was approved, as per Chinese regulations, by the Ministry of Environmental Protection of the People's Republic of China on 27 September 2007. The EIA report concludes that no significant environmental impacts are expected from the project. Impacts that are identified are subject to mitigation measures, and these are accurately described in the final PDD. The letter of approval by the DNA of China confirms the contribution of the proposed CDM project activity to the sustainable development of the host Party. CL closed
CL 22 EG _{facility,y} is not included in the monitoring plan. Revision to the PDD is needed.	9.1	The parameter was included.	The parameter was included in the revised PDD. CL Closed.

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Forward Action Requests	Reference to checklist question	Final conclusion
No FARs raised		

Minor Issues	Reference to checklist question	Summary of project participants' response	Final conclusion
Minor issue 1: the language should be corrected in the discussion of Sub-step 1b	7.7	The language has been corrected in the discussion of Sub-step 1b, please refer to it.	OK