



VALIDATION REPORT

5MW SAHU HYDRO ELECTRIC PROJECT FOR A GRID CONNECTED SYSTEM IN HIMACHAL PRADESH IN INDIA

REPORT No. 2007-1118

REVISION No. 03



VALIDATION REPORT

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Approved by: Michael Lehmann	Organisational unit: Climate Change Services
Client: Him Kailash Hydro Power Private Limited	Client ref.: Mr. Ch.V. Narasimha Raju

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Project Name: 5 MW Sahu Hydro Electric Project for a grid connected system in Himachal Pradesh, India

Country: India

Methodology: AMS-I.D

Version: 13

GHG reducing Measure/Technology: Grid connected renewable electricity generation

ER estimate: 16,457 tCO₂e per year

Size

☐ Large Scale

☒ Small Scale

Validation Phases:

☒ Desk Review

☒ Follow up interviews

☒ Resolution of outstanding issues

Validation Status

☐ Corrective Actions Requested

☐ Clarifications Requested

☒ Full Approval and submission for registration

☐ Rejected

In summary, it is DNV's opinion that the 5 MW Sahu Hydro Electric Project for a grid connected system in Himachal Pradesh in India, as described in the PDD version 03 of 6 February 2009, meets all relevant UNFCCC requirements for the CDM and all relevant host Party criteria and correctly applies the baseline and monitoring methodology AMS-I.D version 13. DNV thus requests the registration of the project as a CDM project activity.

Report No.: 2007-1118	Date of this revision: 2009-04-20	Rev. No. 03
Report title: 5 MW Sahu Hydro Electric Project for a grid connected system in Himachal Pradesh in India		
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Work verified by: Venkata Raman Kakaraparthi (draft report), Mathsy Kutty (final report)		

Key words:

Climate Change

Kyoto Protocol

Validation

Clean Development Mechanism

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Abbreviations

CAR	Corrective Action Request
CAGR	Compound Accumulated Growth Rate
CDM	Clean Development Mechanism
CEA	Central Electrical Authority
CEF	Carbon Emission Factor
CER	Certified Emission Reduction
CH ₄	Methane
CL	Clarification request
CO ₂	Carbon dioxide
CO _{2e}	Carbon dioxide equivalent
DNV	Det Norske Veritas
DNA	Designated National Authority
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
HPSEB	Himachal Pradesh State Electricity Board
IPCC	Intergovernmental Panel on Climate Change
IREDA	Indian Renewable Energy Development Agency
KWh	Kilo Watt hour
MW	Mega Watts
MNES	Ministry of Non-conventional energy sources
MoEF	Ministry of Environment and Forest
MP	Monitoring Plan
NGO	Non-governmental Organisation
ODA	Official Development Assistance
PDD	Project Design Document
PPA	Power Purchase agreement
UNFCCC	United Nations Framework Convention on Climate Change



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1 EXECUTIVE SUMMARY – VALIDATION OPINION

Det Norske Veritas Certification AS (DNV) has performed a validation of the “5 MW Sahu Hydro Electric Project for a grid connected system in Himachal Pradesh, India”, on the basis of UNFCCC criteria for the Clean Development Mechanism and host Party criteria 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.

The project participant is M/s Him Kailash Hydro Power Private Limited. The host Party India meets all participation requirements. The DNA of India has confirmed that the project assists in achieving sustainable development and has accorded the approval for the project on 8 August 2008. No Annex I Party project participant is yet identified.

Having an installed capacity of less than 15 MW, the project is eligible as type I small-scale CDM project activity. It has also been demonstrated that the project is not a de-bundled component of a large scale project. The validation has confirmed that the project is eligible as category I.D small-scale CDM project activity and correctly applies the simplified baseline and monitoring methodology AMS-I.D, version 13. The determination of the baseline is well elaborated, transparent and sufficiently supported with facts. The selected baseline scenario is reasonable for the selected 10 year crediting period. Moreover, an analysis of the barriers facing the project demonstrates that project is not a likely baseline scenario.

The project results in the reduction of GHG emissions that are real, measurable and give long-term benefits and that are additional to what would have occurred in the absence of the project. The total emission reductions from the project are estimated to be 164,570 tCO₂e over the selected 10 year crediting period. The emission reduction forecast has been checked and is deemed likely that the stated amount is achieved given that the underlying assumptions do not change. Adequate training and monitoring procedures have been implemented.

The monitoring plan makes sufficient provision for monitoring relevant project and baseline emission indicators. Responsibilities and authorities for project management, monitoring and reporting and QA/QC procedures have also been addressed.

A local stake holder consultation process has been carried out by the project participant. DNV published the PDD on the DNV Climate Change web site and comments by Parties, stakeholders and UNFCCC accredited NGOs were invited through the CDM web site. No comments were received during the period.

In summary, it is DNV’s opinion that the project, as described in the project design document of 6 February 2009, meets all relevant UNFCCC requirements for the CDM, is eligible as category I.D small-scale CDM project activity and correctly applies the approved simplified baseline and monitoring methodology AMS-I.D version 13. Hence, DNV requests the registration of the “5 MW Sahu Hydro Electric Project for a grid connected system in Himachal Pradesh, India” project as a CDM project activity.



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2 INTRODUCTION

Him Kailash Hydro Power Private Limited has commissioned Det Norske Veritas Certification AS (DNV) to perform a validation of the “5 MW Sahu Hydro Electric Project for a grid connected system in Himachal Pradesh, India” (hereafter called “the project”). This report summarises the findings of the validation of the project, performed on the basis of UNFCCC criteria for the 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, the simplified modalities and procedures for small-scale CDM project activities and the subsequent decisions by the CDM Executive Board.

2.1 Objective

The purpose of a validation is to have an independent third party assess the project design. In particular, the project's baseline, monitoring plan, and the project's compliance with relevant UNFCCC and host Party criteria are validated in order to confirm that the project design, as documented, is sound and reasonable and meets the identified criteria. Validation is a requirement for all CDM projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of certified emission reductions (CERs).

2.2 Scope

The validation scope is defined as an independent and objective review of the project design document (PDD). The PDD is reviewed against the criteria stated in Article 12 of the Kyoto Protocol, the CDM modalities and procedures as agreed in the Marrakech Accords, the simplified modalities and procedures for small-scale CDM project activities and the relevant decisions by the CDM Executive Board, including the approved baseline and monitoring methodology AMS-I.D, version 13 /4/. The validation team has employed a risk-based approach, focusing on the identification of significant risks for project implementation and the generation of CERs.

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



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3 METHODOLOGY

The validation consisted of the following three phases:

- I a desk review of the project design documents
- II follow-up interviews with project stakeholders
- III the resolution of outstanding issues and the issuance of the final validation report and opinion.

The following sections outline each step in more detail.

3.1 Desk Review of the Project Design Documentation

The following table outlines the documentation reviewed during the validation:

- /1/ CDM PDD for “5MW Sahu Hydro Electric Project for a grid connected system in Himachal Pradesh, India”, version 01 dated 1 November 2007, version 02 dated 22 September 2008 and version 03 dated 6 February 2009
- /2/ Letter of Approval from DNA of India, dated 8 August 2008
- /3/ CDM Executive Board, Validation and Verification Manual, version 01.
- /4/ CDM Executive Board, AMS-I.D, version 13 - *Grid connected renewable electricity generation*
- /5/ Civil construction agreement between the proponent and M/s Srinivasa Civil Works Pvt Ltd., dated 8 July 2005
- /6/ Detailed Project Report by Sai Engineering Foundation, January 2003
- /7/ Power Purchase Agreement, dated 28 April 2004
- /8/ Techno economic clearance from HPSEB, dated 2 July 2003
- /9/ IREDA: Loan sanction letter, dated 7 June 2004
- /10/ IREDA: Additional loan sanction letter, dated 10 May 2007
- /11/ N.O.C from PWD, Himachal Pradesh, dated 30 July 2004
- /12/ N.O.C for construction from I and PH department, dated 26 October 2004
- /13/ N.O.C from Sahu Panchayat, dated 20 September 2004
- /14/ Consent to establish from H.P State Environment Protection & Pollution Control Board, dated 15 December 2004.
- /15/ Implementation agreement with Government of Himachal Pradesh, dated 3 September 2003.
- /16/ N.O.C from HP forest department, dated 24 January 2005
- /17/ Chartered Accountants certificate by A.M. Reddy & D.R. Reddy dated 4 April 2008.
- /18/ E & M equipment purchase agreement with M/s Shanghai Leichun (I) Trading Company Pvt. Ltd and M/s Shanghai Leichun International Trading Co. Ltd., dated 9 December 2005.



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- /19/ Annual Administration Report 2004-05 by HPSEB
- /20/ Notification by HP state department of MPP and Power, dated 9 January 2003.
- /21/ Central Electricity Authority, www.cea.nic.in
- /22/ Board of Director resolution of Himkailash Hydro Power Pvt. Ltd for CDM consideration, dated 17 March 2004.
- /23/ Newspaper clippings on occurrence of flash floods in the project area.
- /24/ Commissioning certificate from Himachal Pradesh State Electricity Board, dated 22 April 2008
- /25/ Purchase order for the turbine, dated 2 November 2005
- /26/ Photographs depicting the effect of flash flood at the project site.
- /27/ Loan agreement between Himkailash Hydro Power Pvt. Ltd and IREDA, dated 30 June 2005.
- /28/ Financial analysis
- /29/ Management procedure for data storage
- /30/ HPSEB analysis on hydro power station within Himachal Pradesh and PLF, 2005
- /31/ Reserve Bank of India, Annual report 2006-2007.
<http://rbidocs.rbi.org.in/rdocs/AnnualReport/PDFs/86531.pdf>
- /32/ Bombay Stock Exchange Limited, historical value of BSE 500 indices
<http://www.bseindia.com/histdata/hindices.asp>
- /33/ National Stock Exchange of India Limited, India Index Services & Products Ltd. Market Update; <http://www.nseindia.com/archives/indices/update/indupMar2004.pdf>
- /34/ Himachal Pradesh Electricity Regulatory Commission; Commission's Order On Small Hydro Power Projects Tariff And Other Issues, dated 18 December 2007
- /35/ Seismic zoning map of India <http://asc-india.org/seis-himachal-pradesh.htm>
- /36/ Himachal Pradesh State Electricity Board statistics
http://www.hpseb.com/schemes_which_are_presently_unde.htm
- /37/ Indian Income Tax Act
<http://law.incometaxindia.gov.in/TaxmannDit/DisplayPage/dpage1.aspx>
- /38/ CDM India, Designated National Authority, Ministry of Environment and Forest
<http://cdmindia.nic.in/cdmindia/projectList.jsp?search=search>
- /39/ Contract agreement for transmission line work with M/s Sierra Constructions, Chamba, dated 10 July 2006.
- /40/ Condition for the issuance of N.O.C by Public Work Department, Himachal Pradesh, dated 26 July 2004
- /41/ Engagement letter – Carbon advisory service with M/s Zenith Energy for the development of CDM PDD, dated 01 August 2007



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- /42/ Minutes of the meeting of Board of Directors, dated 30 September 2004, discussing the anticipated PLF of around 45% and considering CDM revenue an essential factor to proceed with the project activity.
- /43/ Sahu small hydro project - Generation details – after COD on 22 April 2008 to January 2009 and the invoices from the electricity board.
- /44/ Letter for enquiry to M/s Zenith Corporate Service Ltd. for the development of 5MW Himkailash hydro project as CDM project activity, dated 17 April 2006.
- /45/ Certificate by Chartered Accountant, A.M. Reddy & D.M. Reddy for the verification of benchmark, dated 22 April 2009.

3.2 Follow-up Interviews with Project Stakeholders

On 24 January 2008 DNV performed interviews with project stakeholders to confirm selected information and to resolve issues identified in the document review. The interview was carried out at the project site. Representatives of the project owner, Him Kailash Hydro Power Private Limited were interviewed. The main topics of the interviews are summarised in Table 1.

	Date	Name	Organization	Topic
/46/	2008-01-24	Sunil Kumar Gupta (Civil Engineer)	Him Kailash Power Private Limited	<ul style="list-style-type: none"> • Clarification on technical details of the project. • Confirmation that the project is not a de-bundled component of a larger project activity • Confirmation on non involvement of ODA • Clarifications on establishment of baseline, monitoring plan and emission reduction calculations. • Clarifications on barriers, prevailing practice barriers. • Resources, training needs and procedures for operation and maintenance.
		P.V. Subvahmanyam (Finance Manager)	Him Kailash Power Private Limited	
		Lakshmi Narayan (Electrical Engineer)	Him Kailash Power Private Limited	
		Surjeet Kumar Malhotra (Project Manager)	Him Kailash Power Private Limited.	
		K.S.K. Rambabu (Assistant Manager)	Zenith Energy Service.	



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- Benefits from CDM registration.

3.3 Resolution of Outstanding Issues

The objective of this phase of the validation was to resolve any outstanding issues which needed be clarified prior to DNV's positive conclusion on the project design. In order to ensure transparency a validation protocol was customised for the project. The protocol shows in a transparent manner the criteria (requirements), means of verification and the results from validating the identified criteria. 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.

The validation protocol consists of three tables. The different columns in these tables are described in the figure below. The completed validation protocol for the "5 MW Sahu Hydro Electric Project for a grid connected system in Himachal Pradesh, India" is enclosed in Appendix A to this report.

Findings established during the validation can either be seen as a non-fulfilment of CDM criteria or where a risk to the fulfilment of project objectives is identified. Corrective action requests (CAR) are issued, where:

- i) mistakes have been made with a direct influence on project results;
- ii) CDM and/or methodology specific requirements have not been met; or
- iii) there is a risk that the project would not be accepted as a CDM project or that emission reductions will not be certified.

A request for clarification (CL) may be used where additional information is needed to fully clarify an issue.



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Validation Protocol Table 1: Mandatory Requirements for CDM Project Activities				
Requirement	Reference	Conclusion		
<i>The requirements the project must meet.</i>	<i>Gives reference to the legislation or agreement where the requirement is found.</i>	<i>This is either acceptable based on evidence provided (OK), a Corrective Action Request (CAR) of risk or non-compliance with stated requirements or a request for Clarification (CL) where further clarifications are needed.</i>		

Validation Protocol Table 2: Requirement checklist				
Checklist Question	Reference	Means of verification (MoV)	Comment	Draft and/or Final Conclusion
<i>The various requirements in Table 2 are linked to checklist questions the project should meet. The checklist is organised in different sections, following the logic of the large-scale PDD template, version 03 - in effect as of: 28 July 2006. Each section is then further sub-divided.</i>	<i>Gives reference to documents where the answer to the checklist question or item is found.</i>	<i>Explains how conformance with the checklist question is investigated. Examples of means of verification are document review (DR) or interview (I). N/A means not applicable.</i>	<i>The section is used to elaborate and discuss the checklist question and/or the conformance to the question. It is further used to explain the conclusions reached.</i>	<i>This is either acceptable based on evidence provided (OK), or a corrective action request (CAR) due to non-compliance with the checklist question (See below). A request for clarification (CL) is used when the validation team has identified a need for further clarification.</i>

Validation Protocol Table 3: Resolution of Corrective Action and Clarification Requests			
Draft report clarifications and corrective action requests	Ref. to checklist question in table 2	Summary of project owner response	Validation conclusion
<i>If the conclusions from the draft Validation are either a CAR or a CL, these should be listed in this section.</i>	<i>Reference to the checklist question number in Table 2 where the CAR or CL is explained.</i>	<i>The responses given by the project participants during the communications with the validation team should be summarised in this section.</i>	<i>This section should summarise the validation team's responses and final conclusions. The conclusions should also be included in Table 2, under "Final Conclusion".</i>

Figure 1 Validation protocol tables



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3.4 Internal Quality Control

The draft validation report including the initial validation findings underwent a technical review before being submitted to the project participants. The final validation report underwent another technical review before requesting registration of the project activity. The technical review was performed by a technical reviewer qualified in accordance with DNV's qualification scheme for CDM validation and verification.

3.5 Validation Team

<i>Role/Qualification</i>	<i>Last Name</i>	<i>First Name</i>	<i>Country</i>	<i>Type of involvement</i>					
				Desk review	Site visit / Interviews	Reporting	Supervision of work	Technical review	Expert input
CDM validator / technical team leader/ Project Manager	Astakala	Vidyacharan	DNV, India	✓	✓	✓	✓		
GHG auditor (Trainee)	Shome	Sharmistha	DNV, India	✓	✓	✓			
Technical reviewers (Draft report)	Kakaraparthi	Venkataraman	DNV, India					✓	
Technical reviewers (Final report)	Kutty	Mathsy	DNV, India					✓	

The qualification of each individual validation team member is detailed in Appendix B to this report.



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4 VALIDATION FINDINGS

The findings of the validation are stated in the following sections. The validation criteria (requirements), the means of verification and the results from validating the identified criteria are documented in more detail in the validation protocol in Appendix A.

The final validation findings relate to the revised project design document version 03 dated 6 February 2009 /1/.

4.1 Participation Requirements

The project activity is being proposed as a unilateral project developed by Him Kailash Hydro Power Private Limited. The host Party India fulfils the participation requirements, having ratified the Kyoto Protocol on 26 August 2002 and having established the National Clean Development Mechanism Authority, Ministry of Environment and Forests (MoEF) as its DNA. MoEF has approved the project on 8 August 2008 /2/ and provided confirmation that the project assists in achieving sustainable development. The issuance of the Letter of Approval by DNA of India for the proposed project activity has been further verified by DNV from the Ministry of Environment and Forest, CDM India, Designated National Authority's website /38/. No Annex I Party project participant is yet identified.

The project is owned by Him Kailash Hydro Power Private Limited and 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 India.

4.2 Project Design

The proposed project is a run of the river 5 MW hydro power project located in the Chamba district of Himachal Pradesh in India and will be connected to the Himachal Pradesh State Electricity Board grid, which forms a part of the Northern regional grid of India. The project is constructed at Sahu Nallah, a tributary of river Ravi in Chamba. The geographical coordinates of the project site are 32°31'56" to 32°39'44" N and 76°12'30" to 76°22'58" E.

The technology used in the project is available in India and no transfer of technology is envisaged. The proposed project is expected to have an annual gross generation of 22.56 GWh at a plant load factor (PLF) of 51.5% and will export a net amount of 20.75 GWh to the northern regional grid through the Himachal Pradesh State Electricity Board (HPSEB) grid.

The plant and machinery of the project consists of two numbers of horizontal impulse wheel turbine and synchronous brushless type generator. The gross head of the proposed project is 174.0 m and the designed head is 153.8 m. All the technical characteristics of the proposed project have been verified from the Detailed Project Report /6/ and during the site visit /46/.

The project will result in an estimated reduction of 164,570 tCO₂e over its entire crediting period of 10 years.. The technology applied is deemed current good practice and is not expected to be replaced within the crediting period.

The project start date has been defined as the date of agreement between the proponent and M/s Srinivasa Civil Works Pvt Ltd., dated 8 July 2005, on the execution and completion of the proposed project plant /5/. The expected operational lifetime of the project is 30 years and



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a fixed crediting period of 10 years has been chosen with the starting date of the first crediting period as 1 June 2009 or the date of registration, whichever is later.

4.3 Baseline Determination

In view of the fact that the project's capacity is less than 15 MW, the project is eligible as type I small-scale CDM project activity and can apply a simplified baseline methodology. The project applies the baseline methodology stipulated for category I.D of the "simplified modalities and procedure for small scale CDM project activity". The simplified baseline methodology AMS-I.D, version 13 is applicable for grid connected renewable electricity generation projects. The application of AMS-I.D, version 13 is justified as:

- The project involves generation of power using hydro resources and it displaces electricity from the northern grid of India. The power purchase agreement (PPA), dated 28 April 2004 /7/, signed between the proponent and Himachal Pradesh State Electricity Board, has been provided and the same was verified by DNV.
- The project activity is a new run of river hydro power plant with a total installed capacity of 5 MW as verified from the detailed project report /6/, the techno economical clearance from the Himachal Pradesh State Electricity Board /8/ and as observed during the site visit.

As the project activity supplies electricity to the Himachal Pradesh State Electricity Board grid, which forms a part of the northern regional electricity grid, the baseline for this project activity is a function of the generation mix of the northern regional grid. The selected baseline scenario is as per the approved methodology, AMS-I.D, version 13. The selection of the northern regional grid as the grid system boundary for the project activity is in line with the EB's guidance for large countries such as India.

The project system boundary includes the power plant from the diversion weir to transmission system till the evacuation point. The plant consists of two 2.5MW horizontal impulse turbines. The spatial boundary of the project includes the Northern regional grid.

	GHGs involved	Description
Baseline emissions	CO ₂	Emissions equivalent to the amount of net electricity supplied by the project activity that would otherwise be generated by power plants connected to the Himachal Pradesh State Electricity Board grid, which is a part of northern grid.
Project emissions	CO ₂	Emissions from diesel consumption in diesel generator set during emergency
Leakage	NA	NA

The selected sources and gas are justified for the project activity.



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4.4 Additionality

The additionality of the project activity has been demonstrated as per Attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities. The project activity primarily demonstrates additionality through investment analysis and other barrier.

4.4.1 CDM consideration and continued action to secure CDM status:

The project started with the execution and completion agreement with M/s Srinivasa Civil works Pvt. Ltd, dated 8 July 2005 /5/, which is the earliest of any real action and investment for the project activity (Neither the implementation agreement with the Government of Himachal Pradesh signed on 3 September 2003 nor the power purchase agreement (PPA) of 28 April 2004 were binding). DNV was able to arrive at this opinion based on review of the financial commitments made by the project developer, which included:

- The purchase order of turbine generator is dated 2 November 2005 /25/
- The Electrical & Mechanical equipment purchase agreement with M/s Shanghai Leichun (I) Trading Company Pvt. Ltd and M/s Shanghai Leichun International Trading Co. Ltd. has been signed on 9 December 2005 /18/.
- The Agreement for construction of transmission line work with M/s Sierra Constructions, Chamba has been signed on 10 July 2006 /39/.

CDM was seriously considered for the project activity prior to the start date. The chronology of events of the project activity are provided below:

- The Memorandum of Understanding with the Government of Himachal Pradesh was signed on 17 May 2001. The detailed project report was prepared by Sai Engineering Foundation, January 2003 /6/ and Techno economic clearance obtained from the Himachal Pradesh State Electricity Board on 2 July 2003 /8/.
- Though an implementation agreement with the Government of Himachal Pradesh was signed on 3 September 2003 /15/, the proponent received the final approval from the forest department of Himachal Pradesh only by 24 January 2005/16/.
- Decision of the Board of Directors to undertake the proposed project activity as a CDM project activity, considering the hydrological risk due to the non availability of complete discharge data, geological risk and long gestation period as described in the Board of Director resolution, dated 17 March 2004 /22/. It has been further verified from the minutes of the meeting of Board of Directors on 30 September 2004 /42/ that due to the low anticipated PLF of around 45%, CDM revenue was considered to be an essential factor to proceed with the project activity.
- Loan sanction letter from the Indian Renewable Energy Development Agency, dated 7 June 2004 /9/.
- The project proponent has signed agreement with M/s Srinivasa Civil works Pvt. Ltd, dated 8 July 2005 /5/ for the execution and completion of the project activity, which is identified as the start date of the project activity.

The final agreement for the work of transmission line has been signed on 10 July 2006. After the commencement of the civil construction, the project activity has encountered flash flood on June 2006, November 2006 and June 2007 as verified by DNV from the newspapers and photographs /23//26/. This has resulted in the increase of gestation period of the project activity and increase in the total project cost, as verified from the Chartered Accountant



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certificate, dated 4 April 2008 /17/. Since, the initial loan sanctioned by IREDA was INR 172.5 million/9/ resulting in a debt: equity ratio of 61:39, against the estimated total investment and the debt equity ratio of 70:30 anticipated in the DPR /6/. The financial closure for the additional loan from IREDA for INR 34 million was achieved on 10 May 2007 /10/, following which the project proponent has closed the negotiation and finally appointed CDM consultant for the project activity.

The assessment of the continuous and real actions taken to secure CDM status for the project in parallel with the project implementation is provided as below:

- Letter for enquiry to M/s Zenith Corporate Service Ltd. for the development of 5MW Himkailash hydro project as CDM project activity, dated 17 April 2006 /44/.
- An agreement with M/s Zenith Energy for the development of documentation for CDM project was signed on 01 August 2007 /41/.
- DNV was appointed as the DOE for the validation of the proposed project on 8 October 2007.
- The PDD was initially published for global stake holder comments from 10 November 2007 to 9 December 2007. The PDD was republished based on AMS-I.D, version 13, from 25 September 2008 to 24 October 2008.
- The project proponent approached the DNA of India for the Letter of Approval on 26 November 2007 and the Letter of Approval was issued by the DNA of India on 8 August 2008 /2/.
- The occurrence of flash floods in June 2006, November 2006 and 29 June 2007 resulted in the increased gestation period and increased total cost of the project activity /23//26/ and the project was commissioned on 22 April 2008 /24/.

Investment barrier:

An investment analysis is applied to demonstrate that the project is not financially attractive and thus faces an investment barrier.

4.4.2 Investment analysis: Choice of approach:

In view of the fact that the proposed project activity generates financial and economic benefits through the sales of electricity, other than the CDM-related income and the baseline does not involve any investment, benchmark analysis is applicable. The proponent has carried out an investment analysis based on the total project cost, tariff structure and cost of production in order to demonstrate that the project is not economically attractive.

4.4.3 Investment analysis: Benchmark selection:

A project IRR of 14.34% has been chosen as the benchmark, which is the weighted average cost of capital (WACC) for the proposed project activity. As per para 11 of “Guidance on the Assessment of Investment Analysis”, WACC is considered to be an appropriate benchmark for project IRR. The selection of the WACC as a benchmark for the proposed project activity is justified and acceptable in view of the fact that the total finances obtained for the project include two components viz.: loan and equity. In order to evaluate the financial viability of the project, the project developer is required to assess the expected minimum returns on debt as well as equity components of the total investment. Hence, the benchmark selected needs to consider the risks associated with each of the components of the total investment. Thus, from an investor’s perspective, WACC is one of the most appropriate benchmark for comparing



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project IRR since it is the weighted average of the total cost of different components of the investment. The computation of WACC takes into account the effective rate of interest on term loan, as verified from the loan sanction letter by the Indian Renewable Energy Development Agency, dated 7 June 2004 /9/. With respect to the cost on equity; the project proponent has calculated the same as per the Capital Asset Pricing Model (CAPM). As per para 13 of the “Guidance on the Assessment of Investment Analysis”, the company’s internal benchmark or expected return for the calculation of return on equity for the WACC calculation can only be used if the project proponent is the only credible project developer. As this project activity could have been developed by other developer or investors also, the project proponent has calculated the return on equity or cost of equity as per the CAPM model, considering the market return and the beta value for power companies listed at the Bombay Stock Exchange, which are applicable to any investor investing in the Indian power sector. Thus, this approach for the calculation of benchmark has been accepted by DNV. The key parameters of the CAPM model have been calculated as follows:

- Risk free return rate has been considered as per the weighted average yield rate of Government security bond, with maturity period ranging up to 30 years, applicable at the time when Board of Director resolved to proceed for the project activity considering CDM revenue. This has been accepted by DNV as the weighted average yield rate of Government security bond for 2003 -2004 is lower than that of the year 2004-2005. The weighted average yield rate of Government security bond has been verified from the annual report of the Reserve Bank of India /31/.
- Market return or Compound Accumulated Growth Rate (CAGR) is calculated from the data, sourced and verified from Bombay Stock Exchange Limited (BSE 500 indices) /32/. To minimize any unsystematic risk associated with the project activity, complete data from BSE 500 has been considered. As larger sample data has been used, the average market return is deemed to be realistic and conservative.
- The lowest unlevered beta value of 0.811 among all the conventional and non conventional power plants listed in the stock exchanges/32//33/, 2003 - 2004, has been applied for the calculation of cost of equity of the project activity, thus removing any financial leverage specifically associated with the project proponent. The lowest unlevered beta value among all the listed power companies has been used to make the cost of equity applicable for the power sector.

The procedure and the data used for the calculation of WACC benchmark of 14.34% has also been verified and certified by Chartered Accountants, A.M. Reddy & D.M. Reddy, dated 22 April 2009 /45/.

4.4.4 Investment analysis: Input parameters:

The Detailed Project Report initially considered a plant load factor of 80% on the basis of only two lean season data of 2001 and 2002 /6/. However, given the uncertainties in the hydrology and the resulting risk in plant load factor, the project proponent decided to go ahead with the project only as a CDM project activity. These reasons have been also recorded in the Board of Directors resolution dated 17 March 2004 /22/ and verified by DNV. It has been further verified from the minutes of the meeting of Board of Directors on 30 September 2004 /42/ that based on the latest data available during 2004, it has been anticipated the PLF of the project activity was likely to be 45%. The project IRR presented in the PDD is based on the actual plant load factor of the existing hydro power plants in the region, during the time of investment decision. The actual average plant load factor of the region, as verified from the



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annual administration report 2004 - 2005 of HPSEB/19/, was 35%. It has been verified from HPSEB report that of the all hydro power plants existing in Himachal Pradesh at the time of investment decision, only three hydro power plants had average plant load factor higher than 50% among which two of the plants are large hydro power plants and thus being excluded from further consideration. The only hydro power plant in the project region, with comparable installed capacity and plant load factor higher than 50% is 6 MW Binwa hydro power plant which had an average plant load factor of 51.5%. It has also been verified from Himachal Pradesh Electricity Regulatory Commission; Commission's Order on Small Hydro Power Projects Tariff and Other Issues, dated 18 December 2007 /34/ that the average plant load factor of the small hydro power plants in Himachal Pradesh is considered to be 45%. However, the proponent has applied 51.5% PLF for the proposed project activity from a conservative point of view.

The investment analysis has been performed for 20 years considering annual operational costs /6/, taxes and incentives, total investments /6//8/ and revenue from the power generation /7/. All the taxes and incentives are confirmed to be applied correctly and as per the Indian Income Tax Act¹ /37/. Straight line depreciation has been calculated in line with the prevailing national regulation and industrial practice.

The techno economical clearance /8/ has been issued by HPSEB based on the installed capacity and the project cost as outlined in the DPR /6/. DNV was able to verify the financial inputs considered in the IRR analysis, such as total project cost, annual operational costs etc from DPR /6/ and the tariff from the power purchase agreement /7/. The estimated project cost of INR 283.2 million, in the year 2002 as per DPR, has been considered for project IRR analysis /28/. This input has been verified from against the estimated project cost of INR 295.64 million, as per the additional loan sanction letter from India Renewable Energy Development Agency, 10 May 2007 /10/. The highest average plant load factor of 51.5% for the similar hydro power plant in the project region has been verified against the annual administration report by HPSEB /19//30/. The operation and maintenance cost of 1.5% of the project cost with 5% yearly escalation has been verified from the DPR /6/. This has been further verified from the Commission's Order on Small Hydro Power Projects Tariff and Other Issues, dated 18 December 2007 /34/.

4.4.5 Investment analysis: Calculation and conclusion:

Based on data from the Detailed Project Report /6/, Techno economical clearance from HPSEB /8/, Power purchase agreement /7/ and the highest average plant load factor of the similar small hydro power plant in the project region /19/, the project IRR without CDM has been calculated to be 11.98 %/28/, which is lower than the WACC benchmark of 14.34%; while with CDM revenue, the project IRR improves to 15.03%. The calculation were verified by DNV and found to be in line with EB's guidance on investment analysis.

4.4.6 Investment analysis: Sensitivity analysis:

A sensitivity analysis has been preformed for the key parameters in order to check the influence of the following factors used during the IRR calculations (without CDM contributions):

¹ <http://law.incometaxindia.gov.in/TaxmannDit/DisplayPage/dpage1.aspx>



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a) **Project cost:** It has been demonstrated that the project IRR touches the benchmark if the project cost decrease by 12.60 %. However, it has been verified from the certificate by Chartered Accountants, A.M. Reddy & D.R. Reddy, dated 4 April 2008 /17/ that the total project cost is INR 323 million against the estimated project cost of INR 295.64 million, as per the additional loan sanction letter from India Renewable Energy Development Agency, 10 May 2007 /10/ and anticipated capitalized project cost of INR 283 million in the DPR /6/, which is used in the project IRR analysis/28/.

b) **Plant load factor:** It has been demonstrated that the project IRR touches the benchmark of 14.34% if the plant load factor increases by 14.35 %. It has been verified from the Himachal Pradesh State Electricity Board annual report that the average PLF of the region is 35%. The only similar hydro power plant in the project region having PLF higher than 50% is 6 MW Binwa hydro power plant with an average plant load factor of 51.5%, at time of investment decision. It has also been verified from Himachal Pradesh Electricity Regulatory Commission; Commission's Order on Small Hydro Power Projects Tariff and Other Issues, dated 18 December 2007 /34/ that the average plant load factor of the small hydro power plants in Himachal Pradesh is considered to be 45%. It has been further verified by DNV from the generation details /43/ of the plant that actual PLF of the project activity from the date of commissioning and till January 2009 is 34.27% .Thus, increase of plant load factor by 14.35 % is deemed unlikely.

It has been verified from the power purchase agreement /7/ that the tariff for the project activity is fixed for 40 years. The operation and maintenance cost of the project activity is only 1.5% of the total project cost /6//8/. Thus, sensitivity analysis for tariff and operation and maintenance cost has not been performed.

Other barrier:

a) **Geological risk:** Due to the very location of project activity in a hilly area, the project proponent also envisaged other barriers like the possibility of landslides, flash floods and earthquakes². All of the three can have a huge impact and loss in terms of life and property, thereby increasing the risks associated with the project. These were further substantiated, when the project activity encountered flash floods thrice during the construction phase. DNV was able to confirm the same from the local newspaper clippings /23/ and the photographs /26/. Furthermore, the project activity is located in the most seismically active zone, Seismic zone V in India³ /35/. This further increases the risk to the project activity.

The consideration of geological risk and anticipated long gestation period due to the nature of terrain in the project area has been verified from the Board of Director, minutes of meeting /22/. It has also been demonstrated that the project activity has encountered barriers due to the limited information on the nature of terrain, as a result of which the initial plan of open water channel has to be replaced with closed water tunnel. This has been verified during the site visit. The consequent increase in the gestation period has resulted in the increase project cost of INR 323 mill Commission's Order on Small Hydro Power Projects Tariff and Other Issues, dated 18 December 2007 /34/ion /17/, which is approximately 15% more than the estimated total project investment of INR 285.1 million in the DPR /6/ and INR 295.64 million in the additional loan sanction letter /10/.

² <http://www.iisc.ernet.in/cursci/oct102004/863.pdf>

³ <http://asc-india.org/seis-himachal-pradesh.htm>



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b) Lack of infrastructure: It has been demonstrated that due to the remote location of the project and lack of infrastructure, the project developer also had to incur an extra cost of INR 3.4 million towards the installation of transmission line /39/, construction of village paths, approach roads, construction of foot bridges during the construction phase /40/.

c) Uncertainty in hydrology: Reliable rainfall/snowfall data is not available for the state of Himachal Pradesh. The consideration of hydrological risk due to non availability of complete discharge data has been verified from the Board of Director minutes of meeting /22/. In the detailed project report /6/, the PLF of the project activity has been estimated to be 80% on the basis of only two lean season data of 2001 and 2002. However, it has also been verified from the HPSEB annual report and analysis that the average PLF of the Sal II hydro power plant located at the upstream of the project activity has an average PLF of 35% /19//30/. Further more, the highest actual plant load factor achieved by the only similar hydro power plant in the project region is 51.5%. This increases the uncertainty of the output of the project activity.

In conclusion, it has been verified that the project is not financially attractive and faces different barriers, such as geographical risk and uncertainty in hydrology and thus is not the most likely baseline scenario. Further, in view of the above discussed barriers, low returns on investment and decision of the Board of Directors to undertake the proposed project activity with CDM revenue /22/, it can be concluded that the benefit from CDM revenue is a decisive for the implementation project activity.

Hence, the emissions reductions occurring from the project are deemed additional to those that would occur in the absence of the project activity

4.5 Monitoring

The project applies the approved monitoring methodology AMS-I.D (version 13) - “*Grid connected renewable electricity generation*” for Type I – Renewable Energy Projects, according to Appendix B of the “*Simplified modalities and procedures for small-scale CDM project activities*” - Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activities /5/. Given that the emission factor is estimated and fixed ex-ante, in line with the monitoring methodology AMS-I.D, version 13, the data to be monitored are the electricity supplied and imported from the grid by the project. The diesel consumption in the diesel generator set during emergency will also be monitored.

The net electricity supplied to the grid will be monitored by main meter and check meter. The recorded data will be cross checked against the sale receipts. Diesel consumption will be monitored by weighbridge meter and cross checked against the fuel purchase receipt. Detailed management plan for monitoring and data storage has been developed and verified by DNV /29/. The monitoring plan is in accordance with the monitoring methodology and will give opportunity for real measurements of achieved emission reductions.

4.5.1 Parameters determined ex-ante

Data available at the time of validation are as follows:

- CO₂ emission factor of the western regional grid, combined margin value, taken from CEA published data, version 2, 21 June 2007.
- Oxidation factor of coal is considered as 1 as per IPCC 2006 default value.



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DNV has verified the value used against the sources and concluded that the data used are appropriate and conservative. This has been further described in section 4.6 of the report.

4.5.2 Parameters monitored ex-post

The parameters that are to be monitored ex post include:

- Gross electricity generated by the project activity.
- The auxiliary electricity utilized by the project activity within the project boundary
- Net electricity supplied to the grid.
- Electricity imported from the grid.
- Fossil fuel consumption in the DG sets during emergency.

4.5.3 Management system and quality assurance

Maintenance and calibration of electricity meters will be carried out as per the procedures prescribed in the power purchase agreement/7/.

Board of Directors of the company is responsible for registration, monitoring, measurement, reporting and reviewing of the data and overall project management. Internal audit for the proposed CDM project will be carried out quarterly. Detailed management plan for monitoring and data storage has been developed and verified by DNV /29/.

4.6 Estimate of GHG Emissions

The calculations and formulae as addressed in the approved baseline and monitoring methodology AMS-I.D, version 13, have been applied. All aspects related to the direct and indirect GHG emissions as relevant to the project activity have been addressed and are presented in a transparent manner, in line with the approved methodology.

Baseline emission: The combined margin emission coefficient for the northern regional grid of India is 793 tCO₂e/GWh, has been sourced from Central Electricity Authority data /21/ version 2, dated 21 June 2007, which was the latest publicly data available at the time of initial web hosting of PDD for the global stake holder comment on 10 November 2007. The Central Electricity Authority, Ministry of Power, Government of India /21/ has published a database of carbon dioxide emission factors from the power sector in India based on detailed authenticated information obtained from all operating power stations in the country. This database⁴ /21/ i.e. the CO₂ baseline database provides information about the OM and BM factors of all the regional electricity grids in India. DNV confirms that the database is an official publication of the Government of India for the purpose of CDM baselines and the OM in the CEA database is calculated *ex ante* using the simple OM approach based on the generation-weighted average emissions per electricity unit of all fossil-fuelled generating sources serving the system over a three year period of 2003-2004, 2004-2005 and 2005-2006 /21/. BM is calculated *ex ante* based on 20% most recent capacity additions in the grid based on net generation as described in ACM0002. Actual calorific values of coal and lignite have been used.

DNV was able to verify the value of combined margin from the Central Electricity Authority published data, 21 June 2007/21/.

The GHG emission reduction due to the project activity has been calculated as the product of net electricity supplied to the grid and the combined margin grid emission factor. The net

⁴ <http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm>



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electricity supplied to the grid will be measured by the main electricity meter and cross checked against check meter. The amount of net electricity supplied to the grid will be verified against the sales receipt from the grid company. The project activity is expected to result in an estimated reduction of 164,570 tCO₂e over its entire crediting period of 10 years.

Project emission: Fossil fuel consumption in the diesel generator set, during emergency, has been incorporated as the project emission and shall be monitored and calculated.

Leakage: It has been addressed and verified by DNV that no transfer of equipment has taken place in the project activity, thus leakage is not involved in the project activity as per the methodology.

4.7 Environmental Impacts

The proposed project activity contributes to generation of green power and is expected to benefit the economic development of a backward region. Thus, the project activity is expected to have only beneficial impacts and no adverse impacts are foreseen. There is no legislative mandate for carrying out an environmental impact assessment study for such project activity. All the statutory clearances have been provided and verified by DNV.

4.8 Comments by Local Stakeholders

Local stakeholders identified are Himachal Pradesh Government Energy Development Agency (HIMURJA), Himachal Pradesh State Electricity Board (HPSEB), Electricity Regulatory Commission of Himachal Pradesh (ERCHP), Himachal Pradesh State Environment Protection & Pollution Control Board (HPPCB), Department of Irrigation, Govt. of Himachal Pradesh, Ministry of Environment & Forests, Govt. of India and local village Panchayat.

The clearances from pollution control board/14/, irrigation department/11/ and Forest department/16/ have been verified by DNV. The NOC from the village panchayat, dated 20 April 2004 /13/ has been verified by DNV. It has also been verified that under HIMURJA policy, that notifications and invitations were circulated in the local news paper for inviting the comments /23/.

4.9 Comments by Parties, Stakeholders and NGOs

The PDD of 1 November 2007 was made publicly available on DNV's climate change website⁵ and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 10 November 2007 to 09 December 2007. The PDD, dated 9 September 2008, was republished for global stakeholder consultation from 25 September 2008 to 24 October 2008, due to the version change of the methodology.

No comments were received during both the periods.

⁵ www.dnv.com/certification/climatechange/Projects/ProjectDetails.asp?ProjectId=1580

APPENDIX A

CDM VALIDATION PROTOCOL

Table 1 Mandatory Requirements for Clean Development Mechanism (CDM) Project Activities

Requirement	Reference	Conclusion
About Parties		
1. The project shall assist Parties included in Annex I in achieving compliance with part of their emission reduction commitment under Art. 3.	Kyoto Protocol Art.12.2	The project is being developed as a unilateral project.
2. The project shall assist non-Annex I Parties in contributing to the ultimate objective of the UNFCCC.	Kyoto Protocol Art.12.2.	OK
3. The project shall have the written approval of voluntary participation from the designated national authority of each Party involved.	Kyoto Protocol Art. 12.5a, CDM Modalities and Procedures §40a	CAR-1 OK
4. The project shall assist non-Annex I Parties in achieving sustainable development and shall have obtained confirmation by the host country thereof.	Kyoto Protocol Art. 12.2, CDM Modalities and Procedures §40a	OK
5. In case public funding from Parties included in Annex I is used for the project activity, these Parties shall provide an affirmation that such funding does not result in a diversion of official development assistance and is separate from and is not counted towards the financial obligations of these Parties.	Decision 17/CP.7, CDM Modalities and Procedures Appendix B, § 2	NA, no Annex I party is identified.
6. Parties participating in the CDM shall designate a national authority for the CDM.	CDM Modalities and Procedures §29	OK
7. The host Party and the participating Annex I Party shall be a Party to the Kyoto Protocol.	CDM Modalities §30/31a	OK
8. The participating Annex I Party's assigned amount shall have been calculated and recorded.	CDM Modalities and Procedures §31b	OK
9. The participating Annex I Party shall have in place a national system for estimating GHG emissions and a national registry in accordance with Kyoto	CDM Modalities and Procedures §31b	NA

Requirement	Reference	Conclusion
Protocol Article 5 and 7.		
About additionality		
10. Reduction in GHG emissions shall be additional to any that would occur in the absence of the project activity, i.e. a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity.	Kyoto Protocol Art. 12.5c, CDM Modalities and Procedures §43	CAR-2 OK
About forecast emission reductions and environmental impacts		
11. The emission reductions shall be real, measurable and give long-term benefits related to the mitigation of climate change.	Kyoto Protocol Art. 12.5b	OK
About small-scale project activities (if applicable)		
12. The proposed project activity shall meet the eligibility criteria for small scale CDM project activities set out in § 6 (c) of the Marrakech Accords and shall not be a debundled component of a larger project activity.	Simplified Modalities and Procedures for Small Scale CDM Project Activities §12a,c	OK
13. The proposed project activity shall confirm to one of the project categories defined for small scale CDM project activities and use the simplified baseline and monitoring methodology for that project category.	Simplified Modalities and Procedures for Small Scale CDM Project Activities §22e	OK
14. If required by the host country, an analysis of the environmental impacts of the project activity is carried out and documented.	Simplified Modalities and Procedures for Small Scale CDM Project Activities §22c	OK
About stakeholder involvement		
15. Comments by local stakeholders shall be invited, a summary of these provided and how due account was taken of any comments received.	CDM Modalities and Procedures §37b	CL-7 OK
16. Parties, stakeholders and UNFCCC accredited NGOs shall have been invited to comment on the validation requirements for minimum 30 days, and the project design document and comments have been made publicly available.	CDM Modalities and Procedures §40	OK. PDD has been published in UNFCCC site from 10

Requirement	Reference	Conclusion
		Nov 07 to 9 Dec 07 for global stakeholder comments. The PDD, dated 9 September 2008, was republished for global stakeholder consultation from 25 September 2008 to 24 October 2008 No comments were received.
Other		
17. The baseline and monitoring methodology shall be previously approved by the CDM Executive Board.	CDM Modalities and Procedures §37e	OK
18. A baseline shall be established on a project-specific basis, in a transparent manner and taking into account relevant national and/or sectoral policies and circumstances.	CDM Modalities and Procedures §45c,d	OK
19. The baseline methodology shall exclude to earn CERs for decreases in activity	CDM Modalities and Procedures §47	OK

Requirement	Reference	Conclusion
levels outside the project activity or due to force majeure.		
20. The project design document shall be in conformance with the UNFCCC CDM-PDD format.	CDM Modalities and Procedures Appendix B, EB Decision	OK
21. Provisions for monitoring, verification and reporting shall be in accordance with the modalities described in the Marrakech Accords and relevant decisions of the COP/MOP.	CDM Modalities and Procedures §37f	OK

Table 2 Requirements Checklist

CHECKLIST QUESTION		Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
* MoV = Means of Verification, DR= Document Review, I= Interview						
A. General Description of Project Activity <i>The project design is assessed.</i>						
A.1. Project Boundaries <i>Project Boundaries are the limits and borders defining the GHG emission reduction project.</i>						
A.1.1. Are the project's spatial boundaries (geographical) clearly defined?		/1/	DR	Yes, the project is located 18 Km from Chamba and 390 Km from State Head Quarters Shimla in the state of Himachal Pradesh. The geographical coordinates of the project site are 32°31'56" to 32°39'44" N and 76°12'30" to 76°22'58" E.		OK
A.1.2. Are the project's system boundaries (components and facilities used to mitigate GHGs) clearly defined?		/1/	DR/I	The project system boundary includes the power plant from diversion weir to transmission system till the evacuation point. The plant consists of two numbers of 2.5MW horizontal impulse turbines. The spatial boundary of the project includes the Northern regional grid.		OK
A.2. Participation Requirements <i>Referring to Part A, Annex 1 and 2 of the PDD as well as the CDM glossary with respect to the terms Party, Letter of Approval, Authorization and Project Participant.</i>						

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
A.2.1. Which Parties and project participants are participating in the project?	/1/	DR/I	India is the host country and Him Kailash Hydro Power Pvt Ltd is the project participants. No Annex I country is identified.		OK
A.2.2. Have all involved Parties provided a valid and complete letter of approval and have all private/public project participants been authorized by an involved Party?	/1/	DR/I	Host country India is yet to provide the letter of approval in addition to the authorization to the project participant. Host Country Approval letter needs to be provided for verification.	CAR-1	
A.2.3. Do all participating Parties fulfil the participation requirements as follows: - Ratification of the Kyoto Protocol - Voluntary participation - Designated a National Authority	/1/	DR/I	India fulfils the participation requirements, having ratified the Kyoto Protocol on the 26 August 2002 and has established a DNA - National Clean development Mechanism Authority, Ministry of Environment and Forests (MoEF). The voluntary participation of the project needs to be confirmed against the letter of approval from the DNA	CAR-1	
A.2.4. Potential public funding for the project from Parties in Annex I shall not be a diversion of official development assistance.	/1/	DR/I	Validation does not reveal any information on the involvement of official development assistance.		OK
A.3. Technology to be employed <i>Validation of project technology focuses on the project engineering, choice of technology and competence/</i>					

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
<i>maintenance needs. The validator should ensure that environmentally safe and sound technology and know-how is used.</i>					
A.3.1. Does the project design engineering reflect current good practices?	/1/ /6/ /8/	DR/I	The technology employed in the project reflects current good practice. Generator and transformer safety panels are installed.		OK
A.3.2. Does the project use state of the art technology or would the technology result in a significantly better performance than any commonly used technologies in the host country?	/1/	DR	The project uses current good practice technology. The project technology is available in India.		OK
A.3.3. Does the project make provisions for meeting training and maintenance needs?	/1/	DR/I	The project does not make any provisions as of now, since the project is under implementation. Training and maintenance procedures need to be formalized. CDM manual may be provided.		OK
A.4. Contribution to Sustainable Development <i>The project's contribution to sustainable development is assessed.</i>					
A.4.1. Has the host country confirmed that the project assists it in achieving sustainable development?	/1/	DR	The letter of approval from the DNA confirming that the project assists in achieving sustainable development needs to be submitted.	CAR-1	
A.4.2. Will the project create other environmental or social benefits than GHG emission reductions?	/1/	DR/I	The project activity will create employment opportunities during construction and also operation phases.		OK

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview		Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
A.5. Small scale project activity <i>It is assessed whether the project qualifies as small-scale CDM project activity</i>						
A.5.1. Does the project qualify as a small scale CDM project activity as defined in paragraph 6 (c) of decision 17/CP.7 on the modalities and procedures for the CDM?		/1/	DR/I	The Project activity comprises of a 5 MW power generation unit using renewable energy (hydropower) as source of fuel. The power generated will be supplied to the regional grid. This project qualifies as Type I, Category D of the small scale CDM projects and as the generation capacity is below the stipulated limit of 15MW.		OK
A.5.2. Is the small scale project activity not a debundled component of a larger project activity?		/1/	DR/I	Project proponent is not involved with any other CDM project activity in the same category and within 1 km of project boundary in last 2 years, hence the project is not a de-bundled component of a larger project activity..		OK
B. Project Baseline <i>The validation of the project baseline establishes whether the selected baseline methodology is appropriate and whether the selected baseline represents a likely baseline scenario.</i>						
B.1. Baseline Methodology <i>It is assessed whether the project applies an appropriate baseline methodology.</i>						

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
B.1.1. Does the project apply an approved methodology and the correct version thereof?	/1/	DR/I	Yes the project confirms to the Category type I D, version 12 for small scale CDM projects. The project is a grid connected renewable electricity generation unit (hydro).		OK
B.1.2. Are the applicability criteria in the baseline methodology all fulfilled?	/1/ /6/ /8/	DR/I	The applicability conditions of the methodology are fulfilled. The project is a grid connected 5 MW small hydro power unit (renewable). The geographical and system boundary of relevant electricity grid-Northern regional grid can be clearly identified.	CL-1	OK
B.2. Baseline Scenario Determination <i>The choice of the baseline scenario will be validated with focus on whether the baseline is a likely scenario, and whether the methodology to define the baseline scenario has been followed in a complete and transparent manner.</i>					
B.2.1. What is the baseline scenario?	/1/	DR/I	The baseline scenario as per the methodology is that in the absence of the project activity, equivalent amount of energy would have been generated from the existing plants or newer plants by using the fossil fuels in the northern grid to which the project activity is connected.		OK
B.2.2. What other alternative scenarios have been considered and why is the selected scenario the most likely one?	/1/	DR/I	No alternate scenario analysis is done. The same is not required as per the methodology.		OK

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
B.2.3. Has the baseline scenario been determined according to the methodology?	/1/	DR/I	Yes, the baseline scenario has been determined as per the methodology.		OK
B.2.4. Has the baseline scenario been determined using conservative assumptions where possible?	/1/	DR/I	Yes, the baseline scenario is arrived based on conservative assumptions.		OK
B.2.5. Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies, macro-economic trends and political aspirations?	/1/	DR/I	Yes, national and sectoral policies have been taken into consideration for selecting the baseline scenario.		OK
B.2.6. Is the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?	/1/	DR/I	Yes, the baseline determination is compatible with available data and literature.		OK
B.2.7. Have the major risks to the baseline been identified?	/1/	DR/I	There are no major risks perceived to the proposed baseline.		OK
B.3. Additionality Determination <i>The assessment of additionality will be validated with focus on whether the project itself is not a likely baseline scenario.</i>					
B.3.1. Is the project additionality assessed according to the methodology?	/1/ /6/ /7/ /8/ /26/	DR/I	As per the Attachment A to Appendix B, the project has been analysed in light of investment barrier, prevailing practice and other barriers 1) Investment barrier: This is demonstrated through long gestation period and uncertainty	CAR-2	OK

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview		Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
		/36/		<p>of hydrology.</p> <p>Long gestation period: It is been indicated that due to the nature of topography, a 1.12 Km long water conductor tunnel has to be constructed rather than an open channel water conductor system. However, during site visit it has been identified that there is no change in the basic design and the channel is closed wherever required.</p> <p>Gestation period of 5 years needs to be substantiated. Evidence for the mentioned investment cost and the source of finance needs to be provided</p> <p>Uncertainty of hydrology: It has been claimed that average PLF of the small hydro power plants in Himachal Pradesh is 35%. During site visit it has been informed that the plant will have an average PLF of 80%. Further, barrier due to average PLF of 35% contradicts the assumed PLF of 83.03% for the proposed project.</p> <p>Hydrological data of the region needs to be provided for verification.</p> <p>DPR of the project needs to be provided.</p> <p>IRR analysis for the project life time needs to be provided.</p> <p>PPA needs to be provided for verification.</p> <p>2) Prevailing practice barrier: It is been</p>		

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview		Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
				<p>indicated that small hydro contributes for 1.15% to India's total installed capacity and 1.58% of the total generation of the northern region. Projects under HIMURJA contribute to 23.9% of the total installed capacity of small hydro in the state.</p> <p>Clarification is requested on:</p> <p>Demonstration of the barrier specifically faced by the proposed project due to the prevailing practice. Also it needs to be clarified on the benefits of projects under the HIMURJA and whether this project comes under that scheme.</p> <p>3) Other barriers:</p> <p>Geological risk: Due to frequent occurrence of flash flood, financial damage loss of time has happened to the project activity for three times in two years. Landslide and earthquakes are also identified as barriers. However, project proponent is requested to demonstrate how the geological barriers like landslides and earthquakes are specific to the proposed project activity and not a barrier to other similar non CDM projects.</p> <p>Institutional barriers: It has been mentioned that original MoU was signed between government and first promoter in 2001 and PPA was signed in 2004. Tariff of Rs</p>		

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				<p>2.50/kWh is fixed for the entire period of the agreement. Supporting proofs needs to be furnished.</p> <p>PP needs to justify the cause of delay in the start of project activity as the MoU was signed in 2001.</p> <p>Other barriers: Inadequacy in finance and high social cost are indicated as barriers.</p> <p>The focus of Hydropower policy in India and Himachal Pradesh towards large and medium sized hydro project and guidelines under HIMURJA policy are also identified as the barriers.</p> <p>Proponent is requested to provide evidence of techno economical clearance'2003. Proof for the sanction letters of IREDA needs to be provided for verification.</p> <p>It has been informed during site visit that the project has no water charge for 10 years and 0% income tax for 15 years. Proponent is requested to demonstrate the barrier due to HIMURJA policy. Further, this remains to be justified as to how 90% of thermal acts as a barrier to the project.</p>		
B.3.2. Are all assumptions stated in a transparent and conservative manner?	/1/	DR/I	Refer to B.3.1	CAR-2	OK	
B.3.3. Is sufficient evidence provided to support the	/1/	DR/I	Refer to B.3.1	CAR-2	OK	

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
relevance of the arguments made?					
B.3.4. If the starting date of the project activity is before the date of validation, has sufficient evidence been provided that the incentive from the CDM was seriously considered in the decision to proceed with the project activity?	/1/ /5/ /22/	DR/I	Starting date of the project activity is stated to be 9 th December 2005, which is the date for the electro mechanical equipment purchase agreement. Proof for the same needs to be provided. Start date of the civil construction needs to be provided. Proof/evidence for CDM consideration prior to the project needs to be furnished. Clarification on the cause of delay for the project proponents to approach a DOE is to be provided.	CL-2	OK
B.4. Calculation of GHG Emission Reductions – Project emissions <i>It is assessed whether the project emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.</i>					
B.4.1. Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR/I	Proposed project being a small hydro power project, project emission is not accounted for. During site visit it has been informed that DG sets will be used for emergency start up. This needs to be addressed.	CL-3	OK
B.4.2. Have conservative assumptions been used when	/1/	DR/I	Not applicable, as project emission is not		OK

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calculating the project emissions?			accounted.		
B.4.3. Are uncertainties in the project emission estimates properly addressed?	/1/	DR/I	NA		OK
B.5. Calculation of GHG Emission Reductions – Baseline emissions <i>It is assessed whether the baseline emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.</i>					
B.5.1. Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/ /21/	DR/I	Baseline emissions have been estimated as the product of electricity generated in the project activity per year and grid emission factor of the northern regional grid, which have been obtained from the official website of the Central Electricity authority (CEA) The installed capacity of project plant is 5 MW and the plant is expected to export an average of 33.299 GWh electricity to the grid per year at an plant load factor of 82%.		OK
B.5.2. Have conservative assumptions been used when calculating the baseline emissions?	/1/ /21/	DR/I	Yes. The chosen baseline is in accordance with the baseline methodology AMS ID. Simple OM emission factor published by CEA are calculated based on the three years data 2003-04, 2004-05, 2005-06 and BM is calculated based on 20% most recent capacity additions in the grid based on net		OK

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			generation The chosen baseline is transparent and the choice of emission factor of the current generation mix used for estimation of emission coefficient is conservative. It is clearly mentioned in the PDD that, the baseline estimation will consider an ex-ante emission factor throughout the crediting period. Hence, monitoring of OM and BM is not required.		
B.5.3. Are uncertainties in the baseline emission estimates properly addressed?	/1/	DR/I	Refer to B.5.1		OK
B.6. Calculation of GHG Emission Reductions – Leakage <i>It is assessed whether leakage emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.</i>					
B.6.1. Are the leakage calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR/I	No transfer of equipment is taking place. Leakage is not accounted for.		OK
B.6.2. Have conservative assumptions been used when calculating the leakage emissions?	/1/	DR/I	NA		OK
B.6.3. Are uncertainties in the leakage emission estimates properly addressed?	/1/	DR/I	NA		OK

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B.7. Emission Reductions <i>The emission reductions shall be real, measurable and give long-term benefits related to the mitigation of climate change.</i>						
B.7.1. Are the emission reductions real, measurable and give long-term benefits related to the mitigation of climate change.		/1/	DR/I	The project activity on implementation as stated is expected to result in emission reduction of 26,406 tCO ₂ e annually through out the 10 year fixed crediting period. Net electricity exported to the grid will be measured monthly.		OK
B.8. Monitoring Methodology <i>It is assessed whether the project applies an appropriate monitoring methodology.</i>						
B.8.1. Is the monitoring plan documented according to the approved methodology and in a complete and transparent manner?		/1/	DR/I	Yes.		OK
B.8.2. Will all monitored data required for verification and issuance be kept for two years after the end of the crediting period or the last issuance of CERs, for this project activity, whichever occurs later?		/1/	DR/I	Yes.		OK
B.9. Monitoring of Project Emissions <i>It is established whether the monitoring plan provides for reliable and complete project emission data over time.</i>						
B.9.1. Does the monitoring plan provide for the collection and archiving of all relevant data		/1/	DR/I	Not applicable. Project emission is not		OK

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necessary for estimation or measuring the greenhouse gas emissions within the project boundary during the crediting period?			accounted for.		
B.10. Monitoring of Baseline Emissions <i>It is established whether the monitoring plan provides for reliable and complete baseline emission data over time.</i>					
B.10.1.Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining baseline emissions during the crediting period?	/1/	DR/I	For baseline calculations, net electricity supplied to grid by the project activity will be measured using main and check meters. Same will be documented. Gross electricity generated by the project and auxiliary consumption will be monitored and is done by metering the electricity. The power generated is recorded by meters and same will be documented. Electricity imported from grid by the project will be measured monthly. During site visit it has been informed that the data from the main meter will be recorded by SEB in presence of one member of the proponent. The data can be cross checked against bills from SEB.		OK
B.10.2.Are the choices of baseline GHG indicators reasonable and conservative?	/1/	DR/I	Yes.		OK
B.10.3.Is the measurement method clearly stated for each	/1/	DR/I	Refer to B.10.1		Ok

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baseline indicator to be monitored and also deemed appropriate?					
B.10.4. Is the measurement <i>equipment</i> described and deemed appropriate?	/1/	DR/I	Electricity meters will be used.		OK
B.10.5. Is the measurement <i>accuracy</i> addressed and deemed appropriate? Are procedures in place on how to deal with erroneous measurements?	/1/	DR/I	Net electricity supplied to the grid and imported from will be measured by electricity meter. Main and check meter will be used for measuring net electricity supplied to grid. Project proponent needs to mention the back up procedure to deal with error in meter and data error. Accuracy level of the meter needs to be addressed.	CL4	OK
B.10.6. Is the measurement <i>interval</i> for baseline data identified and deemed appropriate?	/1/	DR/I	Yes, data will be measured and recorded monthly.		OK
B.10.7. Is the registration, <i>monitoring, measurement and reporting</i> procedure defined?	/1/	DR/I	BoD is the authority for registration, monitoring, measurement, reporting and reviewing the data.		OK
B.10.8. Are procedures identified for <i>maintenance</i> of monitoring equipment and installations? Are the calibration intervals being observed?	/1/	DR/I	The meters will be calibrated as per the industry standard. Accuracy of the main and check meter for net electricity will be tested every 6 months. However, comments in B.10.5 needs to be addressed	CL4	OK

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B.10.9.Are procedures identified for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation)	/1/	DR/I	Yes. Data will be recorded and aggregated monthly.		OK
B.11. Monitoring of Leakage <i>It is assessed whether the monitoring plan provides for reliable and complete leakage data over time.</i>					
B.11.1.Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining leakage?	/1/	DR	Leakage is not accounted for as no transfer of equipments is taking place.		OK
B.11.2.Are the choices of project leakage indicators reasonable and conservative?	/1/	DR	NA		OK
B.11.3.Is the measurement method clearly stated for each leakage value to be monitored and deemed appropriate?	/1/	DR	NA		OK
B.12. Monitoring of Sustainable Development Indicators/ Environmental Impacts <i>It is assessed whether choices of indicators are reasonable and complete to monitor sustainable performance over time.</i>					
B.12.1.Is the monitoring of sustainable development indicators/ environmental impacts warranted by legislation in the host country?	/1/	DR	The DNA of India does not warrant monitoring of sustainable development indicators.		OK

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B.12.2.Does the monitoring plan provide for the collection and archiving of relevant data concerning environmental, social and economic impacts?	/1/	DR	NA		OK
B.12.3.Are the sustainable development indicators in line with stated national priorities in the Host Country?	/1/	DR/I	Project activity is in line with social, economical, environmental and technological well being.		OK
B.13. Project Management Planning <i>It is checked that project implementation is properly prepared for and that critical arrangements are addressed.</i>					
B.13.1.Is the authority and responsibility of overall project management clearly described?	/1/	DR/I	Board of Directors is the overall authority for project management.		OK
B.13.2.Are procedures identified for training of monitoring personnel?	/1/	DR/I	Training of the monitoring personnel needs to be addressed.	CL4	OK
B.13.3.Are procedures identified for emergency preparedness for cases where emergencies can cause unintended emissions?	/1/	DR/I	No GHG emission related to project is expected to occur.		OK
B.13.4.Are procedures identified for review of reported results/data?	/1/	DR/I	All the results and data will be reviewed by BoD.		OK
B.13.5.Are procedures identified for corrective actions in order to provide for more accurate future monitoring and reporting?	/1/	DR/I	Procedure for corrective action for providing more accurate data in the future needs to be	CL5	OK

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				formalized.		
C. Duration of the Project/ Crediting Period <i>It is assessed whether the temporary boundaries of the project are clearly defined.</i>						
C.1.1. Are the project's starting date and operational lifetime clearly defined and evidenced?		/1/	DR/I	Starting date of the project activity is 9 December 2005, which is the date for the electro mechanical equipment purchase agreement. The project operational life time is 30 years. Start date of the civil construction needs to be provided. Proof/evidence for fact that CDM was considered in deciding to proceed with the project. Cause of delay for the project proponents to approach a DOE	CL-2	OK
C.1.2. Is the start of the crediting period clearly defined and reasonable?		/1/	DR	Starting date of the crediting period is 1 st April 2008.		OK
D. Environmental Impacts <i>Documentation on the analysis of the environmental impacts will be assessed, and if deemed significant, an EIA should be provided to the validator.</i>						
D.1. For Small-scale projects						
D.1.1. Does host country legislation require an analysis of the environmental impacts of the project		/1/	DR	No, since the project cost is less than INR 1000 million, it is not required to carry out		OK

CHECKLIST QUESTION * MoV = Means of Verification, DR= Document Review, I= Interview	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
activity?			EIA for the project.		
D.1.2. Does the project comply with environmental legislation in the host country?	/1/ /14/ /11/ /16/	DR/I	All statutory clearance and MoUs needs to be provided.	CAR-3	OK
D.1.3. Will the project create any adverse environmental effects?	/1/	DR	The project being a run of river project, does not involve submergence of land and rehabilitation. During site visit, it has been informed that the project will discharge 20% of water to the main Sahu nallah, as required by MoU with the government.		OK
D.1.4. Have environmental impacts been identified and addressed in the PDD?	/1/	DR	No adverse environmental effect is envisaged from the project activity.		OK
E. Stakeholder Comments <i>The validator should ensure that stakeholder comments have been invited with appropriate media and that due account has been taken of any comments received.</i>					
E.1.1. Have relevant stakeholders been consulted?	/1/ /13/ /23/	DR/I	The identified stakeholders are Himachal Pradesh Government Energy Development Agency (HIMURJA), Himachal Pradesh State Electricity Board (HPSEB), Electricity Regulatory Commission of Himachal Pradesh (ERCHP), Himachal Pradesh State Environment Protection & Pollution Control Board (HPPCB), Department of Irrigation,	CL-6	OK

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			Govt. of Himachal Pradesh, Ministry of Environment and Forest and local village panchayat. It is not clear from PDD whether local population or local NGOs were involved in the stakeholder's consultation process. When and where stake holder consultation was conducted. Supporting evidence for the same needs to be furnished. Project proponent needs to specify the media used for inviting local stake holders comments. Proof for the same needs to be provided. It has been indicated that no negative comments were received. This needs to be demonstrated with supporting proof, by providing minutes of meeting.		
E.1.2. Have appropriate media been used to invite comments by local stakeholders?	/1/ /13/ /23/	DR/I	Project proponent needs to specify the media used for inviting local stake holders comments Proof for the same needs to be provided.	CL-6	OK
E.1.3. If a stakeholder consultation process is required by regulations/laws in the host country, has the stakeholder consultation process been carried out in accordance with such regulations/laws?	/1/	DR/I	Not specifically required for small hydro project under Indian legislation.		OK
E.1.4. Is a summary of the stakeholder comments received provided?	/1/	DR/I	No negative comments were received.	CL-6	OK

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				Proof for the same needs to be provided.		
E.1.5. Has due account been taken of any stakeholder comments received?		/1/	DR/I	Not accounted for, as no negative comments were received.		OK

Table 3 Resolution of Corrective Action and Clarification Requests

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
CAR 1 LoA from host country needs to be provided.	A.2.2, A.2.3, A.4.1	The company made a presentation before Indian DNA for LOA and the same is expected shortly.	Letter of approval has been provided and verified by DNV. OK. CAR 1 is closed.
CAR 2 1) Investment barrier: During site visit it has been identified that there was no change in the basic design and the channel is closed wherever required. Gestation period of 5 years needs to be substantiated. Evidence/proof for the mentioned investment cost and the source of finance needs to be provided	B.3.1-B.3.3	Reasons for long gestation: 1) The PP obtained the various approvals by 2004 and after detailed analysis of site conditions etc commenced the implementation in 2005. Evidence is furnished in the form of agreement executed for civil contract as well as order placed for electro mechanical equipment. The date of activity commencement is accordingly changed in the PDD to July 2005 being the date when an order was placed for execution of civil works. Though the construction was commenced in 2005, the project is still under implementation due to nature of terrain, and climatic disturbances etc. The terrain is loose and originally the PP contemplated open channel for water conductor system. This is evident even from the DPR. But as advised, the design had to be changed for tunnel construction and this has delayed the project gestation period. Further there were flash floods and cloud bursts in the	Though the PP has received various proposals by 2004, the order for civil work has been place on 8 July 2005. A copy of agreement form signed between the PP and the construction company has been provided and verified by DNV. Though there was no change in the basic design of the tunnel, it has been verified from the DPR and during the site visit that due to the nature of terrain, the tunnel needs to be covered in certain area. The news paper clippings and the picture depicting the same has been provided and verified by DNV. It has been confirmed from the chartered accountant (CA) certificate that the actual cost of the project is Rs323 million against the anticipated cost of Rs.283.2 million. Newspaper

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p><u>Uncertainty of hydrology:</u> During site visit it has been informed that the plant will have an average PLF of 80%. Barrier due to average PLF of 35% contradicts the assumed PLF of 83.03% for the</p>		<p>project region. These occurred on 30/06/2007 and 02/05/2007. These flash floods have caused enormous damage in terms of physical disturbance to various activities as well as loss of time for implementation. Particularly in the last flood, the turbines were damaged due to entry of flood water in the turbines. Cost of project has escalated and the promoter had to arrange extra finances for completing the project. All these factors have led to long gestation period.</p> <p>The investment estimated originally is Rs.281.7 millions and the same went up to Rs 320 millions due to long gestation and the loss due to flash floods. The same is funded by term loan of Rs 206.5 million and the balance by way of share capital and unsecured loans. Confirmation on the investment made will be furnished as evidence of cost of project and the means of finance.</p> <p>The project activity is a small hydro power project with an installed capacity of 5 MWs. Himachal Pradesh Government does not publish hydrology data in respect of small streams. Therefore, the hydrology data has to be</p>	<p>cutting and photographs depicting the occurrence of floods during the construction phase of the project are furnished to DNV.</p> <p>It has been demonstrated that the average PLF of region is 35%. The anticipated PLF in the DPR was about 80%, however, it has been verified that there is no hydrological data</p>

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>proposed project.</p> <p>Hydrological data of the region needs to be provided for verification.</p>		<p>collated, interpolated and such data should correlated to other reliable information to draw valid inferences. Needless to state, while interpolation may not yield accurate data, correlating the interpolated data with other reliable information could provide a data which could to be relied upon to some extent, albeit after subjecting it to sensitivity analysis. Error in uncorrelated data could be very high and in this particular case, it could lead to under or over estimation of the available potential. The PLF projected in the DPR was based on such interpolations. However, a reasonable estimation of PLF can be made based on the power generation achieved by up-stream projects. The PP has collected generation details of Sal stage II and Burisingh - both up stream project and found that they had achieved a PLF of around 30%. Details of PLF achieved these projects have already been furnished. If the upstream project does not achieve even 40% PLF, the question of downstream project achieving 83% PLF is ruled out. This demonstrates that the project may not achieve 83% PLF. No hydrology data is published by Government of Himachal Pradesh for the Chamba region. The hydrology is worked out based on catchment area, rainfall and snow fall.</p>	<p>available in the state and the PLF was assumed from the extrapolated data of two lean season data of 2001 and 2002. It has also been verified from the annual administration report 2004-2005 that the actual annual average PLF is 35% in the project region.</p> <p>The average PLF of the region has been verified against the annual administration report of the Himachal Pradesh State Electricity Board.</p>

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>DPR of the project needs to be provided.</p> <p>IRR analysis for the project life time needs to be provided.</p> <p>PPA needs to be provided for verification.</p> <p>2) Prevailing practice: As the prevailing practice analysis has not been justified in relation to the non CDM hydro projects in the region, the proponent is requested to remove the same, incase not further justified.</p> <p>3) Other barriers:</p>		<p>The study is carried out by Sai Engineering Foundation, a reputed consultancy company in Himachal Pradesh.</p> <p>DPR in the form of hard copy is furnished separately</p> <p>The Additionality is demonstrated using investment barrier and the financial statements are being provided to the DOE</p> <p>Hard copy of PPA is provided for verification.</p> <p>We have excluded prevailing practice analysis as the investment and other barriers considered are sufficient to prove the additionality.</p> <p>3)</p>	<p>DPR has been furnished.</p> <p>IRR analysis has been added in the demonstrating the additionality in the revised PDD. The IRR excel sheet and the financial inputs has been verified by DNV. Sensitivity analysis for the key parameters for the variation where the project IRR touches the benchmark.</p> <p>The hard copy of the PPA has been submitted and verified by DNV.</p> <p>The proponent has removed the prevailing practice analysis and the PDD has been revised.</p> <p>The barrier in the implementation phase of the project has been demonstrated along with the</p>

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>Project proponent is requested to demonstrate how the geological barriers like landslides and earthquakes are specific to the proposed project activity.</p>		<p>Even during the project planning stage, the pp was aware of the barriers the project is likely to face due to geological and hydrological barriers. The effect of the barriers identified will be an uncertainty on power generation as well as project viability.</p> <p>Cloud burst, flashfloods or land slides on account of geological barrier would on one hand effect the power generation and on the other hand may also result in long gestation period as well as increase in the cost of project generation. These barriers may not be prevalent had the project activity been initiated in plain lands. Even during implementation period, the PP has experienced the occurrence of the above barriers as explained below.</p> <p>A heavy flood occurred on 30-6-2007, during construction of the project. Both the power house and the tunnel were flooded with water (news paper clipping provided as an evidence for the same)</p> <p>Heavy floods in the chamba region on 2nd May 2007 flooded the power house again bringing heavy financial loss to the project proponent.(news paper clipping provided for the same)</p> <p>Apart from this, flash floods occurred during</p>	<p>photographs of flush flood that occurred. The other possible barrier has also been addressed. Newspaper cutting and photographs depicting the occurrence of floods during the construction phase of the project are furnished to DNV.</p>

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>Institutional barriers: Supporting proofs for the fixed tariff and MoU needs to be furnished.</p> <p>Other barriers: Inadequacy in finance and high social cost are indicated as barriers.</p>		<p>the construction of the project also damaged the power house and the machinery.</p> <p>Evidences in respect to the above are furnished for verification. Since all these barriers have happened in the Chamba region, It may be concluded by the PP that the Chamba region is more prone for the barriers perceived by the PP.</p> <p>Evidence in respect of date of signing of MoU with Government of Himachal Pradesh and date of execution of MoU is provided for verification to support the claim of long gestation for obtaining clearances which would effect investment estimation whereas the tariff is a fixed tariff.</p> <p>The CA certificate furnished indicates the total investment incurred for establishment of the project. The IREDA sanction letter indicates the amount sanctioned for the project. These two documents may be taken as evidence in respect of inadequacy of finances. The project proponent has certainly faced significant constraint with respect to achieving finance from financial institution. The PP approached IREDA with a project cost of Rs.285.7 million seeking a loan of Rs.199.64 million yielding a</p>	<p>A copy of MOU with the government of Himachal Pradesh, dated 3 September 2003 has been provided. The PPA shows that the tariff is fixed.</p> <p>The loan sanction letters from IREDA has been provided for verification. As per the letters from IREDA, the proponent has been granted the amount of loan as applied for by the proponent. The loan from the IREDA, including the additional loan, is Rs206.5 million against the total actual cost of Rs323 million. It has also been verified that the first loan has been sanctioned on 7 June 2004 was of Rs172.5 million and the</p>

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
Proponent is requested to provide evidence of techno economical clearance'2003. Proof for the		<p>debt: equity ratio of 70:30, which is normally the financing pattern applied to such projects. However, during the course of appraisal, mainly due to limited knowledge, the financial institution appraised the project cost at Rs.281.7 million and sanctioned a term loan of only Rs.172.5 million resulting in a debt: equity ratio of 61:39. This resulted in additional financial burden of Rs.31 million. However, the correctness of the project cost estimation made by the PP was proved subsequently, leading IREDA to sanction an additional term loan of Rs.34 million. But, in the process, there was an avoidable delay in implementation of the project and the project had to face a resultant escalation in the project cost. Overcapitalization of the project resulted out of inadequate sanction of finance could have been avoided had the institution sanctioned the term loan requested for in the first instance. The letter submitted to IREDA seeking loan of Rs.199.60 million, original project cost of Rs.285.7 million, sanction of term loan of Rs.172.5 million and additional term loan of Rs.34 million are enclosed as reference.</p> <p>A statement made by the project proponent indicating the social cost incurred on the project activity is also furnished for verification.</p>	additional loan of Rs34 million has been sanctioned on 10 May 2007.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>sanction letters of IREDA needs to be provided for verification.</p> <p>CAR 2 continues: Proponent has to clarify the date when the DPR was prepared. The O&M cost and the loan repayment period does not match the indicators provided in the DPR</p>		<p>Techno economic clearance of 2003 and proof of sanction letters of IREDA are furnished by way of hard copies.</p> <p>Further clarification:</p> <p>The PP signed an MoU with the Government of Himachal Pradesh on 17th May 2001, for preparing the DPR. The DPR was made in January 2003.</p> <p>O&M Costs are charged at 1.5 % on Project Cost as mentioned in DPR. But, as the services are rendered by a contractor and as Service Tax is applicable at 10.20% as per Finance Act,1994, the same has been provided which worked out to 1.65% .The Service tax rate for the Financial year 2005-06 is 10.20% (Service tax rate at 10% : http://indiabudget.nic.in/ub2005-06/cen/exnotest.pdf and Education cess @ 2% on Service Tax i.e.0.20% .Total effective Service Tax Rate is 10.20%)</p> <p>Total Loan Repayment period is 10 years as per DPR including moratorium period. Loan Payback period is only 7 years even as per DPR .Please refer to Chapter 14 (Annexure B – Sheet 1).</p>	<p>Techno economical clearance and IREDA loan letters has been provided by the proponent.</p> <p>Date of preparation of DPR has been clarified. The DPR had been submitted to the Govt. of Himachal Pradesh and inline of which the techno economical clearance was provided to proponent on February 2003.</p> <p>The O&M cost assumed in the project IRR calculation includes the services tax of 10% and thus there is increase in the O&M. The loan repayment period has been further cross checked against the DPR and the loan letter from IREDA and the applied years of repayment is found to be acceptable.</p> <p>CAR 2 continues.</p>

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>CAR 2 continues:</p> <p>Investment analysis:</p> <p>The proponent is requested to clarify the source of beta value considered for the cost of equity calculation and justify the applicability of the value of same to the proposed project activity. This needs to be supported with necessary evidences.</p>	B.3.1-B.3.3	<p>PP had taken the beta values of Tata Power and reliance infrastructure from published data and the beta value for NLC and BF utilities is calculated. The work sheet for calculation of unlevered beta value is being provided to the DOE for reference.</p> <p>The PP had taken the lowest unlevered beta value of power generating companies for the purpose of calculating expected return on equity. The necessary explanation is made in the PDD.</p>	<p>Benchmark of 14.34% has been selected, which is the WACC for the project activity. WACC has been calculated considering the cost of debt and cost of equity. Cost of debt has been verified by DNV from the interest rate as per the loan sanction letter. Cost of equity has been calculated as per the Capital Asset Pricing Model (CAPM). The beta value, used for the cost of equity calculation, in the CAPM model, has been calculated from the stock exchange data. The levered beta for the all the conventional and non conventional power plants listed in the BSE (Bombay Stock Exchange) and NSE (National Stock Exchange) data at the time of investment decision has been considered and the lowest levered beta value, of all the listed power companies at time of CDM decision by Board of Director, has been converted to unlevered beta value, which is 0.811 and has been considered for the calculation of cost</p>

⁶ Collated from Tariff Orders of various State Electricity Regulatory Commissions

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>The proponent is requested to provide evidence for PLF of 50%.</p>		<p>Unlike conventional thermal power projects, PLF achieved by hydroelectric power projects is lower. It varies from place to place and season to season. While thermal power projects</p>	<p>of equity of the project activity. The market return or in this case, Compound Annual Growth Rate (CAGR) has been calculated from data of BSE for the year 2001 to 2004. The data from BSE has been accepted by DNV for the calculation of CAGR, as the number of listed company in BSE is more than NSE and thus, is more realistic. The risk free return on the investment has been sourced and verified from the Reserve bank of India data. The weighted average yield rates of Government bonds, with maturity period of 4 to 30, at time investment decision has been considered. As the cash flow has been conducted for 20, the bond maturity time of 4 to 30 years is considered to be applicable. Considering the calculation of CAGR, beta and bond rate, this is deemed to be conservative and thus as WACC benchmark of 14.34% is accepted by DNV.</p> <p>It has been verified from the Himachal Pradesh Electricity</p>

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion																
		<p>can yield a PLF of 80 to 85%, hydroelectric power projects yield a PLF of anywhere between 30 to 60%. The PLF assumed for Small Hydro Power Projects by some of the State Electricity Regulatory Commissions for determination of tariff is given below⁶:</p> <table><tr><td>State</td><td>PLF</td></tr><tr><td>HPERC</td><td>45%</td></tr><tr><td>UPERC</td><td>35%</td></tr><tr><td>UERC</td><td>45%</td></tr><tr><td>APERC</td><td>35%</td></tr><tr><td>Kerala ERC</td><td>30%</td></tr><tr><td>KERC</td><td>30%</td></tr><tr><td>MERC</td><td>30%</td></tr></table> <p>There are 22 hydro power plants in operation with varying capacities ranging from 0.05 MW to as high as 120 MW. Out of the 22 plants 3 projects are large hydro projects. Based on the statistics published by HP State Government, the average PLF of all these plants is less than 35%. However there are three plants with an average PLF of 50% and their details are:</p> <p>- 120 MW Bhaba : 52.75%</p>	State	PLF	HPERC	45%	UPERC	35%	UERC	45%	APERC	35%	Kerala ERC	30%	KERC	30%	MERC	30%	<p>Regulatory Commission’s tariff order that the PLF for the small hydro power plants in the state has been considered to be 45%. Further, it has also been verified from the HPSEB analysis that the average PLF in the region of the project activity is 35%. However, the analysis shows that 3 hydro plants in the region has PLF higher than 50%, among with two are large scale hydro power plant and thus excluded from the comparison. The only comparable hydro power plant with highest PLF in the project region is 6 MW Binwa plant and thus its PLF of 51.5% has been considered for the IRR analysis of the project activity and has been accepted by DNV.</p> <p>Sensitivity analysis has been included in the IRR excel sheet.</p>
State	PLF																		
HPERC	45%																		
UPERC	35%																		
UERC	45%																		
APERC	35%																		
Kerala ERC	30%																		
KERC	30%																		
MERC	30%																		

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>Sensitivity analysis for the key financial indicators up to the benchmark needs to be included in the IRR excel sheet.</p> <p>CAR 2: Proponent is requested to justify how the geological risk, hydrological risk etc, is a technical barrier. Proponent is requested to name it under “Other barrier”.</p>		<ul style="list-style-type: none"> - 60 MW Bassi : 53.05% - 6 MW Binwa : 51.50% <p>Thus out of the above three projects two are large hydro. Further out of 19 small hydro power plants with data on PLF, only one small hydro project, namely 6 MW Binwa is yielding a PLF of 51.5%.</p> <p>Necessary corrections have been made in the IRR excel sheet</p> <p>Necessary changes have been made in the PDD.</p>	<p>Technological barrier has been changed into other barriers. OK. CAR 2 is closed.</p>
<p>CAR 3 All statutory clearance and MoUs needs to be provided.</p>	D.1.2	<p>Hard copies of all approvals received for commencement of the project activity are furnished separately. These include MOU with Government of Himachal Pradesh for preparing DPR, Implementation agreement with Government of Himachal Pradesh, PPA, Permission from PCB, NOC from Irrigation and</p>	<p>All the statutory clearances have been provided and verified by DNV.</p> <p>OK. CAR 3 is closed.</p>

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
		Public health Department of Government of Himachal Pradesh, Forest clearance and permission from Panchayat are furnished for verification.	
CAR 4 As the methodology AMS ID, version 12 had been expired, the PDD needs to be revised as per the revised methodology version.		The PDD is revised as per version 13 of AMS ID and submitted to the DOE	The PDD has been revised as per AMS ID, version 13 and has been republished in UNFCCC website. OK. CAR 4 is closed.
CL 1 Training of monitoring personnel and maintenance procedures need to be formalized. CDM manual may be provided.	A.3.3, B.13.2	Since this is a small hydro project of 5 MW, there is no CDM manual. However, the management system procedures that will be followed by the PP are provided for reference	Detailed maintenance procedure have been provided and verified by DNV. Internal audit will be conducted every quarterly. OK. CL 1 is closed.
CL 2 Proof for the start date of the project activity needs to be provided. Start date of the civil construction needs to be provided. Proof/evidence for CDM consideration prior to the project needs to be furnished. Clarification on the cause of delay for the project proponents to	B.3.4, C.1.1	Evidence is furnished in the form of agreement executed for civil contract as well as order placed for electro mechanical equipment. The date of activity commencement is accordingly changed in the PDD to 8 th July 2005 being the date when an order is placed for execution of civil works. Detailed minutes of Board Meeting are being furnished to the DOE The calendar of events is being provided to the DOE for verification as an evidence of the chronology of the project activity.	A copy of agreement between the proponent and M/s Srinivasa Civil Works Pvt Ltd., dated 8 July 2005, on the execution and completion of the proposed project plant. The same date has been identified as the start date of the project activity. Extracts of the minutes of the BoD meeting, dated 17 March 2004 have been provided. The extract of the BoD meeting, dated

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>approach a DOE CL 2 continues.</p> <p>Proponent is requested to provide the detailed minutes of the BoD meeting.</p> <p>The proponent needs to substantiate the cause of delay with supporting evidence and provide the complete chronology of the project activity till date.</p> <p>Though the proponent encountered problems due to flush floods and long gestation period, it does not convincingly justify the cause of delay.</p>		<p>The project activity took more than 7 years for completion due to the envisaged problems in Himachal Pradesh. Though an MoU was signed with the State in May 2001, the final approval from Forest department came only in 2005. Actual implementation with respect to placement of orders etc was completed by July 2006. The PP basically a rice miller and was not experienced with respect to the intricacies of hydro project implementation and faced severe financial crunch as the money sanctioned by IREDA was not sufficient for implementation. The situation was such that he was not having sufficient funds to hire a CDM consultant and pay money to the DOE as the priority was for project implementation. As soon as the funds problem was solved and IREDA sanctioned additional loan in May 2007. The PP immediately appointed a consultant. As soon as the PDD was ready the DOE was hired for validation in August 2007. Thus the PP has no intention to delay the validation process and was genuinely affected by various factors.</p>	<p>17 March 2004, specifies that CDM has been considered. The proponent has approached DOE in 2007. It has been verified against the CA certificate that the actual project cost has been higher than the anticipated project cost in the detailed project report. It has been verified that the proponent has received the additional loan from IREDA on 10 May 2007.</p> <p>OK. CL 2 is closed.</p>
<p>CL 3</p> <p>Proposed project being a small</p>	<p>B.4.1</p>	<p>Changes have been incorporated in the PDD</p>	<p>The PDD has been revised.</p> <p>OK. CL 3 is closed.</p>

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
hydro power project, project emission is not accounted for. During site visit it has been informed that DG sets will be used for emergency start up. This needs to be addressed.		including DG set in the monitoring plan. DG set is used only for lighting for emergency purposes and hence consumption of diesel will be negligible.	
CL 4 Project proponent needs to mention the back up procedure to deal with error in meter and data error.	B.10.5, B.10.8	The main meter and the check meter shall be checked for accuracy insitu at least fifteen days before synchronization of the first unit and regularly as required by PPA.. The test for both the meters shall be done with reference to a portable sub standard meter, which shall be of accuracy class of meter under test and as per the prudent utility practices. If during the half yearly test checks , the main meter and the check meter are both found to be beyond the permissible limits of error, then both the meters shall be immediately replaced with spare calibrated meters and the correction applied to the consumption registered by the main meter to arrive at the correct consumption of energy for billing purposes for the period of two billing months prior to the month in which test check has been done and up to the time of calibration/ replacement of the defective meter. Accuracy class for active energy measurement	The procedure that will be adopted by proponent to deal with the meter error and data error has been adequately defined and addressed. Accuracy class of the meter is taken to be 0.5 as per the PPA. OK. CL 4 is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
Accuracy level of the meter needs to be addressed.		shall be 0.5 as defined in applicable IEC/Indian Standards. For all other values, the accuracy class shall be as per prudent utility practices.	
CL 5 Procedure for corrective action for providing more accurate data in the future needs to be formalized.	B.13.5	Management system procedures are produced as an evidence of the same.	The detailed management procedure has been provided and verified by DNV. The internal audit will be done every quarterly. OK. CL 5 is closed.
CL6 It is not clear from PDD whether local population or local NGOs were involved in the stakeholder's consultation process. When and where stake holder consultation was conducted. Supporting evidence for the same needs to be furnished. Project proponent needs to specify the media used for inviting local stake holders comments. Proof for the same needs to be provided. It has been indicated that no negative comments were received. This needs to be demonstrated with supporting proof, by providing minutes of meeting.	E.1.1, E.1.2, E.1.4	This project was conceived in 2001. At that time, small hydro power projects calling for stakeholders meeting was not a common practice. However, the State Government itself takes up the responsibility and ensures that there is no objection from the village in which the project is located before issuing permission. The very fact that the State Government had allowed the project developer to go ahead with the project is an indication of not receiving any negative comments from the villagers or local stakeholders. Further, HIMURJA, the State nodal agency, had, on behalf of Project Proponent, issued a notification in the Hindustan Times (Chandigarh Edition in English and circulated in Himachal Pradesh also) and Divya Himachal (a local news paper in vernacular language)	The NOC from the village panchayat, dated 20 April 2004 has been provided for verification. It has been verified that under HIMURJA policy, that notifications and invitations were circulated in the local news paper for inviting the comments. OK. CL 6 is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
		<p>news papers, on 9th January 2003 informing the general public at large regarding the setting up of the project activity and inviting for comments. Once again no negative comments have been received from the general public. It was only after this that the Government issued the permission to establish the project.</p> <p>It was against this background that a statement has been made in the PDD that no negative comments have been received from stakeholders.</p>	
<p>CL 7</p> <p>As the initial PDD was web hosted on 10 November 2007, during which CEA database, version 2.0 was the latest data available, PP is requested to revise the grid emission factor as per the initial web hosted PDD emission factor data.</p>	B.10	<p>The PDD has been revised as per the 2005-2006 data available at the initial PDD.</p>	<p>The PDD has been revised adequately and the grid emission factor of 2005 - 2006 has been fixed ex ante, as available at the time of PDD submission.</p> <p>Ok. CL 7 is closed.</p>

APPENDIX B

CERTIFICATES OF COMPETENCE



CERTIFICATE OF COMPETENCE

Vidyacharan Astakala

Qualification in accordance with DNV's Qualification Scheme CDM/JI (ICP-9-8-i1-CDMJ1-i1)

<i>GHG Auditor:</i>	Yes				
<i>Technical Area</i>	<i>CDM Validator</i>	<i>CDM Verifier</i>	<i>Sector Expert</i>	<i>Methodology Expert</i>	<i>Technical Reviewer</i>
<i>Landfill gas</i>					
<i>Hydro power</i>	Jan 2009	Jan 2009			
<i>Renewables</i>					
<i>Wind power</i>					
<i>Other renewable</i>					
<i>Biomass</i>	Jan 2009	Jan 2009		Jan 2009	Jan 2009
<i>Grid connection of isolated system</i>					
<i>Cement</i>					
<i>Waste-heat / waste-gas recovery</i>					
<i>Efficiency of thermal power plants</i>					
<i>Coal mine methane</i>					
<i>Fuel switch</i>					
<i>Manure management</i>					
<i>Waste / wastewater treatment</i>					
<i>Energy efficiency</i>					
<i>N₂O</i>					
<i>HFCs</i>					
<i>Flare reduction</i>					
<i>PFCs</i>					
<i>Charcoal</i>					
<i>CO₂ recovery</i>					
<i>Transport</i>					
<i>Non-renewable biomass</i>					
<i>Biofuel</i>					
<i>Pipeline leakage reduction</i>					
<i>SF₆</i>					

Høvik, 9 January 2009

Michael Lehmann

Michael Lehmann

Technical Director, Climate Change Services



CERTIFICATE OF COMPETENCE

Sharmistha Shome

Qualification in accordance with DNV's Qualification Scheme CDM/JI (ICP-9-8-i1-CDMJ1-i1)

<i>GHG Auditor:</i>	<i>Trainee</i>				
<i>Technical Area</i>	<i>CDM Validator</i>	<i>CDM Verifier</i>	<i>Sector Expert</i>	<i>Methodology Expert</i>	<i>Technical Reviewer</i>
<i>Landfill gas</i>					
<i>Renewables</i>					
<i>Hydro power</i>					
<i>Wind power</i>					
<i>Other renewable</i>					
<i>Biomass</i>					
<i>Grid connection of isolated system</i>					
<i>Cement</i>					
<i>Waste-heat / waste-gas recovery</i>					
<i>Efficiency of thermal power plants</i>					
<i>Coal mine methane</i>					
<i>Fuel switch</i>					
<i>Manure management</i>					
<i>Waste / wastewater treatment</i>					
<i>Energy efficiency</i>					
<i>N₂O</i>					
<i>HFCs</i>					
<i>Flare reduction</i>					
<i>PFCs</i>					
<i>Charcoal</i>					
<i>CO₂ recovery</i>					
<i>Transport</i>					
<i>Non-renewable biomass</i>					
<i>Biofuel</i>					
<i>Pipeline leakage reduction</i>					
<i>SF₆</i>					

Høvik, 9 January 2009

Michael Lehmann

Michael Lehmann

Technical Director, Climate Change Services



CERTIFICATE OF COMPETENCE

Raman Venkata Kakaraparthi

Qualification in accordance with DNV's Qualification Scheme CDM/JI (ICP-9-8-i1-CDMJ1-i1)

GHG Auditor:	Yes				
Technical Area	CDM Validator	CDM Verifier	Sector Expert	Methodology Expert	Technical Reviewer
Landfill gas	Jan 2009				
Hydro power	Jan 2009				
Renewables	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Wind power					
Other renewable					
Biomass	Jan 2009				
Grid connection of isolated system					
Cement					
Waste-heat / waste-gas recovery	Jan 2009	Jan 2009	Jan 2009		
Efficiency of thermal power plants			Jan 2009		
Coal mine methane					
Fuel switch			Jan 2009		
Manure management					
Waste / wastewater treatment	Jan 2009				
Energy efficiency	Jan 2009	Jan 2009	Jan 2009		
N ₂ O					
HFCs	Jan 2009	Jan 2009			
Flare reduction					
PFCs					
Charcoal					
CO ₂ recovery			Jan 2009		
Transport					
Non-renewable biomass					
Biofuel					
Pipeline leakage reduction					
SF ₆					

Høvik, 9 January 2009

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Technical Director, Climate Change Services



CERTIFICATE OF COMPETENCE

Mathsy Kutty

Qualification in accordance with DNV's Qualification Scheme CDM/JI (ICP-9-8-i1-CDMJ1-i1)

<i>GHG Auditor:</i>	Yes				
<i>Technical Area</i>	<i>CDM Validator</i>	<i>CDM Verifier</i>	<i>Sector Expert</i>	<i>Methodology Expert</i>	<i>Technical Reviewer</i>
<i>Landfill gas</i>	Jan 2009				
<i>Renewables</i>	Jan 2009				
<i>Hydro power</i>					
<i>Wind power</i>				Jan 2009	Jan 2009
<i>Other renewable</i>					
<i>Biomass</i>					
<i>Grid connection of isolated system</i>					
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<i>Waste-heat / waste-gas recovery</i>					
<i>Efficiency of thermal power plants</i>					
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<i>Waste / wastewater treatment</i>				Jan 2009	Jan 2009
<i>Energy efficiency</i>					
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<i>CO₂ recovery</i>					
<i>Transport</i>					
<i>Non-renewable biomass</i>					
<i>Biofuel</i>					
<i>Pipeline leakage reduction</i>					
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