VALIDATION REPORT

"Dagachhu Hydropower project, Bhutan" in Bhutan

REPORT NO. 2006-0614
REVISION NO. 05

DET NORSKE VERITAS

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VALIDATION REPORT

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CERTIFICATION AS

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Approved by: Michael Lehmann	Organisational unit: Climate Change Service
Client: Pöyry Energy GmbH	Client ref.: Mr. Christian Steinreiber

Project Name: Dagachhu Hydropower Project, Bhutan
Country: Bhutan
Methodology: ACM0002
Version: 07
GHG reducing Measure/Technology: Grid connected renewable energy based power generation.
ER estimate: 498 998 tCO_2 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 "Dagachhu Hydropower Project, Bhutan" as described in the PDD of 22 February 2010, meets all relevant UNFCCC requirements for the CDM and all relevant host Party criteria and correctly applies the baseline and monitoring methodology ACM0002, version 07. Hence, DNV requests the registration of the "Dagachhu Hydropower Project, Bhutan" as a CDM project activity.

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Report title:
"Dagachhu Hydropower Project, Bhutan"

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Abbreviations

ADB	Asian Development Bank
ADF	Asian Development Fund
BHUCORE	Bhutan Consultants & Research
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction
CH_4	Methane
CL	Clarification request
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
CMP	Catchment Area Treatment Plan
DoE	Department of Energy
DNV	Det Norske Veritas
DNA	Designated National Authority
EA	Environmental Assessment
EG	Eastern Grid
EMP	Environment Management Plan
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
HPP	Hydro Power Plant
IPCC	Intergovernmental Panel on Climate Change
MP	Monitoring Plan
MVP	Monitoring and Verification Plan
N_2O	Nitrous oxide
NGO	Non-governmental Organisation
ODA	Official Development Assistance
PDD	Project Design Document
RAP	Resettlement Action Plan.
TPTCL	Tata Power Trading Company Limited
UNFCCC	United Nations Framework Convention on Climate Change

VALIDATION REPORT

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1 EXECUTIVE SUMMARY – VALIDATION OPINION

Det Norske Veritas Certification AS (DNV) has performed a validation of the "Dagachhu Hydropower Project, Bhutan". The validation was performed 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.

The review of the project design documentation and the subsequent follow-up interviews have provided DNV with sufficient evidence to determine the fulfilment of stated criteria.

The project activity is located in Bhutan and is connected to eastern grid of India via power grid of Bhutan, hence host Parties are Bhutan and India. Both Parties fulfil the participation criteria and have approved the project and authorized the project participants. The DNA from Bhutan confirmed that the project assists in achieving sustainable development vide letter of approval dated 31 July 2007/18/. The DNA of India (second host Party) has also approved the project on 21 July 2008 and confirmed that the project assists in achieving sustainable development /19/.

The project correctly applies ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources", version 07/3/.

By producing electricity from renewable energy sources and thereby displacing the fossil fuelled electricity production in the grid connected power plants, the project results in reductions of CO_2 emissions that are real, measurable and give long-term benefits to the mitigation of climate change. It is demonstrated that the project is not a likely baseline scenario. Emission reductions attributable to the project are hence additional to any that would occur in the absence of the project activity.

The total emission reductions from the project are estimated to be on the average 498 998 tCO_2e per year over the selected 7 year renewable crediting period. The emission reduction forecast has been checked and it is deemed likely that the stated amount is achieved given that the underlying assumptions do not change.

The project proponent has prepared a detailed training and monitoring procedures which will be implemented once the project is commissioned. 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.

In summary, it is DNV's opinion that the "Dagachhu Hydropower Project, Bhutan", as described in the PDD of 22 February 2010, meets all relevant UNFCCC requirements for the CDM and all relevant host Party criteria and correctly applies the baseline and monitoring methodology ACM0002 version 07. DNV thus requests the registration of the "Dagachhu Hydropower Project, Bhutan" as a CDM project activity.

2 INTRODUCTION

Pöyry Energy GmbH has commissioned Det Norske Veritas Certification AS (DNV) to perform a validation of the "Dagachhu Hydropower Project, Bhutan" (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 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, and the relevant decisions by the CDM Executive Board, including the approved baseline and monitoring methodology ACM0002, version 07 /3/.

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.

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 lists the documentation that was reviewed during the validation:

/1/ Pöyry Energy GmbH: Project Design Document for the Dagachhu Hydropower Project, Bhutan, version 01 March 2006, version 05, Dated 05 October 2007, and version 07.2 dated 29 September 2009 & final version 7.3 dated 22 February 2010.

/2/ CDM Executive Board: "*Validation and Verification Manual*", version 01, adopted at annex 3 of EB44: http://cdm.unfccc.int/EB/index.html.

/3/ CDM Executive Board: ACM0002, version 07, *Consolidated baseline methodology for grid-connected electricity generation from renewable sources.*

/4/ CDM Executive Board: Tool for demonstration and assessment of additionality, version 5.2.

/5/ Feasibility Study Report of Dagachhu Hydropower Project, Bhutan, (Compiled by Bernard Engineers (Austrian experts - signed a contract with Department of Energy, Ministry of Trade and Industry, Royal Government of Bhutan on 31 March 2005), dated June 2006.

/6/ Approval of Feasibility Study Report by Council of Ministers (Coordination Committee meeting) dated 31 July 2006.

/7/ EA for Dagachhu Hydropower project conducted as a part of Feasibility Study Report

/8/ Letter from Cabinet Secretary (Ministry of Trade and Industry) dated 25 March 2004.

/9/ Inventory list of medium sized hydropower project from Department of Energy submitted to Ministry of Trade and Industry.

/10/ Letter from PwC consultant for ADB due diligence report indicating average cost of debt dated 24 September 2008.

/11/ Post tax return of equity for electricity generation as per Electricity Act of Bhutan - 2001.

/12/ Electricity Act of Bhutan, 2001 to demonstrate that any license shall remain in force for the period specified but shall not exceed 30 years.

/13/ Chapter 15 - Economic & Financial Analysis of approved feasibility report date 31 July 2006.

/14/ Clause 4.6.2 of Bhutan Sustainable Hydropower Policy 2008.

/15/ Draft term sheet signed between Department of Energy and Tata Power Trading Company Limited dated 05 February 2008.

/16/ ADB email to Department of Energy Bhutan dated 19 September 2008 indicating that the financial closure as well as the planned signature of the EPC contract is under risk

to be further delayed without a clear CDM status.

/17/ Extracts of currently ongoing ADB due Diligence report.

/18/ Letter of Approval from Bhutan dated 31 July 2007.

/19/ Letter of Approval from India dated 21 July 2008.

/20/ Revised IRR calculation spreadsheet, dated 19 September 2008.

/21/ Tariff document: recently negotiated for other Bhutanese hydro power plants, e.g. 2.0 INR/kWh for Chukkha and Kurichu power plant in 2005.

/22/ Hydrology study conducted by Japanese consultant (as a part of ADB due diligence).

/23/ Bhutan Annual Power Data Book 2006/07 (contains data from 2002-03-2005-06 available at the time of PDD initial web hosting for GSP).

Bhutan Annual Power Data Book 2006/07 (contains data from 2002-03-2006-07 available at the time of PDD re-web hosting for GSP).

/24/ CO_2 Baseline Database for the Indian Power Sector (User Guide version 2.0, dated December 2006 available at the time of PDD initial web hosting for GSP).

CO_2 Baseline Database for the Indian Power Sector (User Guide version 3.0, dated December 2007 available at the time of PDD re-web hosting for GSP).

/25/ NOC issued by Dagana Dzongkhag: Dzongkhag (District) Administration dated 17 April 2006.

/26/ NOC issued for construction of approach roads for project access by Department of Roads, Ministry of Works & Human Settlement dated 09 May 2006.

/27/ Clearance from Department of Forest, Ministry of Agriculture issued for construction of Project roads & bridges and 220 kV high voltage transmission line for evacuation of Dagachhu project's power dated 29 December 2006.

/28/ Crop compensation settlement receipt dated 01 May 2008.

/29/ Environmental clearance from National environmental Commission of Bhutan for construction of access road dated 02 April 2007.

/30/ EIA Approval from National environmental Commission of Bhutan dated 28 June 2007.

/31/ Copy of Resettlement Action Plan (RAP).

/32/ Bhutan Electricity Authority BEA-001-2006

/33/ Approach road construction agreement signed between Dagachhu hydroelectric project authority & Rinson Construction company dated 06 December 2007.

/34/ Report and Recommendation of the President to the Board of Directors ADB http://www.adb.org/Documents/RRPs/BHU/37399-BHU-RRP.pdf

/35/ Request letter submission to Ministry of Environment & Forest, DNA India requesting Host Country Approval dated 04 March 2008.

/36/ Request letter submission to National Environment Commission, DNA Bhutan requesting Host Country Approval dated 24 March 2006.

/37/ CDM Executive Board: Guidance on Investment Analysis , version 02

/38/ http://www.sari-energy.org/PageFiles/What_We_Do/activities/Bhutan/Overview_of_Bhutan-India_Cooperation_in_the_Power_Sector.pdf

To demonstrate that Bhutanese grid is fully integrated with the eastern grid of India and exports 90% of the total electricity generation of Bhutan to the eastern grid of India &

to demonstrate that:

a) The two grid are not independent but fully integrated, and hence "trans-national grid" and b) that, there is no transmission constraint.

/39/ Power grid corporation transmission network map for Eastern regional load dispatch centre to demonstrate existence of interconnections between eastern region grid of India and electricity transmission networks in Bhutan.

/40/ Transmission network map of Bhutan and India from Bhutan Power Corporation limited (a government of Bhutan organisation responsible for electricity transmission in Bhutan).

/41/ Umbrella Agreement signed between government of India & government of Bhutan[1] dated 28 July 2006.
http://www.indianembassythimphu.bt/

/42/ Tool to calculate the emission factor for an electricity system version 01.

3.2 Follow-up Interviews with Project Stakeholders

Since the construction of hydro power plant was yet to be started, a site visit was not undertaken. DNV conducted the interviews on 24 & 25 September 2008, with representatives of Department of Energy, Government of Bhutan, Dagachhu hydropower project, Tata Power Trading Company Limited and Pöyry Energy GmbH to resolve the issues identified during the desk review of project design document. The main topics of the interviews are summarized below:

Ref.	Date	Name	Topic
/43/	2008/09/24 & 2008/09/25	Mr.Kuenga Namgay, General Manager, Dagachhu Hydroelectric Project Authority, Mr. Tashi Dorjee, Executive Engineer, Hydropower planning section, Department of Energy, Bhutan. Mr. Amey Naik, Sr. Executive, Tata Power Trading Company Limited. Mr. Christian Steinreiber,	• Information of project construction • The development of hydropower project in the region. • Stakeholder's consultation Process • Financial Barrier faced by the project • Barriers faced by the project • Training to the personnel • Environmental and community development activities • Community and environmental developmental plans • The approval status (incl. EIA approval, the feasibility study report approval, CDM project approval) • Project management • Emission reduction monitoring plan • Likely date of commissioning of the

Consultant, Energy GmbH.	Pöyry	project activity • Technical specifications • PLF consideration and arrival methods

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 "Dagachhu Hydropower project, Bhutan" project 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.

In line with the EB guidance vide EB 52, point 44 (g), the PDD and the validation report have been updated to a) demonstrate the project activity meets the requirement of 'trans national electricity systems' (as per definition EB 28, Para 14) b) validation of grid emission factor in line with 'Tool to calculate the emission factor for an electricity system' /42/ and c) include ex-post monitoring of the combined margin grid emission factor to calculate emission reductions.

3.4 Internal Quality Control

The final validation report underwent a 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

				Type of involvement					
Role/Qualification	*Last Name*	*First Name*	*Country*	Desk review	~~Site visit~~ / Interviews	Reporting	Supervision of work	Technical review	Expert input
CDM validator / technical team leader	Kakaraparthi	Venkata Raman	India		✓		✓		
GHG auditor	Srivastava	Gaurav	India	✓	✓	✓			
Sector Expert	Michael	Lehmann	Oslo						✓
Technical reviewer (Final report)	Hendrik	Brinks	Oslo					✓	
Technical reviewer (Final report)	Ramachandran	Ramesh	India					✓	

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

Validation Protocol Table 1: Mandatory Requirements for CDM Project Activities		
Requirement	***Reference***	***Conclusion***
The requirements the project must meet.	*Gives reference to the legislation or agreement where the requirement is found.*	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.

Validation Protocol Table 2: Requirement checklist				
Checklist Question	***Reference***	***Means of verification (MoV)***	***Comment***	***Draft and/or Final Conclusion***
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.	*Gives reference to documents where the answer to the checklist question or item is found.*	*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.*	*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.*	*This is either acceptable based on evidence provided (**OK**), or a c**orrective 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.*

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***
If the conclusions from the draft Validation are either a CAR or a CL, these should be listed in this section.	*Reference to the checklist question number in Table 2 where the CAR or CL is explained.*	*The responses given by the project participants during the communications with the validation team should be summarised in this section.*	*This section should summarise the validation team's responses and final conclusions. The conclusions should also be included in Table 2, under "Final Conclusion".*

Figure 1: Validation protocol tables

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 project design document version 07.3 dated 22 February 2010.

4.1 Participation Requirements

The project is being developed as a unilateral project with Bhutan and India as the host Parties. The project having two host Parties is allowed and was clarified by the Executive Board vide meeting of EB28 paragraph 14, in response to a request for revision AM REV 0027. Both, Bhutan and India fulfil the criteria for participating in a CDM project activity. They have both ratified the Kyoto Protocol and have established designated national authorities for CDM related activities. The National Environment Commission is the designated national authority of Bhutan and the Ministry of Environment and Forests is the Designated National Authority of India. The Bhutanese DNA has approved the project in 31 July 2007 authorizing Department of Energy, Ministry of Economic Affairs as project participant and confirmed that the project contributes to the sustainable development in Bhutan /18/. The DNA of India has approved the project on 21 July 2008, and authorized Tata Power Trading Company Limited as the project participant /19/.

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

The Board noted the request of the Meth Panel for further guidance regarding the request for revision AM_REV_0027 concerning ACM0002 on an approach for the exclusion of immaterial parts of a multinational grid. The Board clarified that the word “regional”, in the context of “regional electricity system” used in the approved methodology, can also be interpreted as extending across several countries. The Board further clarified that trans-national electricity systems are eligible under ACM0002 and the DNAs of countries in these regions, across which the electric system spans, shall be considered as host Parties and shall provide a letter of approval stating that the project activity assists it in achieving sustainable development. Furthermore, the Board clarified that the grid emission factor in this context shall be estimated for the “regional electricity system”.

4.2 Project Design

The proposed project activity (Dagachhu hydro power plant) is a run-of-the river power project with an installed capacity of 114 MW located in the state of Bhutan. The project is expected to generate approximately 500 GWh of electricity per annum at a plant load factor of 50%. A major part of the electricity generated in the project activity will be exported to the neighboring country of India (consumption in the eastern regional grid of India) through the second project proponent Tata Power Trading Company Limited. As required by regulations in Bhutan a royalty of 12% (2012 to 2024) and 18% (after 2024) of the power generated is to be supplied to the government of Bhutan. The project aims for the generation and export of power using the renewable sources, thereby reducing the GHG emissions in the eastern grid of India, which is dominated by fossil fuel, fired power plants.

The technology used for the power generation is two Pelton turbines. The feasibility study for the hydropower plant was prepared by a consulting team comprised of interdisciplinary Austrian experts with extensive know-how in hydropower, ensuring that state-of-the-art technology and hydropower design is incorporated into the project. In order to ascertain the long term sustainability of the know-how transfer, sufficient training needs have been identified and incorporated in the program.

The project construction has not started. The start date of the project activity has been considered as 31st July 2006, which has been evidenced to be the date of approval of the FSR by the Council of Ministers (Coordination Committee meeting) and has been verified by DNV /6/.

The actual construction of the project activity (diversion weir and hydropower plant) is expected to start in June 2009.

The project selects a renewable crediting period of 7 years starting from January 2012 and the project is expected to reduce GHG emissions of 498 998 tCO_2/ year.

4.3 Baseline Determination

The proposed project has applied the approved baseline methodology ACM0002, version 07,"*Consolidated baseline methodology for grid-connected electricity generation from renewable sources*". The selected baseline methodology is applicable to the project as the proposed project is a grid connected new hydropower plant, including a reservoir with a power density of 3 257 W/m². The power density has been verified from the approved feasibility study report /5/.

The project activity is located in the country of Bhutan and about 85% of the electricity generated is exported to the eastern regional grid (fossil fuel intensive grid) of the neighbouring country of India. Hence two host countries are involved in the project activity.

The project having two host countries has been accepted by the Executive Board vide EB28 paragraph 14, in response to request for revision AM_REV_0027. It is clarified by the Executive Board that the word "regional", in the context of "regional electricity system" used in the approved methodology, can also be interpreted as extending across several countries. The Board further clarified that trans-national electricity systems are eligible under ACM0002 and the DNAs of countries in these regions, across which the electric system spans, shall be considered as host Parties and shall provide a letter of approval stating that the project activity assists it in achieving sustainable development. Furthermore, the Board clarified that the grid emission factor in this context shall be estimated for the "regional electricity system".

The project activity fully meets the requirements of EB28, paragraph 14 (w.r.t trans-electricity system) due to the following:

a) Bhutanese grid is fully integrated with the eastern grid of India and exports 90% of the total electricity generation of Bhutan to the eastern grid of India. The installed generation capacity of Bhutan is 1606 MW (considering the large projects only) and the country's demand is only 157 MW, which substantiates Bhutan's intention of power export to the eastern grid of India. As most of the power generated is exported to India /38/, most or all the large hydro projects in Bhutan are either developed with grant assistance from the Government of India or funded by Indian project participants.

b) Most of the high voltage transmission lines in Bhutan have been built mainly for the purpose of exporting electricity to India. Out of four 400 kV transmission lines that connect

the two countries, three are direct links to India with no provision for supplying power in Bhutan. Similarly of the three 220 kV transmission lines, two are direct connections to India with no substations or inter connections in Bhutan. The existence of the direct transmission lines of 440 kV and 220 kV between Bhutan and India substantiates the fact that a) the two grid are not independent but fully integrated, and hence "trans-national grid" and b) that, there is no transmission constraint.
c) The project activity envisages power evacuation to the eastern regional grid of India via the Dajey Substation in Tsirang (220 kV line). The Dajey Substation will be connected to Gelephu Substation in the border from where a 132 kV to India is available.

The electricity from the Daggachu project can also be evacuated from the following routes of,

i) Dajey Substation to Rurichhu Substation to Semtokha Substation in Thimphu to down south to Chhukha Substation and then to the eastern grid of India (via three 220 kV lines).
ii) Dagachhu-Dajey-Gelephu to Salakati substation in India.
iii) Dagana Dajey-Rurichhu-Semtokha-Chhukha to Birpara substation in India.

The existence of the above interconnections can be verified from the eastern region power map of India /39/ & transmission network map of Bhutan and India from Bhutan Power Corporation limited, a government of Bhutan organisation responsible for electricity transmission in Bhutan /40/.

d) The concept of trans-national electricity between India and Bhutan can also be verified from the Umbrella Agreement signed on 28 July 2006 between government of India & government of Bhutan/41/, which clearly states that "The Government of Bhutan & Government of India agree to facilitate, encourage & promote the development and construction of hydro projects and associated transmission systems as well as trade in electricity between the two countries, both through public & private system participation. The government of India also agrees to a minimum import of 5000 MW of electricity from Bhutan by the year 2020". The representative of the Bhutanese power plants also has observer status in the eastern regional power committee (ERPC), a common platform for discussion and solution to the regional problems relating to the grid.

All the above facts substantiate that the eastern regional grid and the Bhutanese grid are not isolated grid systems but constitute a trans-national electricity system. In line with the requirement of the EB28, paragraph 14, India and Bhutan are the Host Parties in the project activity and the DNAs of India and Bhutan have issued the letters of approval for the project activity and also confirmed that the project activity assist in sustainable development of the region /18 & /19/.

In line with the methodology, as the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is that "Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system" version 01 /42/.

The project boundary includes the project activity and all the power plants connecting to the eastern regional grid of India and Bhutanese electricity grid. The baseline emissions are equivalent to the net electricity generated by the proposed project activity times the emission

factor of the eastern regional grid & Bhutanese grid. This is reasonable as the generated electricity is being supplied to the eastern regional grid of India through Bhutanese grid and hence the baseline would be the function of the existing generation mix of the eastern regional grid of India & Bhutanese electricity gird and the addition of new sources. This is also in line with the EB clarification in the EB28 Paragraph 14 which also states that "Furthermore, the Board clarified that the grid emission factor in this context shall be estimated for the "regional electricity system".

DNV acknowledges the fact that the "Tool to calculate the emission factor for an electricity system" version 02 /42/ clearly states that "if the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used".

The DNA of India has published a delineation of the electricity distribution system in India and connected electricity systems, which is available in the Central Electricity Authority (CEA) database, and which is commonly used for CDM projects in India. The CEA database acknowledges the import of electricity from the connected Bhutanese grid by documenting the total power import, as all the Bhutanese projects exported power to India are hydro based (low cost must run), hence not considered for operating margin calculation for the electricity system. The CEA database provides plant specific information of power plants located in India, but does not provide plant specific electricity generation of the Bhutanese power plants, which is required to calculate BM for the selected electricity system. In order to arrive at the combined margin grid emission factor for the project activity considering all the power plants connected to the project activity (in Bhutan and India (eastern grid)), the project proponent has used data sourced from the CEA database version 03.1 for plants in the eastern regional grid of India, and Bhutan Annual Power Data Book 2006/07 for plants in Bhutan and estimated the emission reductions based on the same approach.

However the actual emission reductions during the verification period will be claimed based on the latest combined margin grid emission factor applicable at the time of verification (ex post monitoring of CM emission factor).

The combined Margin emission factor will be updated on annual basis based on the latest information available in CEA database for plants in the eastern regional grid of India, and Bhutan Annual Power Data Book for power plants in Bhutan.

4.4 Additionality

The additionality of the project activity is demonstrated by applying the "Tool for demonstration and assessment of additionality", version 5.2 /4/, and primarily through a financial & barrier analysis.

4.4.1 CDM consideration and continued action to secure CDM status:

The project construction has not yet started. Although construction of approach roads commenced in January 2008 /33/ after obtaining NOC in May 2006 /26/, the main project construction has not yet started as it is subject to financial closure for the project activity. The financial closure has not been achieved due to lack of clear status of CDM and same has been verified from the email correspondence from ADB, the financial institution involved in the project activity, which clearly states that that the financial closure as well as the planned signature of the EPC contract is under risk due to delay in CDM status /16/ and has included a

mandatory requirement for signing the Emission Reduction Purchase agreement for financial closure of the project activity /34/. The cost of approach road construction is negligible compared to the total project cost which is financed by ADB; the start of the approach road does not represent a financial commitment in the project activity.

The start date of the project activity is 31 July 2006 which is the date of Approval of the FSR by Council of Ministers (Coordination Committee meeting) and has been verified by DNV /6/. The selection of this date as the start date has been considered appropriate and the selected date is the earliest date of implementation of the project activity although no commitment has yet been made for any major expenditures.

CDM was considered in the decision to proceed with the project activity as evidenced through:

a) Letter from the Bhutanese Council of Cabinet Ministers (CCM) dated 25 March 2004 in which Cabinet Secretary (Ministry of Trade and Industry) conveyed Department of Energy (DoE) to identify medium sized hydro power project which can be developed as a CDM project /8/.
b) Identification of this project by Department of Energy (DoE) from the inventory list /9/ of hydropower projects as a potential CDM project.
c) Initiation of the action for the preparation of the feasibility study report and the development of the Project Design Document (PDD) in parallel by the Department of Energy (DoE). Contract signed with Bernard Engineers (Austrian experts) on 31 March 2005 /5/.
d) The feasibility study report date June 2006 considers CDM revenues in its financial viability calculations.
e) Project design document submitted to DNV for validation in March 2006. However since the project activity involved two host countries, which was not clear in the version of the methodology at that time, the validation was put on hold till the clarification from the Executive Board vide the EB28 in December 2006 was obtained.

That fact that CDM revenues were decisive in the project to go ahead is clearly demonstrated by the fact that the actual project construction (weir and the hydropower plant itself) has not started, and is planned in June 2009, subject to financial closure (dependent on CDM registration of the project and ERPA signing). The requirement of the CDM revenues for the project activity is also demonstrated by the email from Asian Development Bank (financial institution involved in the project financing) to the Department of Energy (DOE), the project proponent on 19 September 2008 /16/ indicating that the financial closure as well as the planned signature of the EPC contract is under risk to be further delayed without a clear CDM status. ADB email also highlighted that loan agreement will include a mandatory requirement for signing the Emission Reduction Purchase agreement which can be only effective based on the CDM validation and registration at UNFCCC. This is further established from the recommendation report of ADB /34/ (Report and Recommendation of the President to the Board of Directors) in which ADB clearly highlighted the importance of CDM revenue for project activity & instructed project proponent to sign an emission reduction Purchase agreement with Tata Power Trading Company Limited (TPTCL) before 28 February 2009.

The validation started with the submission of a request for deviation on 12 April 2006 titled "Displacement of electricity generation in grid of neighboring country" and thus before the project starting date Hence, continued actions to secure CDM status in parallel with its physical implementation has been satisfactorily demonstrated. In addition, application letters for Letter of Approval were submitted to Bhutan on 24 March 2006 /36/ and to India on 04 March 2008 /35/.

4.4.2 Identification of alternatives to the project activity

The following alternative scenarios have been considered for the project activity.

a) Construction of a fossil fuel fired power plant with the equivalent amount of annual electricity output. This scenario has been considered as one of the credible scenario if the power project will be implemented in eastern region of India as Bhutan does not have any fossil fuel reserves and the electricity system is totally dependent on hydro resources and implementation of fossil fuel fired power plant in eastern region of India will result in more emissions in comparison to baseline scenario proposed by the methodology & hence can not be considered as baseline scenario.

b) Construction of a power plant using another source of renewable energy with equivalent amount of annual electricity output. This scenario has been considered as one of the scenarios if the power project will be implemented in Bhutan as eastern grid of India lacks hydro and other renewable resources and the most recently built hydro power plant in eastern grid was Rangit-III installed capacity of 60 MW built in 2000 /24/. However this scenario can not be considered as alternative to the project activity as Bhutan lacks other renewable resources and all the existing hydropower plants in Bhutan are either financed through development finance institution or bilaterally through development grants whereas the project activity will be financed through commercial debt (hard term loan from Asian Development Bank & commercial debt from OeKB) subject to the project getting registered as a CDM project. A detailed description of these barriers has been provided in the PDD (refer step 3 Barrier Analysis) and accepted by DNV. Hence this scenario can not be considered as a realistic baseline scenario.

c) Supply of equivalent annual power output by the combination of eastern regional grid & Bhutanese grid where the proposed project is connected to. This scenario, continuation of the current scenario, is in compliance with the current laws and regulations and has been considered as baseline scenario.

d) The proposed project activity without CDM revenues. This scenario cannot be considered as baseline scenario as the returns from the proposed project are not attractive in the absence of CDM revenues (as detailed in the section 4.4 below)

DNV considers the list of realistic and credible alternatives to be complete.

Alternatives a), b) and d) were further evaluated. Alternative a) & b) were eliminated as a realistic alternative on the basis of barriers as discussed in 4.4.3. Then alternative d) was eliminated as the project without CDM benefits faces barriers in implementation, cf. 4.4.4 - 4.4.7. Hence the project was proven to be additional to what would have happened without CDM benefits.

4.4.3 Barrier analysis

The project is less attractive than scenario "**Construction of a fossil fuel fired power plant with the equivalent amount of annual electricity output"** for the following reasons and this alternative can therefore be disregarded in the further additionality discussion:

(i) The project activity is developed in Bhutan; Bhutan, being one of the least developed countries in the world, relies mainly on foreign aid for infrastructure projects development. All major projects in Bhutan in the areas of health, education, transport and energy (hydropower projects) have at least been partially financed through development finance institutions or bilaterally through development grants. Due to unfavorable risk profile of the country, commercial banks in Bhutan are reluctant to finance infrastructure projects in Bhutan, which is substantiated from external debt statistics of Bhutan (external debt (through commercial banks-data sourced from the documents of Department of Aid and Debt Management, Bhutan) contributes less than 4% of the total debt outstanding (refer table B.5 of PDD). In contrast to the project activity which will be financed through commercial debt (hard term loan from Asian Development Bank & commercial debt from OeKB) subject to the project getting registered as a CDM project.

(ii) If the project activity would have been implemented in eastern grid of India, the project would have more favorable risk structure because of the better international standing of India in the international financing market. Project developers in India have easier access to project financing due to the availability of Indian financing institutions for project financing as well as potential equity investors. Therefore, access to financing sources does not pose a barrier to developers of thermal Power projects in eastern grid of India.

(iii) Required return on equity: If the project activity would have implemented in eastern grid of India (thermal or hydro power project) project proponent would have be entitled to get 14% post tax return on equity via tariff, as per Indian CERC guidelines on tariff determination in contrast to project activity (Dagachhu hydro power project) which is developed with an objective of selling the power to India. The tariff structure for the project activity has been fixed as per draft PPA signed with TPTCL /15/ and the expected return on equity based on the tariff proposed by TPTCL is less than the 10% post tax return on equity fixed by BEA for electricity generators in Bhutan.

(iv) Other risks associated with hydro power projects due to which they can not be compared with thermal power projects are location accessibility, availability and transportation of fuel, vicinity to uploading stations and availability of infrastructure. However it is DNV opinion that this barrier is generic and by itself cannot sufficiently demonstrate additionality of the project. Nonetheless, DNV accepted that these barriers were included in the PDD as they contribute to the other barriers described above.

4.4.4 Investment analysis: Choice of approach:

Since the project activity generates revenue without CDM and the alternative to the project does not involve investments, a benchmark analysis was selected.

4.4.5 Investment analysis: Benchmark selection:

The benchmark selected is 9.4% return on project investment and has been calculated as the weighted average cost of capital (WACC). The project proponent has used the interest rate of 9% for the debt component of the capital. This interest rate of 9% has been arrived at based on the weighed average of the indicative interest rate from the lenders for the project activity (like National Pension & Provident Fund, ADB, OeKB etc.) /10/ whereas for equity component a post tax return of 10% has been considered & this value is set by Bhutan electricity Authority for electricity generators (BEA-001- 2006) /32/.

The use of the WACC as the benchmark is considered appropriate and in line with the *Guidance on the Assessment of Investment Analysis* which states that a weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR. In the cases of projects which could be developed by an entity other than the project participant the benchmark should be based on publicly available data sources which can be clearly validated by the DOE. Such data sources may include local lending and borrowing rates, equity indices, or benchmarks determined by relevant national authorities. DNV was able to confirm that the interest rate for the debt component used in the calculation of the WACC is sourced from the letter by PwC, consultant for ADB. Based on the due diligence report indicating average cost of debt in Bhutan. DNV has also checked that Bhutan electricity Authority has set a post tax return of 10% on equity for electricity generators (BEA-001- 2006) /32/. Hence the method and calculation used for WACC are deemed to be conservative and appropriate.

4.4.6 Investment analysis: Input parameters:

Since the financial closure for the project is not completed, the input values used for the IRR calculations like investment costs, tariff, loan and interest on loan, O&M costs, return on equity, income tax etc have either been sourced from the Feasibility Study or extracts of Recommendations of ADB's report /34/. The summary of key financial parameters and source of information is provided below:

Parameter	Unit	Amount	Source
Investment volume including interest during construction (IDC)	Million NU	8 160	Letter from DoE (Project Proponent) & Recommendations of ADB's report
Share of equity	%	40	Letter from DoE (Project Proponent) & Recommendations of ADB's report
Tax rate	%	30	Approved Feasibility Study Report
Average cost of debt raised from various sources considering the access to export financing	%	9.0	Letter from PwC (consultant for ADB for conducting the ADB

arrangements offering interest rates below market levels			due diligence)
Repayment period of debt	Years	15	Approved Feasibility Study Report
Required return on equity (post tax)	%	10	Bhutan Electricity Authority BEA -001 2006.
Years of operation and concession	Years	30	Approved Feasibility Study report (Chapter 15 - Economic & Financial Analysis)
Operation and Maintenance costs (fixed)	% of investment volume	1	Approved Feasibility Study Report (Chapter 15 - Economic & Financial Analysis) & Bhutan Electricity Authority BEA -001 2006
Annual escalation in fixed O&M costs	%	4	Approved Feasibility Study report (Chapter 15 - Economic & Financial Analysis)
Variable O&M costs (transmission costs)	NU/kWh	0.125	Approved Feasibility Study report (Chapter 15 - Economic & Financial Analysis)
Power generation in 2012	GWh	500	Approved Feasibility Study report (Chapter 15 - Economic & Financial Analysis) & Hydrology Study (ADB Consultant as a part of due diligence)
Annual capacity degradation	% of annual generation	0.2%	Approved Feasibility Study report (Chapter 15 - Economic & Financial Analysis)
Royalty (electricity given for free to the Bhutanese state) Average of 15% has been considered in the calculations.	% of total generation 2012-2024 after 2024	12% for first 10 years 18% for subsequent years.	Bhutan Sustainable Hydropower Policy 2008, Clause 4.6.2
Benchmark electricity tariff (Basis 2012)	INR/kWh	2.35	Draft PPA DoE with TPTCL
Annual increase of electricity price	%	2	Draft PPA DoE with TPTCL

Exchange rates	INR/EUR	66	Exchange rate Sept08
			ADB Draft Due
	INR/USD	40.5	Diligence report
	INR/NU	1	

While the project has been developed as a CDM project since conceptualization /5/, /8/ and /9/, it was observed during validation that the approved feasibility study report of July 2006 /5/ considered the project to be financially viable without CDM revenue. The project-IRR in the feasibility study report (FSR) of July 2006 was 9.47% without CDM and 9.69 /13/ considering CDM revenue for the year 2012 alone. However, the attractive financial viability is only on the conditions of a) the project proponent negotiating an electricity tariff between 2.50 to 2.90 INR/kWh for the period of 2011 to 2014 (to meet the required Benchmark return of 9.4% /13/ b) the project getting commissioned on time, failing which a delay in the project commissioning by every year would result in project IRR decreasing by 0.68% below the cost of capital/13/ and c) to sign a Power Purchase Agreement (PPA) and Emission Reduction Purchase Agreement (ERPA) for CER sale to have a more secure basis for the financial analysis. These conditions clearly demonstrate that though the FSR indicates the project to be financially viable, the financially viability was dependent on factors not freezed at that time, and was linked to early financial closure and timely completion of the project.

DNV's also observes that the financial calculation in the approved FSR:

a) Did not consider the royalty of 12% (2012 to 2024) and 18% (after 2024) of annual power generation (free of cost) to the Bhutanese state (based on Bhutan Sustainable Hydropower Policy 2008, Clause 4.6.2) /14/ and hence is based on the net power generated.
b) Electricity tariff (as per draft term sheet signed between DoE and TPTCL) /15/ was not freezed at that time.

However the above mentioned conditions have been considered by Asian Development Bank (ADB), financial institution involved in project financing, in their Report and Recommendation of the President to the Board of Directors ADB & has instructed project proponent to sign an emission reduction purchase agreement with TPTCL before 28 February 2009 and has highlighted to the project proponent vide email to Department of Energy Bhutan on the risks on financing without CDM status.

4.4.7 Investment analysis: Calculation and conclusion:

Based on data from the approved FSR, dated 31 July 2006 by Bernard Engineers /5/, draft power purchase agreement signed between Department of Energy, Bhutan & Tata Power Trading Company Limited (TPTCL) dated 5 February 2008 /15/, Bhutan Sustainable Hydropower Policy 2008, and Recommendations of ADB's report /34/, the project IRR without CDM has been re-calculated to be 8.79% /20/ which is lower than the applied benchmark of 9.4% /20/. The IRR calculations were provided in a spreadsheet. The calculation was verified by DNV and has been found to be correct.

4.4.8 Investment analysis: Sensitivity analysis:

A sensitivity analysis has been carried out for parameters contributing more than 20% to revenues or costs. Reasonable variations of the total investment, annual operation and maintenance costs, electricity output and tariff were checked by calculating the variation necessary to reach the benchmark and then discussing the likelihood for that to happen.

- Total investment decreases by 5.7%
- Electricity tariff increases by 6.55%
- Electricity generation increases by 7.1%
- O & M costs decrease by 37.8%

It has been demonstrated that the project IRR crosses the benchmark if the total investment in the project decreases by 5.7%. Considering the fact that the project is planned to be implemented on a turn key basis by the project proponent and the EPC contract is still to be signed, /5/ it is highly unlikely for the total investment to decrease.

The project IRR of the project crosses the benchmark if the electricity tariff increases by 6.55%. This is not likely as the tariff used in the calculations is as per draft term sheet signed between Bhutanese project developers and Tata Power Trading Corporation in February 2008 and set at 2.35 INR/kWh plus an annual escalation of 2% /15/ which is already higher than the tariff for other power plants in Bhutan supplying power to India for e.g.: 2.0 INR/kWh for Chukka in 2005 & 1.80 INR/kWh for Tala in 2006 plants and hence it is unlikely to increase.

It has also been observed that if there is a decrease of 37.8% in O&M cost, the project IRR touches the benchmark. However, this is not a likely scenario.

The project IRR crosses the benchmark if the annual electricity generation increases by 7.1 %. This is an unlikely scenario considering the fact that the plant load factor is based on 15 years (1990-2004) historical statistical data of the water flow. The plant load factor is also confirmed by the hydrology study conducted by Japanese consultant (as a part of ADB due diligence) /22/. The electricity generation figures are variable for different years, but on the average level, it is unlikely to increase by 7.1%.

The investment barrier as presented above is not applicable to the baseline alternative of an equivalent quantity of power being generated in the existing power plant of the eastern grid of India and the existing grid of Bhutan or by future capacity additions in these grids.

4.4.9 Common Practice Analysis: A common practice analysis has been conducted and Bhutan (country) is selected as the region to conduct this analysis, though the power grid of Bhutan is connected to eastern grid of India the power projects in eastern grid of India can not be compared with power projects in Bhutan due to difference in investment environment, tariff policy, tariff structure in both countries).
During the last 10 years 4 medium and large hydroelectric power projects were developed in Bhutan /23/. Out of these four, Tala is in under CDM validation process and remaining three are:
Kurichu hydro electric Project- 60 MW
Basochu upper stage hydro project- 22.5MW
Basochu lower stage hydro power project – 40 MW

However, these projects can not be compared with Dagachhu hydro power project since these projects are developed with bilateral assistance and soft loans either from government of India or Austria whereas the project activity will be financed through ADB hard term ADF loan (Asian Development Fund). Apart from that these projects are located at sites with better infrastructure, good hydrology and low capital costs /23/. The references provided for common practice analysis have been verified by DNV. Hence, the proposed project is not representing common practice.

In conclusion, it is DNV's opinion that it has been correctly demonstrated that the project activity is not financially attractive and thus the emission reductions achieved by the project are additional to any would happen in absence of the project.

4.5 Monitoring

The approved monitoring methodology ACM0002, version 07 – "*Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources"* has been applied to the proposed project. The choice of methodology is justified as the proposed project is a new hydropower project, including a reservoir with power density greater than 4 W/m².

As per methodology, the following parameters will be monitored:

- Net electricity supplied to the Bhutan grid by the proposed project activity will be recorded on monthly basis.
- Installed capacity of the hydro power plant after the implementation of the project activity on annual basis.
- Reservoir area measured in the surface of the water, after the implementation of the project activity, when the reservoir is full on annual basis.
- Data needed to calculate the operating margin emission factor, based on the choice of the method to determine the operating margin (OM), consistent with "Tool to calculate the emission factor for an electricity system" version 02 /42/;
- Data needed to recalculate the build margin emission factor consistent with "Tool to calculate the emission factor for an electricity system" version 02 /42/.

4.5.1 Parameters monitored ex-post

The net electricity generation supplied to the Bhutanese grid by the proposed project activity will be monitored *ex-post* through electricity meters, hourly measured and monthly recorded.
Installation of monitoring equipment, monitoring procedures, calibration frequency and accuracy class of the monitoring equipment will follow the national standard. The construction for the project activity is yet to start and hence at this stage this is deemed appropriate. The installed capacity of the hydro power plant after implementation and reservoir area measured in the surface of the water, after the implementation of the project activity, when the reservoir is full will also be monitored on annual basis, as per the requirements of ACM0002 version 07.
The combined margin grid emission factor will be calculated ex post based on

- Data needed to calculate the operating margin emission factor, based on the choice of the method to determine the operating margin (OM), consistent with "Tool to calculate the emission factor for an electricity system" version 02 /42/ ;

- Data needed to recalculate the build margin emission factor consistent with "Tool to calculate the emission factor for an electricity system" version 02 /42/;

The combined Margin emission factor will be updated based on the latest information available in CEA database for plants in the eastern regional grid of India, and Bhutan Annual Power Data Book for power plants in Bhutan.

4.5.2 Management system and quality assurance

The reading of the power exported to the Bhutanese grid will be measured hourly and recorded on a monthly basis by the project owner. During implementation of the Dagachhu HPP and before the start of the project activity the project developer will establish a CDM Management Team for project management, data collection preparation of monitoring report and communication with Designated Operational Entity and CDM Executive Board.

4.6 Estimate of GHG Emissions

The GHG emission reduction calculations are well documented in line with the approved baseline and monitoring methodology ACM0002 & Executive Board vide EB28 paragraph 14, in response to request for revision AM_REV_0027.

Regarding leakage, no sources of emissions were identified. The electricity generating equipment is not transferred from any other activity.

Project emissions are considered zero for this project activity, as the net electricity delivered to the grid is used for the calculation of emission reductions, discounting the internal use of electricity and the power density is more than 10 W/m^2 /5/.

The baseline emission factor has been calculated as a product of net electricity supplied by the project activity and the combined margin emission factor of the respective grid (eastern regional grid of India and power grid in Bhutan) updated on ex post basis.

The combined margin emission coefficient for eastern regional grid of India and power grid in Bhutan in initially published PDD for global stakeholder Consultation process was estimated to be 1.060 tCO2e/MWh for the purpose of estimation of emission reduction achieved from the project activity and was based on CEA database version 02 and Bhutan Annual Power Data Book 2005/06. This combined margin emission coefficient has been updated during the re-web hosting of PDD and the combined margin emission coefficient for eastern regional grid of India and power grid in Bhutan has been recalculated based on the latest data available (CEA database version 03 and Bhutan Annual Power Data Book 2006/07). The combined margin emission factor has been arrived on based on the following method:

The operating margin (OM) is calculated using the "simple OM" method. Since the low-cost/must-run power plants (including all power plants operating in eastern regional grid of India and power grid in Bhutan) constitute less than 50% of the total grid generation. The simple operating margin has been calculated based on the weighted average emissions per electricity unit (tCO_2/MWh) for three year historical production data of all power plants serving the system (eastern regional grid of India and power grid in Bhutan). The data used to calculate the OM is of year 2004/05, 2005/06 and 2006/07. These are the most recent statistics available at the time of PDD submission. DNV has crosschecked these values against CEA database (CO_2 Baseline Database for the Indian Power Sector (User Guide version 3.0, dated December 2007)./24/ and Bhutan Annual Power Data Book 2006/07 /23/. The OM is calculated to be 1.16 tCO_2e/MWh as a generation-weighted average for the three years

(2004/05, 2005/06 and 2006/07) and will be updated on annual basis during the verification for calculation of actual emission reduction achieved during the verification period (ex post monitoring).

BM is calculated ex ante based on 20% most recent capacity additions in the grid based on net generation as described in tool to calculate emission factor version 02 /42/..The build margin is calculated to be 0.85 tCO_2e/MWh based on the latest information available till 31 December 2007 (at the time of PDD submission). DNV has crosschecked these values against CEA database (CO_2 Baseline Database for the Indian Power Sector (User Guide version 3.0, dated December 2007) /24/ and Bhutan Annual Power Data Book 2006/07 /23/.

The combined margin emission coefficient for eastern regional grid of India and power grid in Bhutan has been estimated to be 1.004 tCO_2e/MWh for the purpose of estimation of emission reductions achieved from the project activity and the emission reductions over the first crediting period are estimated to be 3 492 986 tCO_2e.

However actual emission reduction during the verification period will be claimed based on the updated CM emission coefficient for eastern regional grid of India and power grid in Bhutan (ex post monitoring).

4.7 Environmental Impacts

An Environment Assessment study of the proposed project was carried out by Bhutan Consultants & Research (BHUCORE), and approved by National Environment Commission (NEC) of Bhutan on 28 April, 2007 /30/. The EIA and its approval have been evidenced by DNV /30/. The project proponent has received all necessary approvals and NOC for construction of the project activity (25/26/27/29/30/). An environmental Management plan (EMP) and Catchment Treatment Plan (CMP) to address the possible impacts of the project activity have to be addressed in consultation with various government agencies. The monitoring of these has been included in the Section B.7.1 of the PDD and implementation of these plans will be checked during the CDM verification.

The Resettlement Action Plan (RAP) /31/ to set rules for the compensation of affected people has been developed in line with the regulation and has been evidenced. Crop compensation process has already been completed and this has been verified by DNV /28/. The land substitution is currently ongoing and is planned to be completed until end of 2008. To ensure that the land compensation will be done as per RAP this has been included as a part of monitoring plan and will be checked during the first CDM verification.

4.8 Comments by Local Stakeholders

As a part of Environment Assessment study public consultation process, meetings were held with district officials (from Dagana Dzongkhag) and with people from the communities that are directly affected by the project around 298 stakeholders attended the meeting. A total of 9 meetings were conducted by the Environmental Assessment team from BHUCORE, in which the Dagachhu Hydropower Project and its potential impacts on the socioeconomic and environmental setting of the region were presented. The outcome of the feasibility study of the Dagachhu HPP, which includes the access roads and the transmission line, was also presented.

4.9 Comments by Parties, Stakeholders and NGOs

The PDD version 5 of October 2007 (ACM0002 version 6) has been made publicly available on DNV's climate change website (www.dnv.com/certification/climatechange) and Parties,

stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 23 October 2007 to 21 November 2007. No comments were received.

However, the PDD Version 06 (ACM0002 Version 7) was re web hosted on DNV's climate change website (www.dnv.com/certification/climatechange) and Parties, stakeholders and NGOs were invited to provide comments during a 30 days period from 03 September 2008 to 02 October 2008 this was done due to change in version of the applied methodology. No comments were received during this period.

APPENDIX A

CDM VALIDATION PROTOCOL

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

Requirement	Reference	Conclusion	Cross Reference / Comment
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	NA	Table 2, Section E.4.1 No Annex I Party is yet identified.
2. 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	~~CAR 1~~	Table 2, Section A.3 Confirmation by the host Parties India and Bhutan is pending.
3. The project shall assist non-Annex I Parties in contributing to the ultimate objective of the UNFCCC	Kyoto Protocol Art.12.2.	Yes	Table 2, Section E.4.1
4. 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~~	Written approval from the DNA of Bhutan and India is pending.
5. The emission reductions shall be real, measurable and give long-term benefits related to the mitigation of climate change	Kyoto Protocol Art. 12.5b	~~CAR 3~~ ~~CL 12~~ ~~CL 13~~ ~~CL 14~~	Table 2, Section D & E
6. Reduction in GHG emissions shall be additional to any that would occur in 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 6~~ ~~CL 6~~ ~~CL 7~~	Table 2, Section B
7. 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	Decision 17/CP.7, CDM Modalities and Procedures	Yes	There is no funding from an Annex I Party.

Requirement	Reference	Conclusion	Cross Reference / Comment
counted towards the financial obligations of these Parties.	Appendix B, § 2		
8. Parties participating in the CDM shall designate a national authority for the CDM	CDM Modalities and Procedures §29	Yes	The DNA of the host Party Bhutan is National Environment Commission Secretariat. The DNA of India is the Ministry of Environment and Forests.
9. The host Party and the participating Annex I Party shall be a Party to the Kyoto Protocol	CDM Modalities §30/31a	Yes	The host Party Bhutan ratified the Kyoto protocol on 26 August 2002. India ratified the Kyoto protocol on 26 August 2002.
10. The participating Annex I Party's assigned amount shall have been calculated and recorded	CDM Modalities and Procedures §31b	NA	No Annex I Party is yet identified.
11. The participating Annex I Party shall have in place a national system for estimating GHG emissions and a national registry in accordance with Kyoto Protocol Article 5 and 7	CDM Modalities and Procedures §31b	NA	No Annex I Party is yet identified.
12. 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	Yes	Table 2, Section G
13. Documentation on the analysis of the environmental impacts of the project activity, including transboundary impacts, shall be submitted, and, if those impacts are considered significant by the project participants or the Host Party, an environmental impact assessment in accordance with procedures as required by the Host Party shall be carried out.	CDM Modalities and Procedures §37c	~~CL 15~~ ~~CL 16~~	Table 2, Section F
14. Baseline and monitoring methodology shall be previously approved by the CDM Executive Board	CDM Modalities and Procedures §37e	Yes	Table 2, Section B.1.1 and D.1.1
15. Provisions for monitoring, verification and reporting shall be in accordance with the modalities described in the Marrakech	CDM Modalities and Procedures §37f	Yes	Table 2, Section D

Requirement	Reference	Conclusion	Cross Reference / Comment
Accords and relevant decisions of the COP/MOP			
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	Yes	The PDD (version 5 of October 2007) has been made publicly available on DNV's climate change website (www.dnv.com/certification/climatechange) and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 23 October 2007 to 21 November 2007. No comments were received.
17. 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	Yes	Table 2, Section B.2
18. The baseline methodology shall exclude to earn CERs for decreases in activity levels outside the project activity or due to force majeure	CDM Modalities and Procedures §47	Yes	Table 2, Section B.2
19. The project design document shall be in conformance with the UNFCCC CDM-PDD format	CDM Modalities and Procedures Appendix B, EB Decision	Yes	The project design document is in conformance with the UNFCCC.CDM-PDD format.

Table 2 Requirements Checklist

Checklist Question	Ref.	MoV	Comments	Draft Concl	Final Concl
A. General Description of Project Activity *The project design is assessed.*					
A.1. Project Boundaries *Project Boundaries are the limits and borders defining the GHG emission reduction project.*					
A.1.1. Are the project's spatial (geographical) boundaries clearly defined?	/1/	DR/I	The project is located on the Dagachhu river in the Dagana Dzongkhag (district) in Bhutan. The geo-graphical co-ordinates of the project site are 26°50' to 27°17' North and 89°41' to 90°05' East.		OK
A.1.2. Are the project's system (components and facilities used to mitigate GHGs) boundaries clearly defined?	/1/	DR/I	The main components of the project are clearly defined and include the powerhouse, penstock, surge shaft, headrace tunnel, desilter, weir / intake and transmission lines. The electricity (114 MW) will be generated using two Pelton turbines.		OK
A.2. Technology to be employed *Validation of project technology focuses on the project engineering, choice of technology and competence/ maintenance needs. The validator should ensure that environmentally safe and sound technology and know-how is used.*					
A.2.1. Does the project design engineering reflect current good practices?	/1/ /5/	DR/I	Yes, the project design engineering reflects current good practices.		OK
A.2.2. Does the project use state of the art technology or would the technology result in a significantly better performance than any commonly used	/1/ /5/	DR/I	The project has been designed by Austrian experts having extensive know-how in hydropower in similar terrains. The project		OK

Checklist Question	Ref.	MoV	Comments	Draft Concl	Final Concl
technologies in the host country?			uses state of the art technology. The power generation is using Pelton turbines which are rugged and commonly used for hydropower electricity generation.		
A.2.3. Is the project technology likely to be substituted by other or more efficient technologies within the project period?	/1/	DR/I	No, the project technology is not likely to be substituted by other more efficient technology within the crediting period.		OK
A.2.4. Does the project require extensive initial training and maintenance efforts in order to work as presumed during the project period?	/1/	DR/I	Bhutan has other hydroelectric power projects in operation. However since the plant is new in the particular area, extensive initial training will be required for operation and maintenance.		OK
A.2.5. Does the project make provisions for meeting training and maintenance needs?	/1/	DR/I	Provisions for training are not mentioned in the PDD and need to be clarified.	~~CL 1~~	OK
A.3. Contribution to Sustainable Development *The project's contribution to sustainable development is assessed.*					
A.3.1. Is the project in line with relevant legislation and plans in the host country?	/1/	DR/I	Yes.		OK
A.3.2. Is the project in line with host-country specific CDM requirements?	/1/ /18/ /19/	DR/I	This is to be confirmed with the DNA of Bhutan via their Letter of Approval.	~~CAR 1~~	OK
A.3.3. Is the project in line with sustainable development policies of the host country?	/1/ /18/ /19/	DR/I	Same as A.3.2	~~CAR 2~~	OK
A.3.4. Will the project create other environmental or social benefits than GHG emission reductions?	/1/	DR/I	The project will during the construction stage create employment opportunities to the local population. On the completion of the project, social benefits like additional employment, business opportunities, better		OK

Checklist Question	Ref.	MoV	Comments	Draft Concl	Final Concl
			road access and electrification of the area will improve. Since the local villages will get access to electricity and fuel, cutting of trees for fuel will stop and hence improve the ecological balance of the area.		
B. Project Baseline *The validation of the project baseline establishes whether the selected baseline methodology is appropriate and whether the selected baseline represents a likely baseline scenario.*					
B.1. Baseline Methodology *It is assessed whether the project applies an appropriate baseline methodology.*					
B.1.1. Is the baseline methodology previously approved by the CDM Executive Board?	/1/ /3/	DR	The project applies the baseline methodology of ACM0002 version 4, which is approved by the CDM executive board (and valid up to 8 weeks from 3rd March 2006). However, the project should apply version 05 as the project is not likely to be registered by this date. In the design document under section B.1 reference is made to the "Monitoring methodology: ACM0002 instead of the Baseline methodology".	~~CAR 2~~	OK
B.1.2. Is the baseline methodology the one deemed most applicable for this project and is the appropriateness justified?	/1/ /3/	DR	The baseline methodology ACM0002 "grid connected electricity generation from renewable sources" is most applicable to the project as the project activity is a run-of-the river hydroelectric project connected to the grid.		OK

Checklist Question	Ref.	MoV	Comments	Draft Concl	Final Concl
B.2. Baseline Determination *The choice of baseline will be validated with focus on whether the baseline is a likely scenario, whether the project itself is not a likely baseline scenario, and whether the baseline is complete and transparent.*					
B.2.1. Is the application of the methodology and the discussion and determination of the chosen baseline transparent?	/1/ /3/	DR	The baseline as per the methodology is that electricity delivered to the grid by the project would have otherwise been generated by the operation of grid connected power plants or by the addition of new generation sources. The project activity will export the excess power to the northern grid of the neighbouring country India, as per the agreement between the two countries (evidence seen). Hence the chosen baseline that in the absence of the project, electricity requirement would be met from the existing plants / new plants of Bhutan and the northern grid is transparent and justified. Based on the guidance given by the EB in Para 14 of EB 28 which states that "The Board clarified that the word “regional”, in the context of “regional electricity system” used in the approved methodology, can also be interpreted as extending across several countries. The Board further clarified that trans-national electricity systems are eligible under ACM0002 and the DNAs of countries in these regions, across which the electric system spans, shall be considered as host Parties and shall provide a letter of approval	~~CAR 1~~ ~~CAR 3~~	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl	Final Concl
			stating that the project activity assists it in achieving sustainable development. Furthermore, the Board clarified that the grid emission factor in this context shall be estimated for the "regional electricity system". Since the Bhutan grid is interconnected with the eastern grid of India and there are not significant transmission constraints, it is DNV's opinion reasonable to assume that the project will displace electricity generation in Bhutan and/or will displace electricity generation the Eastern regional grid of India. Hence project proponent is requested to combine the two grids (Bhutan and Eastern regional grid of India) based on the guidance given by the EB in para 14 of EB 28.		
B.2.2. Has the baseline been determined using conservative assumptions where possible?	/1/ /20/	DR/I	The baseline has been estimated using conservative assumptions. It is based on the historic data and forecasts. Bhutan exports a major quantity (75%) of the electricity generated. As the project plant also envisages export of excess power to the northern grid of India, the project electricity system selected is the Northern grid of the Indian electricity system. Hence the project takes into consideration the lower baseline emission factor of the northern grid for conservative estimates. The project also considers the transmission losses from Bhutan to the entry point in	~~CL 2~~	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl	Final Concl
			India and also the transmission losses from the eastern grid to northern grid entry point. The mechanism to calculate the transmission loss from the generating source at Dagachhu HPP to Indian border using I2R method is not transparent and clarification is required for considering the same for financial evaluation of project. Project proponent is also requested to clarify how transmission loss from the eastern grid to northern grid entry point has been calculated.		
B.2.3. Has the baseline been established on a project-specific basis?	/1/ /3/	DR/I	Yes, the baseline has been established on a project specific basis.		OK
B.2.4. Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies, macro-economic trends and political aspirations?	/1/ /3/	DR/I	Yes.		
B.2.5. Is the baseline determination compatible with the available data?	/1/	DR/I	The baseline emission factor has been calculated for the northern grid of Indian electricity network. The OM has been calculated using the option (d) average OM. on the assumption that in India coal is also used as a must run plant. This assumption is to be justified. The average emission rate of the exporting grid has been used for the imports. The build margin has been calculated ex-ante using the Option 1 of the methodology. The sample group of plants is the plants built most recently and whose capacity additions comprise 20% of the net power	~~CAR 3~~ ~~CL 3~~	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl	Final Concl
			generation of 2004-05. In page 27 it is mentioned under access to project site, there it is mentioned that probable site of a natural gas set up is Calcutta, there is no allocation of natural gas to the state of west Bengal from the oil and gas ministry and neither is there any such network to source natural gas for such project.		
B.2.6. Does the selected baseline represent the most likely scenario among other possible and/or discussed scenarios?	/1/	DR/I	The selected baseline scenario represents the most likely scenario.		OK
B.2.7. Is it demonstrated/justified that the project activity itself is not a likely baseline scenario?	/1/ /3/ /4/ /9/ /10/ /11/ /12/ /13/ /14/ /15/ 16/ /17/ /20/ /21/ /22/ /34/	DR/I	The project proponent establishes the additionality of the project using the "Tools for demonstration and assessment of additionality 02". Step 0: This is not applicable as the crediting period starts after the registration of the project. Step 1: Four alternatives to the project activity were identified (a) generation of electricity by the addition of a thermal power plant in the grid (b) generation of electricity by the addition of a biomass power plant in the grid (c) No additions to the grid and (d) project activity not undertaken as a CDM project. All the four alternatives are in compliance with the rules and regulations of Bhutan and India. Step 2: The Option III, benchmark analysis	~~CAR 6~~ ~~CL 4~~ ~~CL 5~~ ~~CL 6~~ ~~CL 7~~ ~~CL 8~~ ~~CL 9~~	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl	Final Concl
			has been selected. The indicator selected is the unit cost (INR/KWh) which can be achieved from the project. The threshold unit cost of 2.25 INR/KWh was evaluated from the PPA executed with the Government of India for the Chukkha HPP in Bhutan, and is used as the benchmark value for generation cost. The basis of assumption of 2% increase in tariff over the years needs to be justified. Sub step 2c: The unit cost of service (INR/KWh) for the project is estimated to be 2.39 without considering the CDM revenues. The cost of service improves to 2.25 on considering the CDM benefit. The cost of service has been calculated from the fixed IRR which corresponds to the weighted average cost of capital The assumptions for the cost of service are transparent and reasonable. However the detailed excel worksheets are to be evidenced. Sub step 2d. A sensitivity analysis has been considered for both the cases and it is demonstrated that the projects cost of service does not meet the bench mark value without the CDM revenues. Step 3: Barrier analysis: It is demonstrated that the commercial debt for Bhutan stands at less than 4 %. The rest is mainly through development financial institutions of bilateral grants. Bhutan has a high risk profile and obtaining commercial loans and foreign		

Checklist Question	Ref.	MoV	Comments	Draft Concl	Final Concl
			equity is difficult and is perceived as a barrier. The poor access to the project site, lack of infrastructure, the challenges and difficulties in the construction of the project, uncertainty of the hydrology, transmission problems, PPA risks and the non recourse risks, which are all seen as justified form pertinent barriers to the project activity. The project is compared to a natural gas fired thermal plant to demonstrate that the barrier is not applicable for the baseline alternatives. The baseline region for the project is northern grid where natural gas fired thermal plants constitute only 10% of the total generation, whereas hydro electric power projects contribute 30% of the grid. The selection of natural gas fired thermal plant as the baseline alternative is not justifiable. The barrier analysis must be done with all viable alternate scenarios, including a hydro electric power plant in northern regional grid. Step 4: Common practice barrier It is evident that setting up a hydro electric power plant is a common practice in Bhutan. Barriers like low income of households does not affect the project. Local electrification is not influenced by the project as the project seems to be 100% export oriented. Development of the roads and infrastructure for the other projects must have come along with the projects and so the other project had to overcome similar		

Checklist Question	Ref.	MoV	Comments	Draft Concl	Final Concl
			barriers during their inception stages. The project has been compared to other 4 most recent projects in Bhutan. It is argued that Dagachhu project is located in a region with household income below the national average, but in the EIA study it is stated that the annual income of the project affected area is above the national average. It is to be confirmed what is the capital cost difference (INR/MWh) for all the four projects compared to the Dagachhu project. Finally, in light of the fact that most of the hydro electrical plants have come up with foreign funding, it is required to adjudge whether foreign fund is involved in the project. In the agreement (article 09) with the Indian government it is clearly stated that India will facilitate funding for the project, again the same is sighted as an financial barrier in the project which is not appropriate. Step 5: It is demonstrated that the CDM revenues will make the project activity economically viable and also result in sustainable development in the project areas.		
B.2.8. Have the major risks to the baseline been identified?	/1/	DR/I	No risk to the baseline is foreseen.		OK
B.2.9. Is all literature and sources clearly referenced?	/1/ /5/	DR/I	All the literature and sources are clearly referenced. The agreements and MoU's referred to in the Design Document are in the draft stage,	~~CL 10~~	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl	Final Concl
			clarification is required on the approval of the same.		
C. Duration of the Project/ Crediting Period *It is assessed whether the temporary boundaries of the project are clearly defined.*					
C.1.1. Are the project's starting date and operational lifetime clearly defined and reasonable?	/1/ /11/ /25/ /26/ /27/	DR/I	The projects starting date (start of feasibility study) is April 2005. The project construction is expected to start in January 2007. The expected operational lifetime of the project is 40 years but the useful lifetime of the project as projected under sub step 2b of the additionality discussion is given as 30 years. Clarification is required on the same.	~~CL 11~~ ~~CL 17~~	OK
C.1.2. Is the assumed crediting time clearly defined (renewable crediting period of seven years with two possible renewals or fixed crediting period of 10 years with no renewal)?	/1/	DR/I	The crediting period selected is renewable crediting period with the first period of seven years starting from 01 January 2012.		OK
D. Monitoring Plan *The monitoring plan review aims to establish whether all relevant project aspects deemed necessary to monitor and report reliable emission reductions are properly addressed ((Blue text contains requirements to be assessed for optional review of monitoring methodology prior to submission and approval by CDM EB).*					
D.1. Monitoring Methodology *It is assessed whether the project applies an appropriate baseline methodology.*					
D.1.1. Is the monitoring methodology previously	/1/	DR	The monitoring plan "consolidated		OK

Checklist Question	Ref.	MoV	Comments	Draft Concl	Final Concl
approved by the CDM Executive Board?	/3/		monitoring methodology for zero-emission grid connected electricity generation "of ACM0002 is previously approved by CDM executive board.		
D.1.2. Is the monitoring methodology applicable for this project and is the appropriateness justified?	/1/ /23/ /24/	DR/I	Yes the monitoring plan is applicable to the project activity as the electricity generated is zero emission hydro power and is connected to the grid of India. The baseline emission factor has been calculated for the Northern grid of Indian electricity network. The OM has been calculated using the option (d) average OM. on the assumption that in India coal is also used as a must run plant. This assumption is to be justified.	~~CAR 3~~	OK
D.1.3. Does the monitoring methodology reflect good monitoring and reporting practices?	/1/	DR/I	Yes the monitoring methodology reflects good monitoring methodology and reporting practices.		OK
D.1.4. Is the discussion and selection of the monitoring methodology transparent?	/1/	DR/I	Yes the discussion and selection of the monitoring methodology is transparent.		OK
D.2. Monitoring of Project Emissions *It is established whether the monitoring plan provides for reliable and complete project emission data over time.*					
D.2.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for estimation or measuring the greenhouse gas emissions within the project boundary during the crediting period?	/1/ /5/	DR/I	Being a renewable electricity generation project, there are no project emissions. The project activity is a run-of the river project and does not have a reservoir. This is to be confirmed by the project proponent with respect to the power density and emission factor for project reservoir emissions (see Annex 5 to EB 23 report).	~~CL 12~~	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl	Final Concl
D.2.2. Are the choices of project GHG indicators reasonable?	/1/	DR/I	The project does not have any emissions.		OK
D.2.3. Will it be possible to monitor / measure the specified project GHG indicators?	/1/	DR/I	The project does not have any emissions		OK
D.2.4. Will the indicators give opportunity for real measurements of project emissions?	/1/	DR/I	The project does not have any emissions		OK
D.2.5. Will the indicators enable comparison of project data and performance over time?	/1/	DR/I	The project does not have any emissions		OK
D.3. Monitoring of Leakage *It is assessed whether the monitoring plan provides for reliable and complete leakage data over time.*					
D.3.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining leakage?	/1/	DR/I	Being a run of the river hydroelectric project, there will be no leakages.		OK
D.4. Monitoring of Baseline Emissions *It is established whether the monitoring plan provides for reliable and complete project emission data over time.*					
D.4.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining baseline emissions during the crediting period?	/1/ /23/ /24/	DR/I	Yes, the monitoring plan provides for the collection and archiving of all relevant data necessary for determining baseline emission during the crediting period. The baseline emission factor has been calculated for the Northern grid of Indian electricity network. The OM has been calculated using the option (d) average OM. On the assumption that in India coal is also used as a must run plant. This assumption is to be justified and the calculation needs correction.	~~CAR 3~~	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl	Final Concl
D.4.2. Is the choice of baseline indicators, in particular for baseline emissions, reasonable?	/1/	DR/I	The baseline indicator selected is CO_2 and is reasonable.		OK
D.4.3. Will it be possible to monitor / measure the specified baseline indicators?	/1/	DR/I	Yes		OK
D.4.4. Will the indicators give opportunity for real measurements of baseline emissions?		DR/I	Yes		OK
D.5. Monitoring of Sustainable Development Indicators/ Environmental Impacts *It is checked that choices of indicators are reasonable and complete to monitor sustainable performance over time.*					
D.5.1. Does the monitoring plan provide the collection and archiving of relevant data concerning environmental, social and economic impacts?	/1/ /5/	DR/I	The Monitoring plan (Environmental management plan) provides for the monitoring of several indicators during the construction and post construction stage. The EMP is to be updated during the time of the DPR preparation.		OK
D.5.2. Is the choice of indicators for sustainability development (social, environmental, economic) reasonable?	/1/	DR	The choice of the indicators selected is reasonable for sustainable development.		OK
D.5.3. Will it be possible to monitor the specified sustainable development indicators?	/1/	DR	Yes		OK
D.5.4. Are the sustainable development indicators in line with stated national priorities in the Host Country?	/1/	DR	Yes		OK
D.6. Project Management Planning *It is checked that project implementation is properly prepared for and that critical arrangements are addressed.*					
D.6.1. Is the authority and responsibility of project	/1/	DR/I	The authority and responsibility of the	~~CAR 4~~	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl	Final Concl
management clearly described?			project management is not described.		
D.6.2. Is the authority and responsibility for registration, monitoring, measurement and reporting clearly described?	/1/	DR/I	The authority and responsibility for the registration, monitoring, measurement and reporting are not described.	~~CAR 4~~	OK
D.6.3. Are procedures identified for training of monitoring personnel?	/1/	DR/I	These are not evident from the PDD and need to be prepared and evidenced.	~~CAR 4~~	OK
D.6.4. Are procedures identified for emergency preparedness for cases where emergencies can cause unintended emissions?	/1/	DR/I	These are not evident from the PDD and need to be prepared and evidenced.	~~CAR 4~~	OK
D.6.5. Are procedures identified for calibration of monitoring equipment?	/1/	DR/I	The QA/QC procedures are presented in the table D.3.		OK
D.6.6. Are procedures identified for maintenance of monitoring equipment and installations?	/1/	DR/I	No	~~CAR 4~~	OK
D.6.7. Are procedures identified for monitoring, measurements and reporting?	/1/	DR/I	The monitoring plan in the annexure 4 highlights these in a flow diagram, but needs elaboration.	~~CAR 4~~	OK
D.6.8. 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	The monitoring plan in the annexure 4 highlights these in a flow diagram, but needs elaboration.	~~CAR 4~~	OK
D.6.9. Are procedures identified for dealing with possible monitoring data adjustments and uncertainties?	/1/	DR/I	These are not evident from the monitoring plan and need to be prepared and evidenced.	~~CAR 4~~	OK
D.6.10. Are procedures identified for review of reported results/data?	/1/	DR/I	These are not evident from the monitoring plan and need to be prepared and evidenced.	~~CAR 4~~	OK
D.6.11. Are procedures identified for internal audits of GHG project compliance with operational requirements where applicable?	/1/	DR/I	These are not evident from the monitoring plan and need to be prepared and evidenced.	~~CAR 4~~	OK
D.6.12. Are procedures identified for project performance reviews before data is submitted	/1/	DR/I	These are not evident from the monitoring plan and need to be prepared and	~~CAR 4~~	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl	Final Concl
for verification, internally or externally?			evidenced.		
D.6.13. Are procedures identified for corrective actions in order to provide for more accurate future monitoring and reporting?	/1/	DR/I	These are not evident from the monitoring plan and need to be prepared and evidenced.	~~CAR 4~~	OK
E. Calculation of GHG Emissions by Source *It is assessed whether all material GHG emission sources are addressed and how sensitivities and data uncertainties have been addressed to arrive at conservative estimates of projected emission reductions.*					
E.1. Project GHG Emissions *The validation of ex-ante estimated project GHG emissions focuses on transparency and completeness of calculations.*					
E.1.1. Are all aspects related to direct and indirect GHG emissions captured in the project design?	/1/	DR/I	Being a renewable electricity generation project, there are no project emissions. The project activity is a run-of the river project and does not have a reservoir. This is to be confirmed by the project proponent with respect to the power density and emission factor for project reservoir emissions (see Annex 5 to EB 23 report).	~~CL 12~~	OK
E.1.2. Are the GHG calculations documented in a complete and transparent manner?	/1/ /5/ /22/	DR/I	The emission reduction calculations of the project are based on an annual output of 500 GWh. - In page 107 of the EIA it is indicated that the project will generate 420 GWh of power , and in page 16 it is mentioned that the annual electrical power is 524 GWh, Clarification is required on the basis of this generation capacity. There are uncertainties wrt. to unavailability	~~CL 13~~ ~~CL 14~~	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl	Final Concl
			of water in the project scenario due to irregular monsoon and catchment's characteristics such as run off, absorption, ice etc which may lead to variable plant load factor. How these uncertainties are accounted for in calculating the annual net output is not transparent. In section A.4.4.1 it says that the average transmission and distribution loss is 3.48% , source of the data is to be clearly indicated.		
E.1.3. Have conservative assumptions been used to calculate project GHG emissions?	/1/	DR	Same as D.2.1	~~CL 12~~	OK
E.1.4. Are uncertainties in the GHG emissions estimates properly addressed in the documentation?	/1/	DR	Same as D.2.1	~~CL 12~~	OK
E.1.5. Have all relevant greenhouse gases and source categories listed in Kyoto Protocol Annex A been evaluated?	/1/	DR	Same as D.2.1	~~CL 12~~	OK
E.2. Leakage *It is assessed whether there leakage effects, i.e. change of emissions which occurs outside the project boundary and which are measurable and attributable to the project, have been properly assessed and estimated ex-ante.*					
E.2.1. Are potential leakage effects beyond the chosen project boundaries properly identified?	/1/	DR	As per the ACM0002, leakages need not be considered.		OK

Checklist Question	Ref.	MoV	Comments	Draft Concl	Final Concl
E.3. Baseline Emissions *The validation of ex-ante estimated baseline GHG emissions focuses on transparency and completeness of calculations.*					
E.3.1. Have the most relevant and likely operational characteristics and baseline indicators been chosen as reference for baseline emissions?	/1/ /3/ /23/ /24/	DR/I	Same as D.4.1	~~CAR 3~~	OK
E.3.2. Are the baseline boundaries clearly defined and do they sufficiently cover sources and sinks for baseline emissions?	/1/ /3/ /23/ /24/	DR/I	The baseline boundaries selected is the northern electricity grid of India and covers sources and sinks for baseline emission calculation.		OK
E.3.3. Are the GHG calculations documented in a complete and transparent manner?	/1/	DR/I	Yes		OK
E.3.4. Have conservative assumptions been used when calculating baseline emissions?	/1/ /23/ /24/	DR/I	Same as D.4.1	~~CAR 3~~	
E.3.5. Are uncertainties in the GHG emission estimates properly addressed in the documentation?	/1/	DR/I	Yes		OK
E.3.6. Have the project baseline(s) and the project emissions been determined using the same appropriate methodology and conservative assumptions?	/1/	DR/I	Being a run of river hydropower project there will be no project emissions.		OK
E.4. Emission Reductions *Validation of ex-ante estimated emission reductions*.					
E.4.1. Will the project result in fewer GHG emissions than the baseline scenario?	/1/ /3/ /23/	DR/I	The project will result in fewer GHG emissions than baseline scenario. The expected emission reductions are an	~~CAR 3~~	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl	Final Concl
	/24/		average of 529 914 t CO_2/year during the crediting period. Project proponent is requested to update combined margin emission factor based on the latest information available (CO2 Baseline Database for the Indian Power Sector, Version 3.0 for eastern grid of India and Annual power data book 2006/2007 for Bhutan) as this is more conservative.		
F. Environmental Impacts *Documentation on the analysis of the environmental impacts will be assessed, and if deemed significant, an EIA should be provided to the validator.*					
F.1.1. Has an analysis of the environmental impacts of the project activity been sufficiently described?	/1/ /5/ /29/ /30/	DR/I	Yes, The environmental assessment (EA) study was conducted by M/s Bernard & Partner through M/s Bhutan Consultants & Research (BHUCORE) and the environmental impacts are sufficiently described.		OK
F.1.2. Are there any Host Party requirements for an Environmental Impact Assessment (EIA), and if yes, is an EIA approved?	/1/ /5/	DR/I	The host country legislation makes it mandatory for hydropower projects to have an environmental clearance before starting of construction. It is not clear if the EIA has the approval. This is to be confirmed.	~~CL 15~~	OK
F.1.3. Will the project create any adverse environmental effects?	/1/ /5/	DR/I	The project is not expected to create any adverse environmental impacts.		OK
F.1.4. Are transboundary environmental impacts considered in the analysis?	/1/	DR/I	The project does not have any emissions and no trans-boundary impacts are considered in the analysis.		OK
F.1.5. Have identified environmental impacts been addressed in the project design?	/1/ /5/	DR/I	No significant impacts are identified in the EA. However the EA has also prepared an	~~CL 18~~	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl	Final Concl
	/29/ /30/		Environmental Management Plan (EMP) which spells out the various parameters that are to be monitored during the construction and post construction phase of the project. This plan is to be updated with along with the detailed project report (DPR). The final EMP is to be evidenced during the verification stage. The EA also recommends the formation of Environment Community Unit (ECU) and a Catchments Management Plan (CMP), at the DPR stage.		
F.1.6. Does the project comply with environmental legislation in the host country?	/1/ /29/	DR/I	The project complies with the environment legislation of the country. However, environment clearance has not been sanctioned by the National Environmental Commission (NEC) secretariat and the Department of Forest. This is to be evidenced.	~~CL 15~~	OK
G. Stakeholder Comments *The validator should ensure that a stakeholder comments have been invited and that due account has been taken of any comments received.*					
G.1.1. Have relevant stakeholders been consulted?	/1/ /25/ /26/ /27/ /30/	DR/I	The relevant stakeholders identified are the residents in the various districts and blocks. All the stakeholders were contacted and meetings were conducted to give information on the project and its advantages and receive feedback on their concerns. In section G.3 it states that only one household needs to be relocated due to the project but it does not refer to the fact that	~~CL 16~~	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl	Final Concl
			(as given in the EIA study page. 14) the project will impact 44 households in some way or the other.		
G.1.2. Have appropriate media been used to invite comments by local stakeholders?	/1/ /25/ /26/	DR/I	Comments from the local stake holders were invited by direct meetings with them. The appropriateness of this process is to be verified through interviews with the DNA of Bhutan.		OK
G.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/ /25/ /26/	DR/I	As per the Environmental Act of 2000, chapter III of Article 16, it is mandatory for the conducting the stakeholders consultation process. The appropriateness of this process is to be verified with the DNA of Bhutan.		OK
G.1.4. Is a summary of the stakeholder comments received provided?	/1/	DR/I	Yes a detailed report of the stakeholder consultation process is provided.		OK
G.1.5. Has due account been taken of any stakeholder comments received?	/1/ /30/ /31/	DR/I	The comments received were mainly positive. The concerns raised were as follows - Compensation for the land used for the project. - Shortage of medical facilities on the influx of migrant workers and danger of spreading of diseases Due account for the first comment will be taken by the formation of a Resettlement Action Plan at the time of DPR preparation. The second point has been addressed in the Environmental Management & Monitoring plan of the EA. The Resettlement Action Plan (RAP) is to	~~CL 19~~	OK

Checklist Question	Ref.	MoV	Comments	Draft Concl	Final Concl
			be evidenced during the verification stage.		

Table 3 Resolution of Corrective Action and Clarification Requests

Draft report corrective action requests and requests for clarifications	Ref. to Table 2	Summary of project participants' response	Final conclusion
CAR 1 The LoA from DNA of India, including confirmation that the project assists in achieving sustainable development, is pending. CAR 2 The name of project participant in LoA of Bhutan is not consistent with the PDD, and the LoA for India.	Table 1 Table 2 A.3.2 A.3.3	The DNA of Bhutan issued a Letter of Approval (LoA) on 31 July 2007 for the Dagachhu hydropower project (please see PDD enclosure). In the LoA, the DNA confirms that the project activity assists Bhutan in achieving sustainable development. The DNA of India issues a Letter of Approval (LoA) on 21 July 2008 for the project activity confirming project's contribution in sustainable development has submitted to DOE. Please refer the clarification certificate from National Environment Commission of Bhutan which is also the DNA for the host country Bhutan that the LoA is issued for the same project and clarifications that the Ministry of Trade and Industry had changed its name to Ministry of Economic Affairs vide Executive Order No. PM/01/07/516 dated October 19, 2007 issued by the Prime Minister of Bhutan.	The Letter of Approval from DNA of Bhutan dated 31 July 2007, including confirmation that the project assists in achieving sustainable development has been verified. The LoA from DNA of India, including confirmation that the project assists in achieving sustainable development, is pending. The LoA from DNA of India dated 21 July 2008, including confirmation that the project assists in achieving sustainable development has been verified. OK Accepted. CAR 1 Closed. Certification issued from National Environment Commission of Bhutan which is also the DNA for the host country Bhutan that the LoA is issued for the same project activity has been reviewed by DNV. Clarifications that the Ministry of Trade and Industry had changed its name to Ministry of Economic Affairs vide Executive Order No. PM/01/07/516 dated October 19, 2007 issued by the

			Prime Minister of Bhutan has also been verified by DNV. OK Accepted. CAR 2 closed.
CAR 3 The project applies the baseline methodology of ACM0002 version 4, which is approved by the CDM executive board (and valid up to 8 weeks from 3rd March 2006). However, the project should apply version 05 as the project is not likely to be registered by this date. In the design document under section B.1 reference is made to the "Monitoring methodology: ACM0002 instead of the Baseline methodology". The project applies the baseline methodology of ACM0002 version 06, which is approved by the CDM executive board (and valid up to 13 August 2008 for request for registration). However, the project should apply version 07 as the project is not likely to be registered by this date.	Table 2 B.1.1	The PDD was updated in order to comply with version 06 of the approved baseline and monitoring methodology ACM0002. The PDD was updated in order to comply with version 07 of the approved baseline and monitoring methodology ACM0002.	OK. The PDD applies version 06 of ACM0002. OK. The PDD has been revised and updated to version 07 of ACM0002. Revised PDD reviewed.
CAR 3 The baseline emission factor has been calculated for the northern grid of Indian electricity network. The OM has been calculated using the option (d) average OM. on the assumption that in India coal is also used as a must run plant. This assumption is to be justified.	Table -1 Table-2 B.2.1 B.2.5 B.2.7 D.1.2 D.4.1 E.3.1	The baseline emission factor has now been revised based on the clarification provided by EB and now baseline emission factor has been calculated for the regional grid comprising the Eastern regional grid of India and Bhutan. The OM has been calculated using Option (a) Simple OM. According to	OK. Version 1 of the PDD assumed that the power exported from the Dagachhu HPP will be supplied to the Birpara substation in the eastern grid in India and consumed entirely in the northern grid of India. A request for deviation and later a request for revision of ACM0002 were submitted for this

	E.3.4 E.4.1	the CO2 Baseline Database for the Indian Power Sector (published by the Indian Central Electricity Authority) hydro and nuclear qualify as low-cost/must-run resources. In the regional grid including Bhutan and Eastern regional grid of India these low-cost/must-run resources covered only 9.8 % of the total grid generation in 2005/2006. The Simple OM emission factor is calculated ex-ante as the generation-weighted average emissions per electricity unit on the basis of historic production data 2003/2004, 2004/2005 and 2005/2006 for all generating sources serving the system not including low-cost/must-run power plants.	project (AM_REV_0018 published on http://cdm.unfccc.int/methodologies/PAmethodologies/Revisions/index.html).OK. The requests for revision was not accepted and "The Meth Panel discussed the proposals for revision of approved consolidated methodology ACM0002 in response to the requests for revision AM_REV_0018, AM_REV_0026 and AM_REV_0029. These requests aim at expanding the applicability of the approved consolidated methodology ACM0002 to project activities in which renewable based power plants export or result in the export of electricity to a grid other than the one in which they are located. The Panel noted that the key issue in such project activities is the traceability of the impact of the project activity power plant, i.e., whether the displacement of electricity by the electricity generated by the project activity takes place in the receiving grid or in other connected grids. In view of this, the Panel decided not to approve the requests for revision and recommends that they may be submitted to the Board as requests for deviation, as these are very specific instances of a general class of such project activities.”

			Hence, the project participants decided to combine the two grids (Bhutan and Eastern regional grid of India) based on the guidance given by the EB in para 14 of EB 28 which states that "The Board clarified that the word “regional”, in the context of “regional electricity system” used in the approved methodology, can also be interpreted as extending across several countries. The Board further clarified that trans-national electricity systems are eligible under ACM0002 and the DNAs of countries in these regions, across which the electric system spans, shall be considered as host Parties and shall provide a letter of approval stating that the project activity assists it in achieving sustainable development. Furthermore, the Board clarified that the grid emission factor in this context shall be estimated for the “regional electricity system”. Since the Bhutan grid is interconnected with the eastern grid of India and there are not significant transmission constraints, it is DNV’s opinion reasonable to assume that the project will displace electricity generation in Bhutan and/or will displace electricity generation the Eastern regional grid of India. The definition of the grid system as a regional grid consisting of the

Project proponent is requested to update combined margin emission factor based on the latest information available (CO2 Baseline Database for the Indian Power Sector, Version 3.0 for eastern grid of India and Annual power data book 2006/2007 for Bhutan) as this is more conservative.		The Simple OM has been updated according to the CO2 Baseline Database for the Indian Power Sector (published by the Indian Central Electricity Authority version 03 including 06/07 data) and latest information from Annual power data book for Bhutan 06/07. The built margin emission factor has also been updated based on the latest available information available.	Bhutan and Eastern regional grid of India is thus appropriate. The revised baseline emission factor is calculated based on the latest information available including 2006/07 data has been verified from CO2 Baseline Database for the Indian Power Sector, Version 3.0 for eastern grid of India and Annual power data book 2006/2007 for Bhutan as this is more conservative. OK Accepted. CAR 3 Closed.
CAR 4 The authority and responsibility and detailed procedures for the registration, monitoring, measurement and reporting are not described.	D.6.1 to D.6.13	During implementation of the Dagachhu HPP and before the start of the project activity (i.e. during year 2012), the monitoring procedure (as shown in Annex 4 of the PDD) will be further elaborated by the Department of Energy (DoE), giving detailed accounts for all of the following: 1. Person at the Department of Energy, responsible for • Project management • Data collection • Preparation of monitoring report • Communication with Designated Operational Entity and CDM Executive Board	Since the project is yet to be implemented, project proponent is requested to ensure that the authority and responsibility and detailed procedures for the registration, monitoring, measurement and reporting will be implemented at least prior to the start date of the crediting period. OK Accepted. CAR 4 Closed.

		2. Person at the Project Authority, responsible for • Data recording • Data collection • Calibration of monitoring equipment • Maintenance of monitoring equipment and installations 3. Procedures for calibration and maintenance of the monitoring equipment 4. Detailed procedures for monitoring, measurements and reporting (including records handling, storage area of records and performance documentation) 5. Detailed procedures for internal review of reported results/data (including a system for corrective actions) 6. Procedures for training of the monitoring personnel Chapter B.7.2. of the PDD was updated in order to reflect this information.	
CAR 5 Since the previous project participant PTC India is replaced by Tata Power Trading, a letter by PTC India is requested as required by the EB in which PTC India confirms the voluntary withdrawal from the project.	Table 2	We would like to clarify that PTC had been initially considered as the project participant in the PDD because PTC is government of India designated cross border power trader for bilaterally constructed project like: chhukha, kurichhu and Tala initially it was	It has been verified from letter issued by Department of Energy, ministry of economic affairs Bhutan dated 01 July 2008, that there was no formal agreement signed between DoE and PTC. OK Accepted.

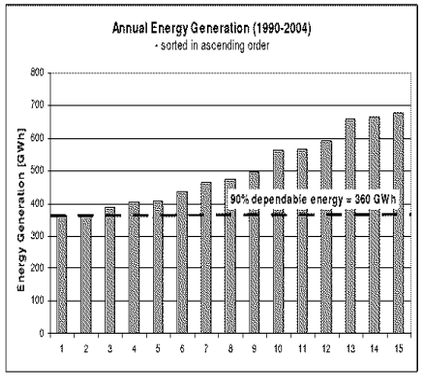
		considered that the project will be developed with the financial assistance from Indian Government hence PTC was considered as project participant earlier. For other project being constructed without government of India assistance cross border trading can be tied up with any other companies in India. Further there was no agreement or MOU signed between DoE and PTC. Please refer to DoE letter enclosed.	CAR 5 Closed.
CAR 6 Project proponent is requested to use latest "Tools for demonstration and assessment of additionality". Version 05.2	Table 1 Table 2 B.2.7	The PDD has been revised to latest tool to demonstrate additionality version 05.2	Revised PDD reviewed. OK Accepted. CAR 6 Closed.
CL 1 Provisions for training are not mentioned in the PDD and need to be clarified.	A.2.5	In order to ascertain the long term sustainability of the know-how transfer, a training program is part of the CDM project activity. The training program is specifically designed to fit the requirements of the Project Authority in order to build up capacity in operation and maintenance of state-of-the-art hydro-electrical equipment. Through the training program, cost optimal operation and maintenance of the hydropower plant can be achieved, maximizing the lifetime of the equipment. This training package will be an integral part of the	The clarifications provided are satisfactory. OK Accepted. CL 1 Closed.

		electro-mechanical supply contract. Chapter A4.3 of the PDD was updated accordingly.	
CL 2 Project proponent is also requested to clarify how transmission loss from the eastern grid to northern grid entry point has been calculated. The mechanism to calculate the transmission loss from the generating source at Dagachhu HPP to Indian border using I2R method is not transparent and clarification is required for considering the same for financial evaluation of project. .	Table 2 B.2.2	The definition of the project boundary has been updated. The spatial extension of the project boundary is now defined as the project site and all power plants connected physically to the regional grid consisting of Bhutan and the Eastern regional grid of India hence transmission loss from the eastern grid to northern grid entry point has now not considered for the project activity. As per the draft power purchase agreement signed between DoE and TPTCL, the TPTCL will pay the energy charges for the units received at Indian border therefore; transmission losses from the dagachhu power plant to the Indian border are taken into account for financial analysis.	Transmission loss from the eastern grid to northern grid entry point has now been removed from the calculation. As per the draft term sheet for power purchase agreement signed between DoE, Bhutan and TPTCL, TPTCL will pay the energy charges for the units received at Indian border hence use of saleable power at Indian border (delivery point) for financial evaluation deemed appropriate. OK Accepted. CL 2 Closed.
CL 3 In page 27 it is mentioned under access to project site, there it is mentioned that probable site of a natural gas set up is Calcutta, there is no allocation of natural gas to the state of west Bengal from the oil and gas ministry and neither is there any such network to source natural gas for such project.	B.2.5 B.2.7	According to the 10th Economic Development Plan of India (2002-2007), an additional 41 GW generation capacity will be installed of which 7,109 MW will be gas-fired generation. In Bihar the state government has a proposal to set up a two-multi fuel gas turbine of 800 MW in Patna. This will be the first of its kind in Bihar, which will run on gas. A 330 MW gas combined cycle power	Since the project proponent was unable to substantiate this argument this statement has now been removed from the PDD. OK. The clarifications provided are satisfactory. OK Accepted CL 3 Closed.

		station at Dholpur, Rajasthan started operation in September 2007. The implementing agency for the project is RRVUNL (state owned power generation company) and it is already operating natural gas based grid connected power plants in the same state i.e. Rajasthan. The information on a possible project site for an alternative gas fired power plant was updated accordingly in the PDD chapter B.5., Sub-step 3b	
~~CL 4~~ The basis of assumption of 2% increase in tariff over the years needs to be justified. It is to be clarified if there has been an agreement on the tariff between TPTCL and DoE.	B.2.7	For the financial analysis, an annual increase of electricity tariff of 2% was assumed based on the historic development of the tariff for the hydropower projects Chhukha and Kurichu. For these two projects, the tariff is negotiated on a regular basis between the DoE, Bhutan and PTC, India. For Kurichhu, no tariff increase was achieved since the commissioning of the project in 2001. For Chhukha, the tariff was increased once (33% in 2005) during the last 8 years of operation. Therefore, the annual increase of 2% is based on conservative empirical evidence (from Chhukha and Kurichhu tariffs) and is the standard figure for financial analyses within the DoE. No PPA with TPTCL has been signed	The tariff increase in the Chhukha power project is to be substantiated with documents. The document dated 14/2/05 indicating that the tariff at Chhukha to be INR 2/KWH was evidenced. It is to be clarified if there has been an agreement on the tariff between PTC and DoE. No formal PPA has been signed with TPTCL till now but it was evidenced through Draft term sheet for proposed

		till now but as per draft term sheet signed on February 14, 2008 for proposed PPA there will be an escalation of 2% per annum on tariff on a compounded basis (rate). Draft term sheet for proposed PPA signed on February 14, 2008 (enclosed).	PPA signed with TPTCL on 14 Feb 2008, also propose an escalation of 2% per annum on tariff on a compounded basis (rate). Hence use of 2% in tariff over the years deemed conservative.
~~CL 4~~ (continued) It is to be clarified if there has been an agreement on the tariff between PTC and DoE.	B.2.7	There is no separate agreement on the tariff between PTC and DoE for the increase of tariff to Rs. 2/kWh. The letter of PTC dated 14.2.2005, which was submitted to you earlier is the only reference document communicating the increase in tariff of Chukha.	Since the previous project participant PTC India is replaced by Tata Power Trading, it is to be clarified if there has been an agreement on the tariff between Tata Power Trading and DoE. No formal PPA has been signed with TPTCL till now.
~~CL 4~~ (continued) Since the previous project participant PTC India is replaced by Tata Power Trading, it is to be clarified if there has been an agreement on the tariff between Tata Power Trading and DoE.	B.2.7	A not legally binding term sheet was signed on February 05, 2008 by Druk Green Power Corporation Ltd. and Tata Power Trading Company Ltd. for the off-take of the electricity from HPP Dagachhu, but no firm tariff has been fixed so far. Therefore, we have to use the old calculation figures used in the feasibility study (see Excel sheets attached).	it was evidenced through Draft term sheet for proposed PPA signed with TPTCL that an average base rate for power purchase from the generation facility at the delivery point will be minimum 2.40 per KWh for the first year of commercial operation and as per power trading practices Dagachhu hydroelectric power authority (DHPA) shall allow a minimum discount of 2% on the sale price to TPTCL for prompt payment on or before the due date, hence the effective tariff rate for the

			base year (year of commercial operation) will be around 2.35 Rs and there is provision of escalation of 2% per annum on tariff on a compounded basis (rate). The figures used in the feasibility study are also in the above proposed range only. OK Accepted. CL 4 Closed.
CL 5 The cost of service has been calculated from the fixed IRR which corresponds to the weighted average cost of capital The assumptions for the cost of service are transparent and reasonable. However the detailed excel worksheets are to be evidenced.	B.2.7	Detailed worksheets for the cash-flow calculations shall not be published for the stakeholder consultation. The detailed worksheets with the cash flow analysis were part of PDD revision 03 submitted to DOE in August 2007.	The excel worksheets for the IRR calculation need to be provided. Also, the Excel worksheet for the cost of power generation needs to be provided. In the sensitivity analysis, it is seen that if the generation increases by 5%, the unit cost of generation comes below the benchmark cost of INR 2.25/KWH. It needs to be justified why the generation will not increase by 5%.
CL 5 (continued) The excel worksheets for the IRR calculation need to be provided. Also, the Excel worksheet for the cost of power generation needs to be provided. In the sensitivity analysis, it is seen that if the generation increases by 5%, the unit cost of generation comes below the benchmark cost of INR 2.25/KWH. It needs to be justified why the generation will not increase by 5%.	B.2.7	The detailed worksheets with the cash flow analysis are attached. The cash flow without CER revenues shows that the fixed IRR of 9.2% can only be achieved with an electricity price of INR 2.31/kWh (power cost equals to price). In chapter 4 of the Feasibility study the energy generation and the hydrological data are analysed in detail; In Table 4.11 the theoretical energy generation of	The worksheet was provided in PDF only and the Excel worksheets are required. The Excel worksheets for the calculation of the unit cost of production in the Dagachhu unit are also to be provided. Since the unit cost of production depends on the total project cost, evidence of that also is to be provided. The financial analysis is based on the

		the last 15 years is illustrated; the firm energy can be defined with 360 GWh.  For the economic calculation we have decided to take 500 GWh which is an optimistic estimation (Figure 4.23 of the feasibility study), the annual electricity generation is shown for the years 1990-2004. In 9 of the 15 years, the generation would have been lower than the assumed 500 GWh. The overall energy calculation by using 15 years only results in a certain range of uncertainty. During the final design phase (2008) another two to three years of run-off data could be available and could be taken into consideration. Summing up, the estimation of 500 GWh is an optimistic value and can only be recalculated by having more precise data available. Based on the available data, it is more realistic to	unit cost of power generation. It is to be clarified if this is the normal practice in Bhutan for assessing of projects. What is the normal benchmark (in terms of IRR) that is used for projects assessment and what would be the project IRR considering the normal tariff in Bhutan? The sensitivity analysis presented indicate that if the power generation increases by 5% the unit cost of generation come to 2.20 INR/KWh which is below the benchmark of 2.25 INR/KWh. However, it needs to be either justified that a variation of 5% is a reasonable variation of this parameter or the value of power generation (or PLF) needs to be determined at which the unit cost touches 2.25 INR/kWh and it must be shown that such a value is not likely to be achieved. It appears that this would be in the range of 52-53% which may not be impossible to achieve considering the fact that the generation projected in the feasibility report (1990 to 2004) shows an increasing trend and from 1990 to 2004 generation is above 500 GWh.

		assume that the average generation will be 5% below the 500 GWh than 5% above.	
CL 5 (continued) a) The worksheet was provided in PDF only and the excel worksheets are required. b) The financial analysis is based on the unit cost of power generation. It is to be clarified if this is the normal practice in Bhutan for assessing of projects. What is the normal benchmark (in terms of IRR) that is used for projects assessment and what would be the project IRR considering the normal tariff in Bhutan?	B.2.7	a) Please find the required worksheets attached. b) The financial analysis based on the unit cost of power generation is normal practice in Bhutan. The expected return on equity (14% before tax, 9.8% post tax) has been established by the Bhutanese government for Dagachhu HPP. The financial structure (25% equity, 75% debt) leads to a project WACC of 9.2% which was used for calculating the unit cost of generation. It is not possible to compare HPP Dagachhu with return expectations of other Bhutanese hydro power plants as they have been directly/ indirectly financed by Government of India. Bhutanese hydro power plants generate electricity mainly for export to India, meaning that they compete with Indian power plants. Therefore, established benchmarks from Indian power plants can be used as reference. The Indian Central Electricity Regulatory Commission (CERC) has set up an acceptable range between 14% and 16% for returns on equity after tax which is significantly higher than the	

c) The Excel worksheets for the calculation of the unit cost of production in the Dagacchu unit are also to be provided. Since the unit cost of production depends on the total project cost, evidence of that also is to be provided.		9.8% assumed for Dagachhu HPP. This proves that the calculation of the unit cost of generation has been undertaken with a conservative value of expected return on equity. There are various publicly available documents which explicitly state this CERC benchmark for power generation projects for determination of tariffs available at the start date of the Project as stated below: CERC's discussion paper of June 2003 stated that the preferred approach for the benchmark for conventional power generating companies would be cost of equity approach (Page 20) and indicated a 16% post tax return on equity benchmark. (http://www.cercind.gov.in/Terms_Condition_of_Tariff.pdf) CERC's notification of March 2004 revised the benchmark for conventional power generating companies to 14% post tax return on equity. See Page 20 of the Order (http://cercind.gov.in/13042007/Terms_and_conditions_of_tariff.pdf). These regulations came into force on 1.4.2004, and unless reviewed earlier or extended by the Commission, shall remain in force for a period of 5 years (31.3.2009).	

d) It needs to be either justified that a variation of 5% for the power generation is a reasonable variation of this parameter or the value of power generation (or PLF) needs to be determined at which the unit cost touches 2.25 INR/kWh and it must be shown that such a value is not likely to be achieved.		The benchmark of 14% or 16% has been used in the most recently published CERC orders for Indian hydro power plants, e.g.: http://www.cercind.gov.in/07012008/Petition-No-89-2007.pdf (RoE14%) http://www.cercind.gov.in/07012008/Petition-No-115-07.pdf (RoE 16%) http://www.cercind.gov.in/07012008/Pet-No-76-07.pdf (RoE 14%) c) Please find attached the Excel worksheets for the calculation of the unit cost of production at HPP Dagachhu with and without CDM revenues which we have extracted from our economic model. This re-calculation resulted in slightly lower unit cost of generation (2.304 instead of 2.305 INR/kWh without CDM revenues, 2.044 instead of 2.049 INR/kWh with CDM), but this does not have any significant effect on the additionality of the project. Total project costs used in this model can be found in the spread sheet Parameters and have been taken from the feasibility study. d) Figure 4.23 of the feasibility study (see page A-32 of this validation report) showed the annual generation year not in chronicle order. The following table (taken from the feasibility study Table	

<table>
<tr>
<td>Project proponent is requested to justify why IRR calculation for the project activity has been revised in the PDD and project proponent is request to provide following documents for verification
Copy of feasibility study report
Proof for total project cost
Proof for tax rate applicable
Proof for average cost of debt</td>
<td></td>
<td>4.11: Annual energy generation estimated for the period 1990-2004) proves that a stable and slightly decreasing trend in the last years can be documented. The highest values are reported for the years 1990, 1998 and 2000, the lowest values are in 1996, 2002 and 2003.

<table>
<tr><td>Year i</td><td>Energy Generation</td><td>5-year-average</td></tr>
<tr><td></td><td>[GWh]</td><td>[GWh]</td></tr>
<tr><td>1990</td><td>676</td><td rowspan="5">496</td></tr>
<tr><td>1991</td><td>564</td></tr>
<tr><td>1992</td><td>403</td></tr>
<tr><td>1993</td><td>404</td></tr>
<tr><td>1994</td><td>435</td></tr>
<tr><td>1995</td><td>560</td><td rowspan="5">508</td></tr>
<tr><td>1996</td><td>359</td></tr>
<tr><td>1997</td><td>463</td></tr>
<tr><td>1998</td><td>663</td></tr>
<tr><td>1999</td><td>495</td></tr>
<tr><td>2000</td><td>655</td><td rowspan="5">493</td></tr>
<tr><td>2001</td><td>591</td></tr>
<tr><td>2002</td><td>387</td></tr>
<tr><td>2003</td><td>360</td></tr>
<tr><td>2004</td><td>472</td></tr>
<tr><td>Average</td><td>499</td><td></td></tr>
</table>

Based on the average figure of 499 GWh per year, the unit cost of</td>
<td>Project proponent has revised the IRR calculation since the calculation provided in the feasibility report did not consider the royalty component and based on the proposed tariff as per draft term sheet signed with TPTCL dated 5 February 2008.
It has been verified by DNV that as per Sustainable Hydropower Policy 2008, Clause 4.6.2. Sustainable Hydropower</td>
</tr>
</table>

Proof for required return on equity Annual capacity degradation Operation and maintenance cost Benchmark electricity tariff Annual escalation tariff		generation are above the achievable tariff of 2.25 INR/kWh. The average figure would have to increase to above 513 GWh in order to touch the 2.25 INR/kWh tariff. In 9 out of the reported 15 years, the annual generation has been lower. Summing up, the estimation of 500 GWh per year for our calculation is an optimistic value and can only be recalculated by having more precise data available. Based on the available data, it is more realistic to assume that the average generation will be 5% below the 500 GWh than 5% above. The present trend in hydropower generation of other projects in Bhutan indicates that the energy generation is on decline. The IRR Calculation has now been revised since the IRR calculated during the feasibility report did not consider the royalty of 12% to 18% of annual power generation which has to be given for free to the Bhutanese state (based on Bhutan Sustainable Hydropower Policy 2008, Clause 4.6.2. In feasibility report of July 2006 the higher electricity price estimations within the feasibility study for 2011 to	Policy 2008, Clause 4.6.2. project proponent has to supply 12% for period 2012-2024 and 18 % of electricity afterwards 2025 as royalty to Bhutanese state, evidence in this reference need to be provided for verification. it was evidenced through Draft term sheet for proposed PPA signed with TPTCL that an average base rate for power purchase from the generation facility at the delivery point will be minimum 2.40 per KWh for the first year of commercial operation and as per power trading practices Dagachhu hydroelectric power authority (DHPA) shall allow a minimum discount of 2% on the sale price to TPTCL for prompt payment on or before the due date, hence the effective tariff rate for the base year (year of commercial operation) will be around 2.35 Rs and there is provision of escalation of 2% per annum on tariff on a compounded basis (rate).copy of feasibility study report has been verified by DNV . All the assumption used to calculate project IRR has been taken either from approved feasibility report or from draft ADB due diligence. OK Accepted CL 5 Closed.

		2014 have been proven to be much too optimistic. For example, the proposed tariff which is currently under negotiation between Bhutan and Tata Power is only 2.35 INR/kWh for 2012; this is much below the price level of 2.50 to 2.90 INR/kWh which was assumed in the feasibility study and due to change in the debt equity ratio for the Project activity. Please find enclosed annexure : Copy of feasibility study report Draft term sheet signed with TPTCL Extracts from ADB draft due diligence report. Copy of letter from PwC consultant for ADB due diligence Loan and grant project summary (ADB) Revised financial excel	
CL 6 The barrier analysis must be done with all viable alternate scenarios, including a hydro electric power plant in northern regional grid.	Table-1 Table-2 B.2.7	The barrier analysis in Sub-step 3b of the PDD chapter B.5. was updated in order to show that the identified barriers would not prevent the implementation of the alternatives (including a hydro electric power plant in the Eastern regional grid of India).	OK. The clarifications provided are satisfactory. OK Accepted CL 6 Closed.
CL 7		Step 4b of the common practice analysis	

It is evident that setting up a hydro electric power plant is a common practice in Bhutan. Barriers like low income of households do not affect the project. Local electrification is not influenced by the project as the project seems to be 100% export oriented. Development of the roads and infrastructure for the other projects must have come along with the projects and so the other project had to overcome similar barriers during their inception stages.	Table-1 Table-2 B.2.7	explains the essential distinctions between the proposed project activity to the other similar activities in Bhutan. Thereby it is explained why the similar activities did not face the barriers to which the proposed project activity is subject. It is mentioned that the other similar activities are located in areas in which rather good infrastructure, such as road access and proximity to high voltage grid was already available. In order to support this argument, certain indicators from the proposed project region were listed, such as low income of households (see also CL8) and low electrification rate. The fact that the Dagachhu project is mainly export oriented does not constrain this evidence. Furthermore, although the Dagachhu project is planned to export most of its energy, there will still be electricity infrastructure set up in the region as part of the construction and other infrastructure power supply which has to be set up in order to implement the project. Finally, due to the fact that hydropower construction usually concentrates on rather developed valleys in Bhutan, the other similar projects had to overcome	

CL 7 Pending As per the revised PDD and financial project proponent has to supply 12% for period 2012-2024 and 18 % of electricity afterwards 2025 as royalty to Bhutanese state, evidence in this reference need to be provided for verification.		far less barriers in terms of roads and infrastructure development. Thereby those projects showed a more favourable cost structure. However, the main argument against the proposed project being common practice is the fact that for the other similar projects substantial amounts of donor financing, soft loans or other development funds were available. Please refer Sustainable Hydropower Policy 2008, Clause 4.6.2. Letter from DoE (Ministry of Economic Affairs) clearly stating that project activity have to supply 12% for period 2012-2024 and 18 % of electricity afterwards 2025 as royalty to Bhutanese state, has been enclosed.	Copy of Sustainable Hydropower Policy 2008 has been reviewed. Letter from Department of energy (Ministry of Economic Affairs) dated 17 September 2008 has been verified by DNV. OK. The clarifications provided are satisfactory. CL 7 Closed.
CL 8 The project has been compared to other 4 most recent projects in Bhutan. It is argued that Dagachhu project is located in a region with household income below the national average, but in the EIA study it is stated that the annual income of the project affected area is above the national average. It is to be confirmed what is the capital cost	B.2.7	The EA study differentiates between indirectly affected households (chapter 3.4.4) and directly affected households (chapter 3.4.5). The monthly income of the 703 indirectly affected households was estimated at NU 1,126 which is below the national average of NU 1,200. Only the rather small group of 41 directly affected households have	OK. The clarifications provided are satisfactory. CL 8 Closed.

difference (INR/MWh) for all the four projects compared to the Dagachhu project.		monthly incomes of NU 1,229 which is slightly above the national average. Therefore, in the whole project region (including indirectly and directly affected areas) the household income is below the national average. For the four most recent hydro projects in Bhutan (per Sub step 4b of chapter B.5.), there are no detailed financial analyses available with the production cost calculated similar to the Dagachhu HPP. Nevertheless, the hydropower projects Tala, Kurichu and Basochu Upper Stage have received grants between 37% and 53% of the investment costs. The Basochu Lower Stage received a subsidised loan with an interest rate below 3%. As a result, these projects could be developed under much more favourable financial conditions which are not available for the proposed project activity. Therefore, as described in Sub step 4b, developing a hydropower project under commercial conditions does not represent common practice in Bhutan.	

CL 9 In light of the fact that most of the hydro electrical plants have come up with foreign funding, it is required to adjudge whether foreign fund is involved in the project. In the agreement (article 09) with the Indian government it is clearly stated that India will facilitate funding for the project, again the same is sighted as a financial barrier in the project which is not appropriate.	B.2.7	The financing structure for the project has not been finalized up to now. As of now, the funding structure will be based on 25% equity capital from sources within Bhutan and 75% debt from foreign banks in India and/or Europe on a commercial basis. Therefore, funding for this project does not result in a diversion of official development assistance. Article-9 of the cooperation agreement between India and Bhutan states that "…India shall facilitate the availing of facilities including financing from various financial institutions in India…" For the Dagachhu project all funding sources are currently based on commercial terms. There is no indication from India to provide any soft-loans or grants, which were available to other similar projects, to finance the Dagachhu HPP project.	It is stated that the financial closure has not been done. The latest on the financial fund sourcing is to be provided.
CL 9 (continued) It is stated that the financial closure has not been done. The latest on the financial fund sourcing is to be provided.	B.2.7	In the Feasibility Study, the Project was proposed to be financed with 25% equity and 75% debt. Accordingly, the Royal Government of Bhutan (RGoB) has requested for loan from the Austrian Government for financing of Electro-mechanical equipment part of the Project. RGoB has also applied for loan from the Asian Development Bank (ADB).	OK. The clarifications provided are satisfactory. OK Accepted CL 9 Closed.

		ADB has initiated PPTA in April 2007 to carry out due diligence exercise for Dagachhu finance and the PPTA will be completed by March 2008 and loan approval is expected by middle of 2008. RGoB is also exploring finances from domestic financial institutions as well as from Indian commercial banks. Some of the domestic financial institutions have expressed interest in financing the Project (NPPF has indicated about EUR 20.00 million for the Project). The Hydropower Generating Companies in Bhutan have also committed some funds for the Dagachhu HPP. The RGoB has approved and sanctioned about EUR 5 million during 2007-08 financial year for construction of project infrastructure (roads, bridges, construction power lines etc.). All in all, it is expected that the complete financial closure for the Project would be possible by the end of 2008.	
CL 10 The agreements and MoU's referred to in the Design Document are in the draft stage, clarification is required on the approval of the same.	B.2.9	The "Agreement between the Royal Government of Bhutan and the government of the Republic of India concerning cooperation in the field of hydroelectric power" was signed in 2006. The agreement is considered to be confidential.	The final MOU between India and Bhutan is to be provided. This is stated to be confidential, but needs to be provided to the DOE for perusal. The document will be kept confidential only.

CL 10 (continued) The final MOU between India and Bhutan is to be provided. This is stated to be confidential, but needs to be provided to the DOE for perusal. The document will be kept confidential only.	B.2.9	As this is a Bilateral Agreement between the Royal Government of Bhutan and the Government of the Republic of India, we have to first seek concurrence of the Government of Republic of India for sharing the contents of this Agreement. We have therefore, got the concurrence of the Government of India to use only those part/contents (Article 8 concerning CDM cooperation) relevant for the PDD. However, we are sending the complete Agreement for kind perusal of the DOE. *Please do not make the whole Agreement public.*	OK. The MoU was provided and reviewed by DNV. OK Accepted CL 10 Closed.
CL 11 The expected operational lifetime of the project is 40 years but the useful lifetime of the project as projected under sub step 2b of the additionality discussion is given as 30 years. Clarification is required on the same.	C.1.1	The expected operational lifetime of 40 years for hydropower plants in based on a conservative estimate and can be even longer depending on appropriate operation and maintenance of the equipment. Nevertheless, due to legal regulations in Bhutan (Electricity Act of Bhutan, 2001), any hydropower project has to be returned from the Project Authority holding the operating license to the Royal Government of Bhutan after 30 years of operation. Therefore, the financial analysis carried out for the project in Step 2b of the additionality had to be done for a maximal operational lifetime of 30 years. In	Though the expected operational lifetime of the project activity is 40 years but as per Electricity Act of Bhutan, 2001 any license shall remain in force for the period specified but shall not exceed 30 years. Hence use of 30 year life time for financial analysis deemed appropriate for the project activity. OK. The clarifications provided are satisfactory. CL 11 Closed.

		addition, hydropower plants would require major refurbishment work after a lifetime of app. 30 years which was not considered in the financial analysis.	
CL 12 Being a renewable electricity generation project, there are no project emissions. The project activity is a run-of the river project and does not have a reservoir. This is to be confirmed by the project proponent with respect to the power density and emission factor for project reservoir emissions (see Annex 5 to EB 23 report).	Table 1 Table-2 D.2.1 E.1.1 E.1.2 E.1.3 E.1.4 E.1.5	The "Power Density"[W/m²] is calculated by dividing the installed power of the project by the flooded surface area. For the Dagachhu HPP, this figure can be calculated as follows: 114,000,000 W / 35,000 m² = 3,257 W/m², which is by far above the threshold of 10 W/m². Therefore the approved methodology ACM0002 can be used and the project emissions from the reservoir may be neglected. The data for calculating the Power Density was taken from Chapter 1.2.4. (Table 1-1) of the Environmental Assessment (Enclosure 4 to the PDD).	The calculation of the power density is not clear. The surface are of the reservoir stated to be 35000 m2 is not seen in the table 1.1 of chapter 1.2.4. The evidence for the surface area of the reservoir is to be provided.
CL 12 (continued) The calculation of the power density is not clear. The surface are of the reservoir stated to be 35000 m2 is not seen in the table 1.1 of chapter 1.2.4. The evidence for the surface area of the reservoir is to be provided.		The figure of 35,000m3 for the flooded reservoir area was taken from Table 1 - 3 of chapter 1.2.5.2. of the EIA as can be seen below (second column from the right).	The power density calculation indicates a reservoir size of 0.035 km2. The value indicated in the EA report submitted to DNV indicates a reservoir size of 0.01 km2. This difference has no significant impact on the power density but nonetheless further clarifications are requested.

		1.2.5.2 Site Selection Alternatives This site selection alternative concerns only for Dam location and there are two op available for the decision. • Option 1: Dam site 1A with open desilting chamber at Gewathang. This option advantage over other, as Dam height will be shorter by 16m. This has ther economic and environmental advantages compared to other. Map 3 shows the pr alternatives. The energy capacity is about 500 GWh (Table 1.3). • Option 2: Dam site 1 is located some 500 m downstream of dam alternative 1A. Th have higher dam height while the same level of energy will be generated (Table Map 3 shows the project alternatives. Table 1-3 Principal statistic of options for developing DHPP Option / Basic Arrangement / Energy (MW) / Energy (GWh/a) / Dam Height (m) / Storage Volume (million M^3) / Size of Reservoir (km2) 1 / DHPP with Dam site 1A / 114 / 500 / 21 / 0.3 / 0.03 2 / DHPP with Dam site 1 / 114 / 500 / 37 / 1.0 / 0.05	
CL 12 (continued) The power density calculation indicates a reservoir size of 0.035 km2. The value indicated in the EA report submitted to DNV indicates a reservoir size of 0.01 km2. This difference has no significant impact on the power density but nonetheless further clarifications are requested. However as per ACM 0002 version 07 the project proponent has to monitor the installed capacity of the project after implementation and Surface area at full reservoir level, hence project proponent is requested to include this as a part of data to be monitored.	B.4.1 B.4.2 B.4.3 B.9.1 B.9.2 B.9.3 B.9.4 B.9.5 B.9.6 B.9.7 B.9.8 B.9.9	Initially, the draft EA report dated February 2006 was submitted to DNV which showed the reservoir size of 0.01 km2. For the PDD for stakeholder consultation – submitted to DNV in September 2007 – the final version of the EA report (July 2006) was included as PDD "Enclosure 4 Environmental Assessment Main Report. PDF". There you can find in table 1-3 the correct reservoir size of 0.035 km2.	The power density has been calculated on the basis of reservoir size of 0.035 km2. The value of reservoir area has been crosschecked against the approved EIA report dated 31 July 2006. Project proponent has revised the PDD now installed capacity of the project after implementation and Surface area at full reservoir level has now been included in section B.7.1 of the PDD. OK Accepted CL 12 Closed.
CL 13 The emission reduction calculations of the project are based on an annual output of 500 GWh. - In page 107 of the EIA it is indicated that the project will generate 420	Table 1 Table 2 E.1.2	The generation figures in the EA are based on earlier estimates taken from preliminary versions of the Feasibility Study for the Dagachhu HPP. The final generation figure is 500 GWh and the	Copy of detailed hydrology assessment study and final approved study has been verified by DNV.

GWh of power , and in page 16 it is mentioned that the annual electrical power is 524 GWh, Clarification is required on the basis of this generation capacity. There are uncertainties with respect to unavailability of water in the project scenario due to irregular monsoon and catchments' characteristics such as run off, absorption, ice etc which may lead to variable plant load factor. How these uncertainties are accounted for in calculating the annual net output is not transparent. As per the revised PDD and financial project proponent has to supply 12% for period 2012-2024 and 18 % of electricity afterwards 2025 as royalty to Bhutanese state, evidence in this reference need to be provided for verification.		EIA has been updated accordingly (see enclosure). For the Feasibility Study of the Dagachhu HPP a detailed hydrological assessment was carried out considering all relevant uncertainties in the water flow. This served as a basis for optimising the power plant design and for calculating a reasonable annual generation figure which is expected to be achieved in average throughout the operational lifetime of the project. Further details are available in the Feasibility Study of the Dagachhu HPP. Copy of hydrological assessment enclosed. Please refer Sustainable Hydropower Policy 2008, Clause 4.6.2. Letter from DoE (Ministry of Economic Affairs) clearly stating that project activity have to supply 12% for period 2012-2024 and 18 % of electricity afterwards 2025 as royalty to Bhutanese state, has been enclosed.	Copy of Sustainable Hydropower Policy 2008 has been reviewed. Letter from Department of energy (Ministry of Economic Affairs) dated 17 September 2008 has been verified by DNV. OK Accepted CL 13 Closed.
CL 14 In financial analysis an average transmission and distribution loss of 1.61 %has been considered, source of the data is to be clearly indicated.	Table 1 Table 2 E.1.2	T and D loss data has been sourced from the approved feasibility report of 31 July 2008. As per the draft term sheet signed with Tata Power Trading Company Limited, TPTCL will pay only for the units supplied to the eastern grid of India	OK. The clarifications provided are satisfactory. CL 14 Closed.

		hence this has been used for financial analysis of the project activity.	
CL 15 The host country legislation makes it mandatory for hydropower projects to have an environmental clearance before starting of construction. It is not clear if the EIA has the approval. This is to be confirmed.	Table -1 Table -2 F.1.2 F.1.5 F.1.6	Based on the review and approval of the final EA and Socio-economic assessment report of Dagachhu HPP, the National Environment Commission (NEC) of Bhutan has issued the Environmental Clearances (EC) in June 2007 for development of Dagachhu HPP and also for construction of approach roads (~20 km) and two bridges in the Project area. The EC as well as Forestry Clearances issued by the Department of Forest, Ministry of Agriculture can be submitted on request. The following agencies/organizations has issued no objection letter for activities related to development of Dagachhu HPP 1. Concerned Dzongkhag (District) Administration, in this case Dagana Dzongkhag and Tsirang Dzongkhag has issued no objection letters. 2. For construction of approach roads for the Project access, Department of Roads, Ministry of Works & Human Settlement has issued no objection letter; 3. The Department of Forest, Ministry of Agriculture has issued a Forestry Clearances for Project and roads &	The EIA approval from the National EIA EIA approval from National Environment Commission (NEC) of Bhutan is to be provided. All the other clearances stated in the response are also to be provided.

		bridges and also for 220 kV high voltage transmissions line (19 km long) for evacuation of Dagachhu power has been issued.	
CL 15 (continued) EIA approval from National Environment Commission (NEC) of Bhutan is to be provided. All the other clearances stated in the response are also to be provided.	Table -1 Table -2 F.1.2 F.1.5 F.1.6	Please find attached the clearances issued for the HPP Dagachhu project. Referring to the clearance from involved Dzongkhag (District) Administration. The whole Dagachhu Project falls under Dagana Dzongkhag/District. Therefore, no objection of Tsirang Dzongkhag is not needed.	EIA Approval from National environmental Commission of Bhutan dated 28 June 2007 has been verified by DNV. Environmental clearance from National environmental Commission of Bhutan for construction of access road dated 02 April 2007 has been verified by DNV. Approach road take off clearance from ministry of works and human settlement dated 09 May 2006 has been verified by DNV. Forest clearance for transmission line from ministry of agriculture, department of forests dated 29 December 2006 has been verified by DNV. Clearance from Dzongkhag (District) Administration dated 17 April 2006 has been verified by DNV. Since the construction of project activity will be started in Jan 2009 the Environmental Management Plan (EMP) and Catchments Management Plan (CMP) has now been included in and the monitoring plan and this will be further verified from subsequent approvals from National Environment

			commission during subsequent verifications please refer CL 18 of the report. OK Accepted. CL 15 Closed.
CL 16 In section G.3, states that only one household needs to be relocated due to the project but it does not refer to the fact that (as given in the EIA study page. 14) the project will impact 44 households in some way or the other.	Table -1 Table 2 G.1.1	Based on the findings of the EA, one semi-permanent household needs to be relocated, 41 households are directly affected and 703 households are indirectly affected by the project. The direct effect of the project on the households is related to land use changes due to construction of the project road, project components and transmission infrastructure. Section E.3. of the revised PDD states that "Although only one household needs to be resettled due to the construction of the transmission line, the RAP would delineate all affected people and outline appropriate compensation for land losses so that people are not disadvantaged due to the project". This indicates that there will be households affected by the project in addition to the one household which must be relocated. Nevertheless, as indicated in chapter 5.1.2 of the EA, any negative effects and required mitigation will be assessed in the Resettlement Action Plan (RAP).	It is stated that the all impacts will be addressed in the Resettlement Action Plan. DNV requests this Resettlement Action Plan to be provided for perusal.

CL 16 (continued) It is stated that the all impacts will be addressed in the Resettlement Action Plan. DNV requests this Resettlement Action Plan to be provided for perusal.	Table -1 Table 2 G.1.1	As part of the Asian Development Bank (ADB) social safeguard exercise, a comprehensive Resettlement Action Plan of the Dagachhu HPP was carried out and prepared. It is attached herewith for kind perusal.	Copy of detailed Resettlement Action Plan of the Dagachhu HPP has been verified by DNV. Since the project construction has started, it is to be confirmed if the compensation to the affected people has been settled or not.
CL 16 (continued) Since the project construction has started, it is to be confirmed if the compensation to the affected people has been settled or not.	Table -1 Table 2 G.1.1	In January 2008, the first infrastructure work (roads, bridges, power lines) for HPP Dagachhu started. Compensation to affected people due to loss in crop due to this work has already been settled. Please find the attached proof (file name: Crop compensation to PAFs.pdf). Regarding the land compensation the project authority is in process of working out with local authorities for payment of land compensation or land replacement and will be completed by end of 2008.	Project proponent has already settled the crop compensation to the affected people; this has been verified by crop compensation receipt. Since majority of the effected people are in favor of land replacement, the project proponent has already submitted a application for land replacement to Dasho Dzongdag Dzongkhang Administration on 29 May 2008. The project proponent has conducted a meeting with representatives of local heads and Dzongkhag administration to update the stakeholders on the progress of the process on 22 June 2008. This has been verified from minutes of meeting held on 22 June 2008. However land replacement process is still going on project proponent is requested to include this as a part of monitoring plan and this will be verified

			during the time of first verification please refer CL 19 of this report. OK Accepted. CL 16 Closed.
CL 17 Further clarifications are needed on the start date of the project activity. When was the investment decision to implement the project made?	C.1.1	Based on the results of the feasibility study, EA and CDM assessment, the Bhutanese government approved the project in 31 July 2006 to take up Dagachhu hydropower project under the condition of CDM development. This can be considered as the first investment decision. In January 2008, the first infrastructure construction work started. The tender of EPC contract will take place between July and December 2008. In December 2008, the EPC contract will be signed which will be the second and final investment decision. Main construction work (dam, plant, powerhouse, etc.) will start afterwards in January 2009.	Date of feasibility study approval (31 July 2006) from Government of Bhutan has been chosen as a start date of the project activity. Copy of approved feasibility study dated 31 July 2006 has been evidenced. OK Accepted. CL 17 Closed.
CL 18 Since the construction of project activity will be started in Jan 2009 the Environmental Management Plan (EMP) and Catchments Management Plan (CMP) need to be included in section B.7.1 of the PDD in order to ensure that the Environment Management Plan	Table 2 F.1.5	This has now included as a part of monitoring Plan. Please find the revised PDD.	This Environmental Management Plan (EMP) and Catchments Management Plan (CMP) has now been included in section B.7.1 of the PDD in order to ensure that the Management Plan (EMP) and Catchments Management Plan (CMP) will be implemented as per

(EMP) and Catchments Management Plan (CMP) will be implemented as per the plan and this will be further verified from subsequent approvals from National Environment commission during subsequent verifications.			the plan and this will be further verified from subsequent approvals from National Environment commission during verification. CL 18 Closed.
CL 19 Land replacement process is still going on project proponent is requested to include Resettlement action plan as a part of monitoring plan and this will be verified during the time of first verification.	Table 2 G.1.5	This has now been incorporated in the revised PDD.	Project proponent has revised the PDD and Resettlement action plan has been included in section B.7.1 of the PDD in order to ensure that the land compensation will be done as per the RAP plan and this will be verified during the time of First verification. CL 19 Closed.

APPENDIX B

CERTIFICATES OF COMPETENCE

CERTIFICATE OF COMPETENCE

Raman Venkata Kakaraparthi

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

GHG Auditor:		Yes				
Technical Area		***CDM Validator***	***CDM Verifier***	***Sector Expert***	***Methodology Expert***	***Technical Reviewer***
Landfill gas		Jan 2009				
Renewables	*Hydro power*	Jan 2009			Jan 2009	Jan 2009
	Wind power	Jan 2009	Jan 2009			
	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_2O						
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

Michael Lehmann
Technical Director, Climate Change Services

CERTIFICATE OF COMPETENCE

Ramesh Ramachandran

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

GHG Auditor:		Yes				
Technical Area		***CDM Validator***	***CDM Verifier***	***Sector Expert***	***Methodology Expert***	***Technical Reviewer***
Landfill gas		Jan 2009	Jan 2009	Jan 2009		
Renewables	*Hydro power*	Jan 2009	Jan 2009		Jan 2009	Jan 2009
	Wind power	Jan 2009	Jan 2009			
	Other renewable	Jan 2009	Jan 2009			
Biomass		Jan 2009	Jan 2009			
Grid connection of isolated system		Jan 2009	Jan 2009			
Cement		Jan 2009	Jan 2009			
Waste-heat / waste-gas recovery		Jan 2009	Jan 2009			
Efficiency of thermal power plants		Jan 2009	Jan 2009			
Coal mine methane		Jan 2009	Jan 2009			
Fuel switch		Jan 2009	Jan 2009			
Manure management		Jan 2009	Jan 2009			
Waste / wastewater treatment		Jan 2009	Jan 2009	Jan 2009		
Energy efficiency		Jan 2009	Jan 2009			
N_2O		Jan 2009	Jan 2009			
HFCs		Jan 2009	Jan 2009			
Flare reduction		Jan 2009	Jan 2009			
PFCs		Jan 2009	Jan 2009			
Charcoal		Jan 2009	Jan 2009			
CO_2 recovery		Jan 2009	Jan 2009			
Transport		Jan 2009	Jan 2009			
Non-renewable biomass		Jan 2009	Jan 2009			
Biofuel		Jan 2009	Jan 2009			
Pipeline leakage reduction		Jan 2009	Jan 2009			
SF_6		Jan 2009	Jan 2009			

Høvik, 9 January 2009

Michael Lehmann
Technical Director, Climate Change Services

CERTIFICATE OF COMPETENCE

Hendrik Brinks

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

GHG Auditor:		Yes				
Technical Area		***CDM Validator***	***CDM Verifier***	***Sector Expert***	***Methodology Expert***	***Technical Reviewer***
Landfill gas		Jan 2009			Jan 2009	Jan 2009
Renewables	*Hydro power*				Jan 2009	Jan 2009
	Wind power					
	Other renewable					
Biomass					Jan 2009	Jan 2009
Grid connection of isolated system						
Cement						
Waste-heat / waste-gas recovery					Jan 2009	Jan 2009
Efficiency of thermal power plants						
Coal mine methane					Jan 2009	Jan 2009
Fuel switch						
Manure management						
Waste / wastewater treatment					Jan 2009	Jan 2009
Energy efficiency					Jan 2009	Jan 2009
N_2O						
HFCs						
Flare reduction						
PFCs						
Charcoal						
CO_2 recovery						
Transport						
Non-renewable biomass						
Biofuel						
Pipeline leakage reduction						
SF_6						

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CERTIFICATE OF COMPETENCE

Michael Lehmann

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

GHG Auditor:		Yes				
Technical Area		***CDM Validator***	***CDM Verifier***	***Sector Expert***	***Methodology Expert***	***Technical Reviewer***
Landfill gas		Jan 2009	Jan 2009		Jan 2009	Jan 2009
Renewables	*Hydro power*	Jan 2009	Jan 2009	Jan 2009	Jan 2009	Jan 2009
	Wind power	Jan 2009	Jan 2009			
	Other renewable	Jan 2009	Jan 2009			
Biomass		Jan 2009	Jan 2009		Jan 2009	Jan 2009
Grid connection of isolated system		Jan 2009	Jan 2009	Jan 2009	Jan 2009	Jan 2009
Cement		Jan 2009	Jan 2009		Jan 2009	Jan 2009
Waste-heat / waste-gas recovery		Jan 2009	Jan 2009		Jan 2009	Jan 2009
Efficiency of thermal power plants		Jan 2009	Jan 2009		Jan 2009	Jan 2009
Coal mine methane		Jan 2009	Jan 2009		Jan 2009	Jan 2009
Fuel switch		Jan 2009	Jan 2009		Jan 2009	Jan 2009
Manure management		Jan 2009	Jan 2009		Jan 2009	Jan 2009
Waste / wastewater treatment		Jan 2009	Jan 2009		Jan 2009	Jan 2009
Energy efficiency		Jan 2009	Jan 2009		Jan 2009	Jan 2009
N_2O		Jan 2009	Jan 2009		Jan 2009	Jan 2009
HFCs		Jan 2009	Jan 2009		Jan 2009	Jan 2009
Flare reduction		Jan 2009	Jan 2009		Jan 2009	Jan 2009
PFCs		Jan 2009	Jan 2009		Jan 2009	Jan 2009
Charcoal		Jan 2009	Jan 2009		Jan 2009	Jan 2009
CO_2 recovery		Jan 2009	Jan 2009		Jan 2009	Jan 2009
Transport		Jan 2009	Jan 2009		Jan 2009	Jan 2009
Non-renewable biomass		Jan 2009	Jan 2009		Jan 2009	Jan 2009
Biofuel		Jan 2009	Jan 2009		Jan 2009	Jan 2009
Pipeline leakage reduction		Jan 2009	Jan 2009		Jan 2009	Jan 2009
SF_6		Jan 2009	Jan 2009		Jan 2009	Jan 2009

Høvik, 9 January 2009

Michael Lehmann

Technical Director, Climate Change Services

CERTIFICATE OF COMPETENCE

Gaurav Srivastava

Qualification in accordance with DNV's Qualification Scheme CDM/JI (ICP-8-1-CDMJI-i1)

GHG Auditor:		Yes				
Technical Area		***CDM Validator***	***CDM Verifier***	***Sector Expert***	***Methodology Expert***	***Technical Reviewer***
Landfill gas						
Renewables	*Hydro power*					
	Wind power					
	Other renewable					
Biomass						
Grid connection of isolated system						
Cement						
Waste-heat / waste-gas recovery						
Efficiency of thermal power plants						
Coal mine methane						
Fuel switch						
Manure management						
Waste / wastewater treatment						
Energy efficiency						
N_2O						
HFCs						
Flare reduction						
PFCs						
Charcoal						
CO_2 recovery						
Transport						
Non-renewable biomass						
Biofuel						
Pipeline leakage reduction						
SF_6						

Høvik, 5 November 2009

Michael Lehmann

Technical Director, Climate Change Services