VALIDATION REPORT

"NAM SANA HYDROPOWER PROJECT" IN LAO PDR

REPORT NO. 2012-9729

REVISION NO. 01

DET NORSKE VERITAS™

MANAGING RISK

Validation of project activity "Nam Sana Hydropower Project" in Lao PDR	
For: Eneco Energy Trade, B.V.	
Account Ref.: Mark Meyrick/Philip Britton	

DNV CLIMATE CHANGE SERVICES AS

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Summary:

Project Name: Nam Sana Hydropower Project
Country: Lao PDR
Methodology: AMS-I.D Version: 17
GHG reducing Measure/Technology: Grid connected renewable electricity generation form hydropower plant
Sectoral scope(s):
ER estimate: 25 335 tCO_2e per year (average)
Size ☐ Large Scale ☒ Small Scale
Validation Phases:
☐ Desk Review ☐ Follow up interviews
☒ Resolution of outstanding issues
Validation Status
☐ Corrective Actions Requested ☐ Clarifications Requested
☒ Submission for registration ☐ Rejected

In summary, it is DNV's opinion that the project activity "Nam Sana Hydropower Project" in Lao PDR, as described in the PDD, version 07 of 24 December 2014, meets all relevant UNFCCC requirements for the CDM and correctly applies the baseline and monitoring methodology AMS-I.D, version 17. Hence, DNV requests the registration of the project as a CDM project activity.

Prepared by:	Verified by:	Approved by:
Wan Hasliza SM Jamaluddin, Lim Yap Hong, Fathullah Akmal Khalid, Simon Wong Yon-Sing, Lai Chee Keong	S.Ranganathan	Michael Lehmann

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Rev. No.	Date	Reason for Issue
0	22 December 2012	Draft validation report
01	29 December 2014	Final validation report

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Abbreviations

BM	Build Margin
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CER	Certified Emission Reduction(s)
CH_4	Methane
CL	Clarification request
CM	Combined Margin
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
DNA	Designated National Authority
DNV	DNV Climate Change Services AS
FAR	Forward Action Request
FSR	Feasibility Study Report
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IEE	Initial Environmental Examination
IPCC	Intergovernmental Panel on Climate Change
Lao PDR	Lao People's Democratic Republic
LoA	Letter of approval
NGO	Non-governmental Organisation
MoC	Modalities of communication
ODA	Official Development Assistance
OM	Operating Margin
PDD	Project Design Document
PS	Clean Development Mechanism Project Standard
tCO_2e	Tonnes of CO_2 equivalents
TGO	Thailand Greenhouse Gas Management Organisation (Public Organisation)
UNFCCC	United Nations Framework Convention on Climate Change
VVS	Clean Development Mechanism Validation and Verification Standard

MANAGING RISK

1 EXECUTIVE SUMMARY – VALIDATION OPINION

DNV Climate Change Services AS (DNV) has performed a validation of the project activity "Nam Sana Hydropower Project" in Lao PDR. The validation was performed on the basis of UNFCCC criteria for the Clean Development Mechanism 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 host Party is Lao PDR and the Annex I Party is United Kingdom of Great Britain and Northern Ireland. Both Parties fulfil the participation criteria and the DNA of Lao PDR and the DNA of the United Kingdom of Great Britain and Northern Ireland have approved the project and authorized the project participant Electricité du Laos, Lao PDR, and Eneco Energy Trade, B.V., Netherlands, respectively.. The DNA from Lao PDR confirmed that the project assists in achieving sustainable development.

The project correctly applies the baseline and monitoring methodology AMS-I.D, version 17 "Grid connected renewable electricity generation".

Being a small-scale hydropower, the project activity has an installed capacity of 14 MW which will be exported to the Thailand and Laos national grid which is dominated by fossil fuel power plants. As a result, 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 25 335 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 monitoring plan provides for the monitoring of the project's emission reductions. The monitoring arrangements described in the monitoring plan are feasible within the project design, and it is DNV's opinion that the project participants are able to implement the monitoring plan.

In summary, it is DNV's opinion that the project activity "Nam Sana Hydropower Project" in Lao PDR, as described in the PDD, version 07 dated 24 December 2014 meets all relevant UNFCCC requirements for the CDM and correctly applies the baseline and monitoring methodology AMS-I.D, version 17. Hence, DNV requests the registration of the project as a CDM project activity.

Kuala Lumpur and Oslo, 29 December 2014

Simon Wong Yon-Sing
Validator

Michael Lehmann
Director of Services and Technologies
DNV Climate Change Services AS

2 INTRODUCTION

Eneco Energy Trade, B.V. has commissioned DNV Climate Change Services AS (DNV) to perform a validation of the proposed CDM project activity "Nam Sana Hydropower Project" in Lao PDR (hereafter called "project"). This report summarises the findings of the validation of the project, performed on the basis of UNFCCC criteria for the CDM, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to Article 12 of the Kyoto Protocol, the CDM modalities and procedures, the simplified modalities and procedures for small-scale CDM project activities and the subsequent decisions by the CDM Executive Board.

2.1 Objective

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

2.2 Scope

The validation scope is defined as an independent and objective review of the project design document (PDD). The PDD is reviewed against the criteria stated in Article 12 of the Kyoto Protocol, the CDM modalities and procedures as agreed in the Marrakech Accords, the simplified modalities and procedures for small-scale CDM project activities and the relevant decisions by the CDM Executive Board, including the approved baseline and monitoring methodology AMS-I.D (version 17) / 18/. The validation was carried out in accordance with the principles and the requirements for validation contained in the Validation and Verification Standard.

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 document review

II follow-up actions (e.g. on-site visit and telephone or email interviews)

III the closing out of validation findings and the issuance of the final validation report and opinion

The following sections outline each step in more detail.

3.1 Document review

The following tables list the documentation that was reviewed during the validation.

3.1.1 Documentation provided by the project participants

/ 1/ Asianet Services Co. Ltd.: CDM-PDD for project activity "Nam Sana Hydropower Project" in Lao PDR, version 01 dated 30 August 2012 (published for global stakeholder consultation) and version 07 dated 24 December 2014 (submitted for request for registration)

/ 2/ Asianet Services Co. Ltd.: *Financial Investment IRR Spreadsheet*, version 01, dated 30 August 2012 (initial version) and *Nam Sana IRR Calculations Only 25 Years 1.7.14.xls* (final version)

/ 3/ Asianet Services Co. Ltd.: *Emission Reduction Spreadsheet*, version 01, dated 30 August 2012 (initial version) and *Nam Sana Emissions Reductions Only Resend 1.7.14.xls* (final version)

/ 4/ Narawat Patanakarn Public Company Limited.: *Feasibility Study Environmental Impact Assessment and Definite Design of Nam Sana Hydropower Project (FSR)*, dated November 2010

/ 5/ Thailand Greenhouse Gas Management Organisation (Public Organisation): *Summary Report of the study of emission factor for electricity generation of Thailand in year 2010*, date published 30 December 2011 http://www.tgo.or.th/english/download/publication/GEF/2010/GEFReport_ENrevise4.pdf

/ 6/ Narawat Patanakarn Public Company Limited.: *Initial Environmental Examination for Nam Sana Hydropower Project*, dated November 2010 (EIA Report)

/ 7/ Electricité du Laos, Lao PDR: *List of Compensation for the Local Stakeholders*, dated 12 March 2012

/ 8/ Lao PDR Ministry of Natural Resources and Environment: *Certificate for the Approval for the EIA and FSR report dated December 2011*, dated 21 May 2012

/ 9/ Lao PDR Government: *Letter on Accepting the Usage of 10% Discount Rate for Investment Analysis*, dated 24 September 2012

/ 10/ Electricité du Laos, Lao PDR and Eneco Energy Trade, B.V.: *Modalities of Communication Statement for Nam Sana Hydropower Project in Lao PDR*, latest signature on 4 October 2012

/ 11/ Confirmation of receipt of the "*Intention to develop the CDM project*" by the DNA of Lao PDR dated 15 March 2012

/ 12/ Start work order on the access road to the site, dated 29 November 2011

3.1.2 Letters of approval

/ 13/ Ministry of Natural Resources and Environment (DNA of Lao PDR): *Letter of approval* dated 02 April 2014

/ 14/ Environment Agency (DNA of United Kingdom of Great Britain and Northern Ireland): *Letter of approval* dated 23 December 2014

3.1.3 Methodologies, tools and other guidance by the CDM Executive Board

/ 15/ CDM Executive Board: *Clean Development Mechanism Validation and Verification Standard,* version 07.0

/ 16/ CDM Executive Board: *Clean Development Mechanism Project Standard,* version 07.0

/ 17/ CDM Executive Board: *Clean Development Mechanism Project Cycle Procedure,* version 07.0

/ 18/ CDM Executive Board: *Baseline and monitoring methodology AMS-I.D Grid connected renewable electricity generation*, version 17 of EB 61 Annex 17, dated 3 June 2011

/ 19/ CDM Executive Board: *Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion*, version 02 of EB 41 Annex 11, dated 2 August 2008

/ 20/ CDM Executive Board: *Guidelines for the reporting and validation of plant load factors*, version 01 of EB 48 Annex 11, dated 17 July 2009

/ 21/ CDM Executive Board: *Tool to determine the remaining lifetime of equipment*, version 01 of EB 50 Annex 15, dated 16 October 2009

/ 22/ CDM Executive Board: *Guidelines on Assessment of Debundling for SSC Project Activities*, version 03 of EB 54 Annex 13, dated 28 May 2010

/ 23/ CDM Executive Board: *Guidelines on the assessment of investment analysis*, version 05 of EB 62 Annex 5, dated 15 July 2011

/ 24/ CDM Executive Board: *Tool to calculate the emission factor for an electricity system*, version 4.0.0 of EB 75 Annex 15

/ 25/ CDM Executive Board: *Guidelines on the demonstration of additionality of small-scale project activities*, version 09.0 of EB 68 Annex 27, dated 20 July 2012

/ 26/ CDM Executive Board: *General Guidelines for SSC CDM Methodologies*, version 19.0 of EB 69 Annex 27, dated 13 September 2012

/ 27/ CDM Executive Board: *Glossary: CDM Terms*, version 07.0 of EB 70 Annex 7, dated 23 November 2012

/ 28/ CDM Executive Board: *Clarification Host Party for project activities and bundled project activities*, EB 70 Annex 38 dated 23 November 2012

/ 29/ CDM Executive Board: *Prior Consideration of the CDM for Nam Sana Hydropower Project*, date received 15 March 2012
http://cdm.unfccc.int/Projects/PriorCDM/notifications/index_html (for prior consideration)

3.1.4 Documents used by DNV to validate / cross-check the information provided by the project participants

/ 30/ Lao PDR Government: *Law on Electricity*, dated 31 May 1997

/ 31/ International financial website, (last accessed on 2 September 2014)
http://www.indexmundi.com/laos/inflation_rate_%28consumer_prices%29.html

/ 32/ EdL signed EPC contract with conditions dated 20 June 2011 (last accessed on 2 September 2014)
www.set.or.th/dat/news/201106/11027019.pdf

/ 33/ Maunsell and Lahmeyer International: *Power System Development Plan for Lao PDR*, dated August 2004 (this is published at the Lao PDR Ministry of Energy and Mines website as part of the Government Plan, (last accessed on 25 November 2012)
http://www.poweringprogress.org/index.php?option=com_jotloader&cid=11&Itemid=97

/ 34/ The Environmental Protection Law (1999) (last accessed on 10 August 2014)
http://www.vientianetimes.org.la/Laws%20in%20English/40.%20Law%20on%20Environmental%20Protection%20(1999)%20Eng.pdf

/ 35/ Lao PDR Science Technology Environment Agency: *National Policy Environmental and Social Sustainability of the Hydropower Sector in Lao PDR*, year 2006

/ 36/ IPCC: *2006 IPCC Guidelines for National GHG Inventories*, volume 2

/ 37/ PDD publishing website:
http://cdm.unfccc.int/Projects/Validation/DB/A0DW9MCVAID7IP64NX8B2V2R0OGXW3/view.html

/ 38/ CDM Projects Reference List:
Project 5583: http://cdm.unfccc.int/Projects/DB/SQS1324398658.36/view
Project 6120: http://cdm.unfccc.int/Projects/DB/Germanischer1335441117.9/view
Project 5258: http://cdm.unfccc.int/Projects/DB/BVQI1316699433.82/view
Project 9038: http://cdm.unfccc.int/Projects/DB/CEC1356084291.13/view
Project 9526: http://cdm.unfccc.int/Projects/DB/TUEV-RHEIN1358418951.2/view

/ 39/ Electricité du Laos, Lao PDR: Annual report 2009 (Electricite Du Laos)

/ 40/ Electricité du Laos, Lao PDR: Annual Report 2010 (Electric du Lao)

/ 41/ Statistics Yearbook in Lao PDR 2010 published by Statistics Planning Office of EDL

/ 42/ Electricité du Laos, Lao PDR: Electricy Statistics for Year 2011

/ 43/ Electricité du Laos, Lao PDR: Annual Repot 2012 (Electric du Lao)

/ 44/ EGAT Annual report 2008 (Electricity Generating Authority of Thailand)

/ 45/ EGAT Annual report 2009 (Electricity Generating Authority of Thailand)

/ 46/ EGAT Annual report 2010 (Electricity Generating Authority of Thailand)

/ 47/ Electricity Power Plants in Laos December 2011 (Ministry of Energy and Mines of Laos PDR) (last accessed 1 May 2014)
http://www.poweringprogress.org/download/Electric_Power_Plants_in_Laos_December_2011.pdf

3.2 Follow-up actions

The project is a greenfield project, and the weir and the powerhouse were still under construction as verified during a site visit on 5 December 2012. DNV has conducted a physical site inspection at the project activity site to interview the local stakeholders as part of DNV's assessment of the project's compliance with the CDM requirements. Representatives from the local stakeholders of the villagers surrounding the hydropower project site were also invited.

Moreover, for a hydropower project, the FSR, EIA, and additional background documents relating to the project design and baseline were assessed as a part of the validation.

On 5 December 2012 to 6 December 2012, Wan Hasliza SM Jamaluddin from DNV Kuala Lumpur visited the physical site and performed interviews with project stakeholders.

	Date / Type of interview	Name / Organization	Topic
/ 48/	5 December 2012 ☒ On-site ☐ Face-to-face at office ☐ Telephone ☐ E-mail	• Philip Britton / Asianet Services Co. Ltd.	• Technology applied and operational lifetime • Applicability criteria • Monitoring and reporting procedures • Existence of investment and common practice barriers • Conservativeness of assumptions used • Estimated emission reductions • Stakeholder consultation process • Project investment analysis / additionality • Project funding • Calibration, internal audit and corrective action procedures
/ 49/	5 December 2012 ☒ On-site ☐ Face-to-face at office ☐ Telephone ☐ E-mail	• Thedsana T/chamkaunsouc / Electricité du Laos, Lao PDR • Vongvilay Sisoulath / Electricité du Laos, Lao PDR • Sengphouangphet P. / Electricité du Laos, Lao PDR • Souksavath Siththisave / Electricité du Laos, Lao	• Provisions for training, operation and maintenance • Monitoring and reporting procedures • Power purchase agreement

		PDR	
/ 50/	5 December 2012 ☒ On-site ☐ Face-to-face at office ☐ Telephone ☐ E-mail	• Xiengphila. S / Local Stakeholders (Nasu Village) • Oun / Local Stakeholders (Nasu Village) • Khomphan. V / Local Stakeholders (Nasu Village) • Mouy / Local Stakeholders (Nasu Village) • Khamphao. Th / Local Stakeholders (PhonNgarm.V Village) • Vilay / Local Stakeholders (PhonNgarm.V Village) • Cheun / Local Stakeholders (PhonNgarm.V Village) • Seng XayaVong / Local Stakeholders (PhonNgarm.V Village)	• Opinion on project • Compensation • Stakeholder consultation process
/ 51/	6 December 2012 ☐ On-site ☒ Face-to-face at office ☐ Telephone ☐ E-mail	• Immala / DNA of Lao PDR • Imthaboualy / DNA of Lao PDR • Bounthee Saythongvanh / DNA of Lao PDR • Sengphaangkhome / DNA of Lao PDR	• Incentives in place for CDM projects • Host country approval status • Legal and environmental requirements • Stakeholder consultation requirement • Common practice with regard to power generation in Lao PDR • Sustainable development issues • Official government funding • Grid emission factor

3.3 Closing out of validation findings

The objective of this phase of the validation was to resolve any issues which needed be clarified prior to DNV's conclusion on the project's compliance with applicable CDM requirements. 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 four tables. The different columns in these tables are described in the figure below. The completed validation protocol for the project activity "Nam Sana Hydropower Project" in Lao PDR is enclosed in Appendix A to this report.

Table 2 of the validation protocol documents the findings of the desk review of the project design documentation and follow-up interviews with project stakeholders. Any findings raised in Table 2 are listed in Table 3 of the protocol, and changes to the description of the project design as a result of these findings will be addressed in Table 3. Table 2 thus may not reflect all aspects of the project as described in the final PDD submitted for registration.

A corrective action request (CAR) is raised if one of the following occurs:

(a) The project participants have made mistakes that will influence the ability of the project activity to achieve real, measurable additional emission reductions;

(b) The applicable CDM requirements have not been met;

(c) There is a risk that emission reductions cannot be monitored or calculated.

A clarification request (CL) is raised if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met.

A forward action request (FAR) is raised during validation to highlight issues related to project implementation that require review during the first verification of the project activity. FARs shall not relate to the CDM requirements for registration.

The validation identified six CARs, seven CLs and one FAR. The CARs and CLs were satisfactorily addressed by the project participants by among other revising the PDD (please refer to Table 3 in Appendix A for further details). In addition to the changes made to the PDD as a result of the validation findings, the following changes to the PDD (version 07 dated 24 December 2014) were made compared to the version of the PDD published for stakeholder comments (version 01 dated 30 August 2012):

- Revision of the monitoring parameter nomenclature to be consistent with the methodology
- Annex I Party is represented by United Kingdom of Great Britain and Northern Ireland
- Update to version 5 of the CDM-PDD form

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**) or a **corrective action request (CAR)** if a requirement is not met.*

Validation Protocol Table 2: Requirement Checklist				
Checklist question	***Reference***	***Means of verification (MoV)***	***Assessment by DNV***	***Draft and/or Final Conclusion***
The various requirements in Table 1 are linked to checklist questions the project should meet. The checklist is organised in different sections, following the logic of the CDM-PDD	*Gives reference to documents where the answer to the checklist question or item is found.*	*Means of verification (MoV) are **document review (DR)**, **interview (I)** or any other follow-up actions (e.g., on site visit and telephone or email interviews) and **cross-checking (CC)** with available information relating to projects or technologies similar to the proposed CDM project activity under validation.*	*The discussion on how the conclusion is arrived at and the conclusion on the compliance with the checklist question so far.*	*OK is used if the information and evidence provided is adequate to demonstrate compliance with CDM requirements. A **corrective action request (CAR)** is raised when project participants have made mistakes, the CDM requirements have not been met or there is a risk that emission reductions cannot be monitored or calculated. A **clarification request (CL)** is raised if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met. A **forward action request (FAR)** during validation is raised to highlight issues related to project implementation that require review during the first verification of the project activity.*

Validation Protocol Table 3: Resolution of Corrective Action and Clarification Requests			
Corrective action and/ or clarification requests	***Ref. to checklist question in table 2***	***Response by project participants***	***Validation conclusion***
*The **CARs** and/ or **CLs** raised in Table 2 are repeated here.*	*Reference to the checklist question number in Table 2 where the CAR or CL is explained.*	*The responses given by the project participants to address the CARs and/or CLs.*	*The validation team's assessment and final conclusions of the CARs and/or CLs.*

Validation Protocol Table 4: Forward Action Requests		
Forward action request	***Ref. to checklist question in table 2***	***Response by project participants***
The FARs raised in Table 2 are repeated here.	*Reference to the checklist question number in Table 2 where the FAR is explained.*	*Response by project participants on how forward action request will be addressed prior to first verification.*

Figure 1: Validation protocol tables

3.4 Internal quality control

The validation report underwent a technical review performed by a technical reviewer qualified in accordance with DNV's qualification scheme for CDM validation and verification.

3.5 Validation team

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

				Type of involvement						
Role	***Last Name***	***First Name***	***Country***	Desk review	Site visit / Interviews	Reporting	Supervision of work	Technical review	TA 1.2 competence	Financial expertise
Team leader (Validator) until 14 February 2013	SM Jamaluddin	Wan Hasliza	Malaysia	✓	✓	✓	✓		✓	
Team leader (Validator) from 15 February 2013	Lim	Yap Hong	Malaysia	✓		✓	✓			
Team leader (Validator) from 1 July 2013	Wong	Simon Yon-Sing	Malaysia	✓		✓			✓	
Expert (until 1 January 2014)	Khalid	Fathullah Akmal	Malaysia	✓		✓				✓
Expert (from 1 January 2014)	Lai	Chee Keong	Malaysia	✓		✓				✓
Technical reviewer	Seshan	Ranganathan	India					✓	✓	

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 as documented and described in the PDD, version 07 dated 24 December 2014 / 1/.

4.1 Comments by Parties, stakeholders and NGOs

The PDD, version 01 dated 30 August 2012, was made publicly available on the CDM website and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 1 November 2012 to 30 November 2012 / 37/.

No comment was received from the global stakeholder consultation.

4.2 Approval, authorization and contribution to sustainable development

The project participants are Electricité du Laos, Lao PDR, and Eneco Energy Trade, B.V., Netherlands. The host Party is Lao PDR and the Annex I Party is the United Kingdom of Great Britain and Northern Ireland. Both Parties meet all relevant participation requirements.

The letter of approval (LoA) was issued by DNA of Lao PDR on 02 April 2014, authorizing Electricité du Laos, Lao PDR, as project participant and confirming that the project assists in achieving sustainable development / 13/.

The LoA by the DNA of the United Kingdom of Great Britain and Northern Ireland was issued on 23 Decemberr 2014, authorizing Eneco Energy Trade, B.V., Netherlands, as project participant /14/..

The letters of approval were received from the project participants. DNV does not doubt the authenticity of the letters of approval. DNV considers the letters are in accordance with paragraphs 39-42 of the VVS / 15/ The project does not result in a diversion of ODA and is separate from and not counted towards its financial obligations as a Party.

4.3 Modalities of communications

DNV has performed due diligence on the Modalities of Communications (MoC) statement / 10/ submitted by the project participants in accordance with applicable requirements in the VVS as documented in section A.4 of Table 2 in the validation protocol in Appendix A to this report. DNV was able to confirm the information contained in the MoC and that the MoC complies with all relevant forms and requirements.

4.4 Project design

The proposed project activity is to make use of hydrological resource in Nam Sana River to generate electricity to the Laos Central Grid which is also connected to Thailand National Grid via a powerhouse which is located on the right bank of Nam Sana River. The project is located in the Nam Sana, the location coordinates of the weir is latitude 19.216038°N, longitude 102.339227°E and the location coordinates of the power house is latitude

19.204662°N, longitude 102.310886°E which has been confirmed by DNV during the site visit.

The proposed project activity is a greenfield project activity as confirmed during site visit. The project involves the construction and operation of hydropower plant with a total installed capacity of 14 MW, provided by 2 units of 4 MW and 1 unit of 6 MW Francis type turbine units with gross electricity generation of 49 550 MWh per year, as evidenced through the feasibility study report (FSR) / 4/. The estimated annual electricity generation capacity of 49 550 MWh, the project has plant load factor of 40.4%, as sourced from the FSR / 4/. The hydropower plant includes weir, headrace box culvert, surge tank, powerhouse and tailrace channel. As the project is a run-of-river hydropower, hence there is no new reservoir is being built.

The starting date of the project activity is after 19 September 2011, which is the date that the Project Participant and the EPC Contractor committed to the obligations in the pre-agreed EPC Contract, which was signed on 20 June 2011 / 32/, by starting work on access road after authorisation is given by the local authority. The authorisation was given as the cabinet has given verbal approval on the Initial Environmental Examination (IEE) of the project, while the official approval was given on 21 May 2012 / 8/.

The expected lifetime of the project is 50.5 years, which is sourced from the FSR / 4/. DNV has calculated that if the project operates at 3 539 hours (based on the plant load factor of 40.4%) and the hydro turbines have the technical lifetime of 150 000 hours (based on the default value from "*Tool to determine the remaining lifetime of equipment*"), the project activity would have a 42.4 years of technical lifetime. Hence the expected lifetime of 50.5 years sourced from the FSR is deemed acceptable / 4/.

The renewable crediting period of 7 years has been selected starting from 1 January 2015. The project activity is projected to reduce emissions by 25 335 tCO_2e per year over the crediting period / 2/. Being a renewable electricity project, the project activity will generate greenhouse gas (GHG) emission reductions by avoiding CO_2 emissions from electricity generation by fossil fuel power plants, which are connected to the grid.

DNV considers the project description of the project contained in the PDD to be complete and accurate. The PDD complies with the relevant forms and guidance for completing the PDD / 1/.

4.5 Application of selected baseline and monitoring methodology

The project participants applied the simplified baseline methodology of type I, AMS-I.D – Gird connected renewable electricity generation (version 17) small scale CDM project activity / 18/.

The project fulfils the following conditions under which AMS-I.D (version 17) is applicable:

1. The project is a hydropower with a capacity of 14 MW which generates renewable electricity and supply to the national grid (Lao PDR Central Grid which is also connected to the Thailand National Grid). This is in line with paragraph 1 of AMS-I.D (version 17) / 18/;
2. The proposed project supplies the electricity to the national grid; hence this is in line with paragraph 2 of AMS-I.D (version 17) / 18/;
3. The project is a new run-of-river hydropower project hence this is in line with paragraph 4 of AMS-I.D (version 17) / 18/;

4. The project is a hydropower project which does not involve reservoirs; hence this is in line with paragraph 4 of AMS-I.D (version 17) / 18/;
5. The project is a hydropower project which does not involve biomass; hence this is in line with paragraph 5 of AMS-I.D (version 17) / 18/;
6. The project is a hydropower project which does not involve heat generation; hence this is in line with paragraph 6 of AMS-I.D (version 17) / 18/; and
7. The project is a greenfield project and does not involve addition, retrofit, or replacement of energy generation units. This is also confirmed during the site visit. This is in line with paragraph 7 and 8 of AMS-I.D (version 17) / 18/.

DNV was able to verify that the project activity is not a de-bundled component of a larger project activity as there is no other small scale project activity with the same project participant, and in the same project category, and registered within the previous two years, and whose project boundary is within 1 km of the project boundary of the propose small scale activity at the closest point.

All applicability conditions mentioned above has been confirmed also during the site visit and follow-up interviews as it is described in section 3.2 of this report. DNV has concluded that the application of the baseline methodology is transparent and reasonable.

The assessment of the project's compliance with the applicability criteria of AMS-I.D (version 17) / 18/ are documented in detail in section B.2 of Table 2 in the validation protocol in Appendix A to this report.

4.6 Project boundary

The spatial extent of the project boundary is clearly defined as the proposed project and all power plants connected physically to the regional grid consisting of the Thai Grid and Lao Central Grid. The project will be connected to the Lao Power Grid which is connected to Thailand Power Grid according to the "*Existing Power System Diagram in Year 2012*" as of 9 January 2013 on the EDL Annual Report 2012 / 43/. The Lao Power Grid is also connected to Chinese, Vietnamese and Cambodian power grid. None of country whose grid is connected to the Lao Power Grid are Annex I countries. Therefore the emission factor of the connected electricity system is not zero, according to the "*Tool to calculate the emission factor for an electricity system"* version 4 / 24/.

According to the "*Tool to calculate the emission factor for an electricity system*" / 24/, if DNA of host country has not published delineation of project electricity system and connected electricity systems, the project proponent should define the project electricity system and any connected electricity system and justify in PDD. In the PDD, the project electricity system is identified as regional grid consisting of Lao Power Grid and Thailand Power Grid, since DNA of Lao PDR has not published delineation of project electricity system and connected electricity system, and Thailand DNA's delineation is for projects located in Thailand, not covering those located in other country with a trans-national project electricity system. According to the interview to the government authority and the EDL / 49/, there is no spot market between Lao and Thailand Power Grid, and the load of the transmission lines between Lao Power Grid and Thailand Power Grid is far below 50% of its rated capacity during all the year. According to the EDL Annual Report 2010 / 40/, tariff for import and export are fixed and which is depend on peak or off peak season, therefore there is no spot market.

It was also validated that there are no legal or technical restrictions for international electricity exchange. Therefore, the project electricity system and connected electricity system are defined according to the tool. According to the "*11 Transmission Line Connection among Countries*" on the EDL Annual Report 2012 / 43/, the Lao Power Grid is connected to the Thailand grid by one 500kV, two 230kV, six 115kV and five 22kV transmission lines. It is also connected to the China grid by 110kV, 22kV and 10kV transmission lines, to the Vietnam grid by one 35kV and three 22kV transmission lines and to the Cambodia grid by one 22kV transmission line.

According to the "*Electricity Power Plants in Laos December 2011*" on the "*Powering Progress*" website by the Department of Energy Business, Ministry of Energy and Mines, Lao PDR / 47/, out of fourteen operational electricity power plants with total installed capacity of 2 548.5 MW, nine power plants with total installed capacity of 2 438 MW identify Thailand as the planned market. Other five power plants identify Laos as the planned market.

None of the operational power projects on the list is planning for Vietnam or China market. However, there is one power plant (Xekaman 3 Hydropower project) that just started operation in July 2013 that is going to export electricity to Vietnam, and another hydropower plant (Xekaman 1 Hydropower project) under-construction and several hydropower projects in planning or feasibility study stages are indicating Vietnam as planned market.

According to the EDL Annual report 2009 / 44/, the EGAT Annual report 2009 / 45/ and 2010 / 46/, the exported electricity from Lao to Thailand was greater than the domestic electricity consumption in Lao from 2008 to 2010. The imported electricity from Thailand to Lao was more than 50% of domestic electricity consumption in Lao. It was validated that the figure is in line with the data of the EDL and EGAT Annual Report / 39// 40// 41// 42// 43// 44// 45// 46/. The Lao Power Grid is connected to the Thailand, Vietnam and China grid through the international connecting transmission line. According to "*Tool to calculate the emission factor for an electricity system*" / 24/, a connected electricity system is defined as an electricity system that is connected by transmission lines to the project electricity system, China grid and Vietnam grid are considered as the connected electricity system, the imported electricity from China and Vietnam is included in the emission factor calculations.

According to interview to EDL during on-site assessment / 49/, there is currently only small amount of import from Vietnam and China to Lao and no export to them due to limitation of the transmission lines connecting to the China grid and the Vietnam grid. According to "*Electricity Statistics in Lao PDR 2010*" / 41/ and Annual Report (2008-2010) Electricity Generating Authority of Thailand / 44// 45// 46/, the total electricity imported from these countires is small 0.18% (2009), 0.35% (2008) and 1.57% (2007) of the total electricity generated by the proposed regional grid.

The Thailand grid is considered as a part of the project electricity system due to non-existence of significant transmission constraint, since the Thailand grid and Lao grid are interconnected by several international transmission lines. Therefore it is reasonable to identify the Lao Power Grid and Thailand Power Grid as an electricity system for the project, and it complies with the applied methodology and tool. The spatial extent of the project boundary is clearly defined as the proposed project and all power plants connected physically to the Lao Central C1 Grid and Thailand National Grid. The defined project boundary is in line with AMS-I.D (version 17) / 18/.

The selected sources and gases are justified for the project activity. The emission sources and gases included in the project boundary are presented as the table below:

	GHGs involved	Description
Baseline emissions	CO_2	Main emission is from the electricity generation by fossil fuel power plants from the Lao Central Grid and Thailand National Grid that are displaced due to the project activity.
Project emissions	CO_2	Project emission from the fossil fuel consumption for the backup system which will be monitored *ex-post*. There is no emission from water reservoirs of hydro power plant as the project does not involve a reservoir.
Leakage	N/A	There is no transfer of equipment from other project hence the leakage is not considered as per AMS-I.D (version 17) / 18/.

The identified boundary and selected sources and gases are justified for the project activity. The validation of the project activity did not reveal other greenhouse gas emissions occurring within the proposed CDM project activity boundary as a result of the implementation of the proposed project activity which are expected to contribute more than 1% of the overall expected average annual emission reduction, which are not addressed by AMS-I.D (version 17) / 18/.

4.7 Baseline scenario identification and description

The project activity is the installation of a new hydro power plant which is connected to the Lao Central C1 Grid and Thailand National Grid. The baseline scenario is the electricity delivered to the grid by the proposed project which would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources within the Lao Central Grid and Thailand National Grid. This is in accordance with AMS-I.D (version 17) / 18/.

The power generation in Lao PDR is dominated by hydropower. As the power generation is from the Lao PDR side is sourced from hydropower which is a low cost/must run resource, hence the calculation of OM is solely based on data from Thailand. The Thailand national grid is dominated by fuel-fired power plants. It is deemed likely that fuel-fired power plants will continue to dominate the power sector due to the local availability of low-cost coal.

The approved baseline methodology has been correctly applied to identify a complete list of realistic and credible baseline scenarios, and the identified baseline scenario most reasonably represents what would occur in the absence of the proposed CDM project activity.

All the assumption and data used by the project participants are listed in the PDD and/or supporting documents. All documentation relevant for establishing the baseline scenario and correctly quoted and interpreted in the PDD. Assumptions and data used in the identification of the baseline scenario are justified appropriately, supported by evidence and can be deemed reasonable. Relevant national and/or sectoral policies and circumstances are considered and listed in the PDD.

4.8 Algorithms and/or formulae used to determine emission reductions

The emission reductions (ER_y), by the project activity during the crediting period is the difference between baseline emissions (BE_y), project emissions (PE_y) and emissions due to leakage (L_y), as follows:

- Baseline emissions: This is the product of the grid emissions factor ($EF_{grid,CM,y}$ in tCO_2/MWh) times the net electricity supplied by the project activity to the grid (EG_y in MWh);
- Project emissions: There are no emissions from water reservoir of the hydropower plant as the project is a run-of-river hydro power plant, which does not require reservoir, hence the project does not result in new reservoir. Nevertheless, the project will have diesel generator for back-up purposes. Hence, the emissions from diesel generator will be monitored *ex-post* as per "*Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion*" and will be assumed zero in the *ex-ante* calculation / 19/;
- Leakage: No leakage has to be considered for the proposed project activity in accordance with AMS-I.D (version 17) / 18/.

The grid emission coefficient is calculated according to the procedures prescribed in the latest "*Tool to calculate the emission factor for an electricity system"* (version 4) / 24/.

The PDD was made publicly available on UNFCCC website on 1 November 2012 / 37/. The calculation of emission factor of the regional electricity system consisting of Lao Power Grid and Thailand Power Grid is in line with the steps described "*Tool to calculate emission factor for electricity system*" / 24/ using most recent official sources available to the project participant at the time of commencement of the validation, including: "*The Study of emission factor for an electricity system in Thailand 2010*" published on 30 December 2011 / 5/, "*Annual Report (2008 to 2010) Electricity Generating Authority of Thailand*" / 44// 45// 46/, "*Statistics Yearbook*" prepared by Statistics Planning Office of EDL in Laos 2010 / 41/. The selection of the 2009 (Thailand) and 2010 (Lao PDR) Study / 41/ is thus justified as it is the most recent data available at the time of submission of the CDM-PDD to designated operational entity for validation, which is in accordance to the "*Tool to calculate the emission factor for an electricity system",* version 4 / 24/.

EF_{OM} **:** Simple OM method is used. Low-Cost/Must-Run resources in the identified regional electricity system consisting of Lao Power Grid and Thailand Power Grid constitute less than 50% of total grid generation in average of the five most recent years (2006 to 2010), 8.22% in 2006, 8.08% in 2007, 7.41% in 2008 and 7.32% in 2009 and 5.65% in 2010. The EF_{OM} is calculated to be 0.5994 tCO_2e/MW, i.e. the average of EF_{OM} in 2008, 2009 and 2010 / 3/.

EF_{BM} **:** The Build Margin (BM) emission factor was calculated by *ex-ante* (Option 1) in that 2010 data was used as the most recent information available on plants already built for sample group *m* at the time of validation. The sample group *m* consists of the power plant capacity additions in the electricity system that comprise 20% of the system generation (32 934.25 GWh) and that have been built most recently (10 815.57 GWh). The BM is calculated as the generation weighted average emission factor of the sample group *m* and arrived to be 0.4231 tCO_2/MWh / 3/.

Thus, the weights w_{OM} and w_{BM} are selected as 0.5 and 0.5 respectively, as stipulated for hydropower projects by the calculation tool. The combined margin 0.5113 tCO_2e/MWh is fixed *ex-ante* for the first crediting period / 3/.

Based on the calculations and results presented in the sections above the implementation of the project activity will result in an average *ex-ante* estimation of emission reduction conservatively calculated to be 25 335 tCO_2e per year for the selected crediting period / 3/.

All assumptions and data used by the project participants are listed in the PDD and/or supporting documents, including their references and sources. All documentation used by the project participants as the basis for assumptions and source of data is correctly quoted and interpreted in the PDD. All values used in the PDD are considered reasonable in the context of the proposed CDM project activity. The baseline methodology has been applied correctly to calculate project emissions, baseline emissions, leakage and emission reductions. All estimates of the baseline, project and leakage emissions can be replicated using the data and parameter values provided in the PDD.

4.9 Additionality

The additionality of the project is demonstrated by applying the "*Guidelines on the demonstration of additionality of small-scale project activities*" (version 09.0) / 25/.

4.9.1 Prior consideration of CDM

Project start date

The starting date of the project activity is 19 September 2011, which is the date that the Project Participant and the EPC Contractor committed to the obligations in the pre-agreed EPC Contract, by starting work on access road after authorisation is given by the local authority. Even though the contract was signed on 20 June 2011 / 32/, the contract was with pre-conditions such as approval of IEE and also commitment from the project developer. The commitment was met with the starting on access road while the IEE has been submitted for approval at the same time. The authorisation was given as the cabinet has given verbal approval on the Initial Environmental Examination (IEE) of the project, while the official approval was given on 21 May 2012 / 8/. Hence, 20 June 2011 was not deemed the actual starting date due to the lack of actual work (i.e. commitment to construct road access) and the progress of IEE which was only finalised at a later stage.

Evidence for prior consideration

The project's starting date of 19 September 2011 is after 2 August 2008.

- A CDM notification form for this project was sent to the DNA of Lao PDR on 19 March 2012, regarding the commencement of the project and its intention to seek CDM status. DNV has checked the notification and is able to confirm that the receipt of notification by DNA of Lao PDR through the interview held in the DNA's office and an official letter sent on 15 March 2012 / 11/.
- In addition, the CDM notification form dated 28 February 2012 for this project was sent to UNFCCC secretariat, regarding the commencement of the project and its intention to seek CDM status. The UNFCCC website shows that the notification of prior consideration of the CDM for this project was received on 15 March 2012 / 29/. DNV has checked the UNFCCC website link for this notification and is able to confirm that the notification had been received by UNFCCC secretariat.

Real and continuing actions

The project activity starting date is 19 September 2011 which is after 2 August 2008 / 12/. As the starting date is 19 September 2011, this is still less than 180 days from the initial notification to the CDM Secretariat on 15 March 2012.

It is DNV's opinion that the proposed CDM project activity complies with the requirements for prior consideration of the CDM contained in the CDM Project Standard and the CDM Project Cycle Procedure and Validation and Verification Standards.

4.9.2 Identification of alternatives to the project activity

The alternatives to the project activity are:

1. Proposed project activity not undertaken as a CDM project activity; and
2. Continuation of current situation of grid electricity generation.

Both alternatives to the project activity as listed above are in compliance with Lao PDR laws and regulations and consequently achievable as cross-checked against Lao PDR policy. Thus, DNV considers the listed alternatives to be credible and complete. The alternatives 1) and 2) are realistic and credible alternatives and will be discussed the next steps.

4.9.3 Investment analysis

Choice of approach

As the proposed project generates financial and economic benefits other than CDM related income through the sales of electricity and the alternative to the project does not involve an investment, a benchmark analysis was justified for conducting the investment analysis.

Benchmark selection

The benchmark selected is a discount rate of 10% which was published by Lao PDR Government on August 2004 / 33/. This rate was available to the project participants during the investment decision in year 2011. In addition, the Lao PDR Government has accepted the usage of discount rate of 10% as the benchmark for the project activity on 24 September 2012 which confirmed the validity of the discount rate / 9/. In comparison, the expected return on equity derived from the "*Guidelines on the assessment of investment analysis*" shows 13.25% / 23/. Hence, the discount rate of 10% is deemed more conservative and acceptable / 24/.

The input parameters used in the investment comparison analysis are verified as follows:

No	Parameter	Source of data and assessment
1	Investment costs	The investment cost is estaimted to be USD 26.84 million which is consistent with the FSR, which was prepared on November 2010 / 4/. This is less than eleven months prior to the decision to proceed with the project activity which was 11 September 2011 / 32/. Given this relative short period of time between the preparation of the FSR and the decision to proceed with the project activity, it is unlikely in the context of the project that the input values would have materially changed. The FSR was approved on 21 May 2012 / 8/. The FSR considers the total investment costs to be USD 30.5 million, as the remaining cost of USD 4.03 million is for refurbishment and allowed the project to operate up to 50.5 years / 4/. As the project is a

BOT scheme lasting 25 years, the refurbishment cost has been excluded and the residual value has been included. This will increase the project IRR and thus it is acceptable.

DNV has cross-checked with the registered PDDs and IRR spreadsheet of hydropower projects in Lao PDR (UNFCCC reference) and found that the investment cost per MW are as follow / 38/:

UNFCCC reference number	Installed capacity (MW)	Investment Cost (US$million)	Investment cost/ installed capacity (US$m/MW)
Project activity	14	26.8	1.91
5583	250	247	0.988
6120	100	121	1.21
5258	76	135	1.73
9038	120	250	2.08
9526	9.136	17.5	1.9

The validation team then checked investment cost per total capacity for the project activity is within the range of registered CDM hydropower projects in Laos / 38/ and is similar to the only small scale project (#9526). It is also noticed that the registered CDM hydropower projects in Laos were also started in or before 2007.

By checking the international financial website / 31/, the inflation rate of Laos is 4.5%, 7.6%, 0.03% and 5.9% from 2007-2010. Thus it is indicated that there is an inflation tendency in Laos in recent years. Thus it is considered that the estimation of investment cost is deemed to be reliable.

<table>
<tr>
<td>2</td>
<td>Tariff</td>
<td>The tariff rate of 0.06 USD/kWh (fixed) is based on FSR. The FSR was approved on 21 May 2012 / 8/. DNV has identified the other hydropower CDM registered projects are receiving tariff at the range of 0.04 to 0.05 USD/kWh which is lower than the project / 38/. Therefore, the tariff rate of 0.06 USD/kWh is deemed reasonable.
DNV has cross-checked with the registered PDDs and IRR spreadsheet of hydropower projects in Lao PDR (UNFCCC reference) and found that the tariff are as follow / 38/:
<table>
<tr><th>UNFCCC reference number</th><th>Installed capacity (MW)</th><th>Tariff (US$/kWh)</th></tr>
<tr><td>Project activity</td><td>14</td><td>0.06</td></tr>
<tr><td>5583</td><td>25</td><td>0.04</td></tr>
<tr><td>6120</td><td>100</td><td>0.0468</td></tr>
<tr><td>5258</td><td>76</td><td>0.04-0.045</td></tr>
<tr><td>9038</td><td>120</td><td>0.0459</td></tr>
<tr><td>9526</td><td>9.136</td><td>0.0625</td></tr>
</table>
The validation team then checked the tariff applied for the project activity is within the range of registered CDM hydropower projects in Laos / 38/. Thus it is considered that the estimation of the tariff is deemed to be reasonable.</td>
</tr>
<tr>
<td>3</td>
<td>Electricity generation</td>
<td>According to the Guidelines for the reporting and validation of plant load factors EB 48 Annex 11/ 20/, it is considered that:
(a) The plant load factor provided to banks and/or equity financiers while applying the project activity for project financing, or to the government while applying the project activity for implementation approval;
(b) The plant load factor determined by a third party contracted by the project participants (e.g. an engineering company).
The plant load factor of the project activity has been calculated under EB 48 Annex 11, option (b). The guidelines for the reporting and validation of PLFs is based on FSR of this project and was determined by Narawat Patanakarn Public Company Limited / 4/, which is the independent third party contracted by the project participants. The FSR was approved on 21 May 2012 / 8/.
The amount of electricity generated by the project activity is based on the FSR which has estimated that the hydropower plant to have annual</td>
</tr>
</table>

electricity generation capacity of 49 550 MWh. This is calculated to the plant load factor of 40.4%. The FSR / 4/ has taken into consideration of the relevant influencing variables such as the historical and estimated rain fall and river water flow rate, turbine efficiency, transmission losses and provisions for maintenance and breakdown. This is deemed acceptable.

Data measurements in Lao PDR are not as detailed as they are in many countries and therefore the estimates have been made on the basis of data from nearby hydrological stations, and the data has been processed and final electricity generation estimated by Narawat Patanakarn Public Company Limited / 4/.

DNV has cross-checked with the registered PDDs and IRR spreadsheet of hydropower projects in Lao PDR (UNFCCC reference) and found that the electricity generation and plant load factor (PLF) are as follow / 38/:

UNFCCC reference number	Installed capacity (MW)	Net generation (GWh/year)	PLF % (Gross gemeration)
Project activity	14	248.6	40.4
5583	250	962.8	44.63
6120	100	420.9	48.05
5258	76	309	46.61
9038	120	501.9	48.2
9526	9.136	32.5	40.61

The validation team then checked the PLF applied for the project activity is on the lower range of registered CDM hydropower projects in Laos. Nevertheless, the sensitivity analysis will consider the sensitivity of this parameter against the additionality criteria (benchmark) / 38/.

<table>
<tr>
<td>4</td>
<td>Annual operating and maintenance (O&M) costs</td>
<td>The operation and maintenance cost is sourced from the FSR prepared by Narawat Patanakarn Public Company Limited / 4/, which estimated to be USD 280 000 per year. This is equivalent to 0.92% of the investment cost. This is lower than the standardised parameters for financial modelling published by Lao PDR government which assumes O&M cost of 1.5% of the total capital cost.
DNV has cross-checked with the registered PDDs and IRRR spreadsheet of hydropower projects in Lao PDR (UNFCCC reference) and found that the investment cost per MW are as follow / 38/:
<table>
<tr><th>UNFCCC reference number</th><th>% of O&M costs from the total investment cost</th></tr>
<tr><td>Project activity</td><td>0.92</td></tr>
<tr><td>5583</td><td>1.5</td></tr>
<tr><td>6120</td><td>1.9</td></tr>
<tr><td>5258</td><td>0.09</td></tr>
<tr><td>9038</td><td>1.20</td></tr>
<tr><td>9526</td><td>1.77</td></tr>
</table>
The validation team then checked the O&M cost per total investment for the project activity (i.e. 0.92%) is within the range of registered CDM hydropower projects in Laos (i.e. 0.09% - 1.9%) / 38/. Thus it is considered that the estimation of O&M is deemed to be reliable.</td>
</tr>
<tr>
<td>5</td>
<td>Depreciation</td>
<td>The project proponent will operate the hydropower plant for a 25 years concession period under BOT (Build Operate Transfer) scheme / 4/, after which it will be transferred to the Host Government, Lao PDR. Therefore, the project is assumed to depreciate in straightline trend over the period of the owner’s investment in IRR calculation, that is 25 years.</td>
</tr>
<tr>
<td>6</td>
<td>Salvage value</td>
<td>The period of the investment analysis is 25 years, which is the concession period of the hydropower project / 4/. Thus, according to the “Guidelines on the Assessment of Investment Analysis” / 23/, the fair value of the project activity need not be considered for a power project of more than 20 years. Nevertheless, the salvage value has not been taken into consideration as the plant will be transferred to the Host Government, Lao PDR after 25 years.</td>
</tr>
</table>

Calculation and conclusion

The IRR calculations were provided and transparently calculated in the spread sheet / 2/, which has been checked for the accuracy and reproducibility of the calculations. The assumptions and calculations were verified and found to be correct by DNV as in Section 4.9.3 – Input Parameters. Pre-tax project IRR over 25 years was calculated, giving a percentage return of 8.35% against the benchmark of 10%. The IRR improves to 10.30% when CDM revenues are included. In addition, the input values in the PDD / 1/ have been confirmed to be consistent with the financial analysis calculation / 2/.

Sensitivity analysis

A sensitivity analysis was carried out for parameters contributing more than 20% to revenues or costs in order to check the robustness of the financial analysis, which includes the annual electricity generation, total investment costs, electricity tariff and O&M costs. The variations necessary to reach the benchmark were determined and the likelihood for the project IRR to cross the benchmark was discussed. DNV was able to verify that the project IRR will touch the benchmark only if the below mentioned parameters change by values as mentioned below:

1 Decrease of 17.72% for total investment cost will result in the project IRR crossing the benchmark. Although there is currently no signed contract at the time of validation to compare the estimated and actual capital costs, the validation team then checked investment cost per total capacity for the project activity is close to the range of registered CDM hydropower projects in Laos. It is also noticed that the registered CDM hydropower projects in Laos were also started in or before 2007.

   By checking the international financial website / 31/, the inflation rate of Laos is 4.5%, 7.6%, 0.03% and 5.9% from 2007-2010. It can be observed that there is an inflation tendency in Laos in recent years. Thus considering the inflation factor and that the project has not made any financial agreement at the time of validation it is considered that the estimation of investment cost is deemed to be reliable and that any decrease in the investment cost that will impact the additionality will be unlikely;

2 Increase of 34.34% for annual electricity generation (or plant load factor) will result in the project IRR crossing the benchmark. It is unlikely that this scenario would happen as the expected operating hours were calculated from hydrological data of the FSR prepared by an independent consultant Narawat Patanakarn Public Company Limited / 4/. In addition, an increase of 34.34% from the baseline PLF will result in the project PLF to exceed 50%, which exceeds the highest PLF from the registered projects in UNFCCC. Therefore, it is not likely in terms of water resources to have the annual operation hour increased by more than 34.34% from the current electricity generation;

3 Increase of 34.5% for electricity tariff will result in the project IRR crossing the benchmark. As the Power Purchase Agreement (PPA) is not signed during the course of validation and FSR has estimated the tariff, DNV has cross-checked with the registered PDDs and IRR spreadsheet of hydropower projects in Lao PDR / 38/. The electricity tariff adopted for the project activity is amongst the highest and only second to project 9526 which applies the tariff of 0.0625 US$/kWh). At an increase of 34.5% increase in the tariff to almost 0.08 US$/kWh, it has exceeded all the tariff currently available on the UNFCCC database of Lao PDR hydropower projects;

4 Decrease of 366.07% for O&M costs will result in the project IRR reaching the benchmark. It is not possible for the project to operate without O&M costs.

Key Indicators	*Variation of the parameter indicator needed to reach benchmark 10%*
Investment costs	Decrease 17.72%
Annual electricity generation	Increase 34.34%
Electricity tariff	Increase 34.5%
O&M costs	Decrease 366.07%

DNV could confirm that the probability for any of the parameters to reach those values is very low and this confirms that the project is not financially attractive for private investors. Therefore, the proposed project lacks financial attractiveness within the reasonable range.The spreadsheet for financial analysis including the assumptions for the sensitivity analysis has been verified by DNV. The sensitivity analysis shows that even with likely variations of the key input parameters, the pre-tax project IRR of the proposed project is lower than the benchmark. In conclusion, the assessment of the arguments presented is deemed to sufficiently demonstrate that the project is not financially attractive.

4.1.1 Barrier analysis

Barrier analysis is not applied in the additionality argument as the project participant has selected the investment analysis for the demonstration of additionality.

4.1.2 Common practice analysis

Not applicable as the project activity comes under small scale CDM project and this is in line with the "*Guidelines on the demonstration of additionality of small-scale project activities*" / 25/.

4.1.3 Additionality - Conclusion

In conclusion, it is sufficiently demonstrated that the project is not a likely baseline scenario and that emission reductions resulting from the project are additional.

4.2 Monitoring plan

The project monitoring plan is in compliance with the monitoring methodology AMS-I.D (version 17) / 18/. The selected monitoring methodology is applicable for the project. The monitoring plan will give opportunity for real measurements of achieved emission reductions. Monitoring of sustainable development indicators is not required by the Lao PDR DNA.

It is DNV's opinion, that the project participants are able to implement the monitoring plan.

4.2.1 Parameters determined ex-ante

The combined margin emission factor is determined *ex-ante* based on the most recent information available; the detailed calculations of the combined margin emission factor are described in the following section 4.8. The parameters are listed in below table:

Data and Parameters	*Unit*	*Ex-ante Determined Value*	*Data sources*
Operating margin of regional grid comprising Laos Central C1 and the Thailand grid	tCO_2/MWh	0.5994	Calculated
Build Margin of regional grid comprising Laos Central C1 and the Thailand grid	tCO_2/MWh	0.4231	Calculated
Emission factor of regional grid comprising Laos Central C1 and the Thailand grid	tCO_2/MWh	0.5113	Calculated
Installed capacity	MW	14	As per project design document

4.2.2 Parameters monitored ex-post

The monitoring of the following GHG indicators will allow for an *ex-post* determination of emission reductions:

1. Electricity supplied by the proposed hydropower plant to the grid ($EG_{y,export}$) – measured continuously with two-way power meters. The reading from the meter is measured hourly and at least monthly recording. The electricity meter used in the project activity will have accuracy of class 0.2S and able to measure the electricity input and output within +0.2% of the accuracy value. The electricity meters will be calibrated by qualified laboratory and the calibration frequency will be in line with IEC 60687.
2. Electricity supplied by the grid to the proposed hydropower plant ($EG_{y,import}$) – measured continuously with two-way power meters. The reading from the meter is measured hourly and at least monthly recording. The electricity meter used in the project activity will have accuracy of class 0.2S and able to measure the electricity input and output within +0.2% of the accuracy value. The electricity meters will be calibrated by qualified laboratory and the calibration frequency will be in line with IEC 60687.
3. Net electricity supplied to the grid by the proposed hydropower plant ($EG_{BL,y}$) – calculated by using the monitored data $EG_{y,import}$ and $EG_{y,export}$. The electricity meter used in the project activity will have accuracy of class 0.2S and able to measure the electricity input and output within +0.2% of the accuracy value. The electricity meters will be calibrated by qualified laboratory and the calibration frequency will be in line with IEC 60687.
4. Installed capacity of the hydropower plant after the implementation of the project activity (Cap_{PJ}) – monitored yearly based on the manufacturer's nameplate.
5. Quantity of fuel type I combusted in process j during the year y ($FC_{i,j,y}$) – measured continuously using volume meter or a ruler if a small daily tank is used. The measuring will be calibrated at least once a year. The consistency of the metered fuel will be cross-checked by an annual energy balance that is based on purchased quantities and stock

changes. This is in line with the "*Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion*" / 19/.

6. Weighted average net calorific value of fuel type in in year y ($NCV_{i,j}$) – calculated by using the default value at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2. of Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories / 36/. Any future revision of the IPCC Guidelines will be taken into account. This is in line with the "*Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion*" / 19/.
7. Weighted average CO_2 emission factor of fuel type I in year y ($EF_{CO2,j,y}$) – calculated by using the default value at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2. of Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories / 36/. Any future revision of the IPCC Guidelines will be taken into account. This is in line with the "*Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion*" / 19/.

The parameters relevant to reservoir based hydro are not applicable and not included in the monitoring plan as per AMS-I.D (version 17) / 18/. This is due to the project is employing run-of-the-river hydropower which does not involve reservoir as evidenced from the FSR / 4/ and site visit.

4.2.3 Management system and quality assurance

The overall monitoring lies with Electricité du Laos, Lao PDR. The authority and responsibility for project management, monitoring, measurement and reporting will be agreed between the project participants and formalized. Procedures for calibration of monitoring equipment, maintenance of monitoring equipment and installations, and for records handling have been generally identified. The electricity generation meters will be calibrated according to the IEC 60687 standards. Detailed procedures have been elaborated in the PDD. These will be maintained and implemented to enable subsequent verification of emission reductions.

As the project construction is still ongoing, the detailed procedures of the monitoring plan will be finalized and kept ready for implementation prior to the start of project operation. All data collected will be archived and be kept for at least two years after the end of the last crediting period.

The application of the monitoring methodology is transparent and DNV considers the project participants able to implement the monitoring plan.

4.3 Environmental impacts

Analysis of environmental impacts is required by Lao PDR as stipulated under the National Policy – Environmental and Social Sustainability of the hydropower section in Lao PDR (561/CPI), the preparation of an Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) is a regulatory requirement for all devolpment projects in Lao PDR according to the Environmental Protection Law of 1999 / 34/ and Environmental Asessment Regulations.In accordance to the Lao PDR Law on Electricity / 30/ and National Policy / 35/, all hydropower projects needs to prepare an Environmental Impact Assessment (EIA).

An Environmental Impact Assessment (EIA) for the project activity was completed by Narawat Patanakarn Public Company Limited. on December 2011 / 6/. The EIA has been approved by the Lao PDR Ministry of Natural Resources and Environment 21 May 2012 / 8/. The EIA assessed potential environmental impacts, such as vibration, noise pollution, and

ecological impact. The monitoring of sustainable development indicator is not required by any statute and this has confirmed by Lao PDR DNA.

Based on these information, DNV could determine that no significant environmental impacts are expected from the project activity and that possible impacts were adequately mitigated.

4.4 Local stakeholder consultation

Local stakeholders' comments were invited to stakeholder consultation meetings which were carried out from 25 August 2010 to 31 August 2010 and between 25-28 December 2010. The local stakeholders' comments were conducted as part of EIA / 6/. The consultations were carried out in four affected districts, namely Ban Naxou, Phonngam, Ban Nasangthong, and Ban Namphot. DNV was able to verify that the stakeholders' consultation meetings were held in the presence of respective representatives from the Kasi District. The summary of the stakeholders' consultation meeting were included in the EIA which has been provided to DNV for review / 6/.

During the site visit, DNV has interviewed the local stakeholders and confirmed that they have been informed on the project. No relocation of villages is needed for the project, however there are farms and field which are affected due to the project activity and the affected local stakeholders will be compensated / 7/. The Lao PDR DNA has confirmed that the local stakeholder consultation meetings have been conducted in accordance to the local standards and the actions taken to resolve the affect local stakeholders are adequate and in line with national regulations.

DNV considers the local stakeholder consultation carried out adequately.

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APPENDIX A

CDM VALIDATION PROTOCOL

Table 1 Mandatory requirements for Clean Development Mechanism (CDM) project activities

Requirement	Reference	Conclusion
About Parties		
1. The project shall assist Parties included in Annex I in achieving compliance with part of their emission reduction commitment under Art. 3.	Kyoto Protocol Art.12.2	OK
2. The project shall assist non-Annex I Parties in contributing to the ultimate objective of the UNFCCC.	Kyoto Protocol Art.12.2.	OK
3. The project shall have the written approval of voluntary participation from the designated national authority of each Party involved.	Kyoto Protocol Art. 12.5a, CDM Modalities and Procedures §40a	OK
4. The project shall assist non-Annex I Parties in achieving sustainable development and shall have obtained confirmation by the host country thereof.	Kyoto Protocol Art. 12.2, CDM Modalities and Procedures §40a	OK
5. In case public funding from Parties included in Annex I is used for the project activity, these Parties shall provide an affirmation that such funding does not result in a diversion of official development assistance and is separate from and is not counted towards the financial obligations of these Parties.	Decision 17/CP.7, CDM Modalities and Procedures Appendix B, § 2	OK
6. Parties participating in the CDM shall designate a national authority for the CDM.	CDM Modalities and Procedures §29	OK
7. The host Party and the participating Annex I Party shall be a Party to the Kyoto Protocol.	CDM Modalities §30/31a	~~CAR 1~~ OK
8. The participating Annex I Party's assigned amount shall have been calculated and recorded.	CDM Modalities and Procedures §31b	OK
9. The participating Annex I Party shall have in place a national system for estimating GHG emissions and a national registry in accordance with Kyoto Protocol Article 5 and 7.	CDM Modalities and Procedures §31b	OK
About additionality		
10. Reduction in GHG emissions shall be additional to any that would occur in the absence of the project activity, i.e. a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those	Kyoto Protocol Art. 12.5c, CDM Modalities and Procedures §43	OK

Requirement	Reference	Conclusion
that would have occurred in the absence of the registered CDM project activity.		
About forecast emission reductions and environmental impacts		
11. The emission reductions shall be real, measurable and give long-term benefits related to the mitigation of climate change.	Kyoto Protocol Art. 12.5b	OK
About small-scale project activities (if applicable)		
12. The proposed project activity shall meet the eligibility criteria for small scale CDM project activities set out in § 6 (c) of the Marrakech Accords and shall not be a debundled component of a larger project activity.	Simplified Modalities and Procedures for Small Scale CDM Project Activities §12a,c	OK
13. The proposed project activity shall confirm to one of the project categories defined for small scale CDM project activities and use the simplified baseline and monitoring methodology for that project category.	Simplified Modalities and Procedures for Small Scale CDM Project Activities §22e	OK
14. If required by the host country, an analysis of the environmental impacts of the project activity is carried out and documented.	Simplified Modalities and Procedures for Small Scale CDM Project Activities §22c	OK
About stakeholder involvement		
15. Comments by local stakeholders shall be invited, a summary of these provided and how due account was taken of any comments received.	CDM Modalities and Procedures §37b	OK
16. Parties, stakeholders and UNFCCC accredited NGOs shall have been invited to comment on the validation requirements for minimum 30 days, and the project design document and comments have been made publicly available.	CDM Modalities and Procedures §40	OK
Other		
17. The baseline and monitoring methodology shall be previously approved by the CDM Executive Board.	CDM Modalities and Procedures §37e	OK
18. A baseline shall be established on a project-specific basis, in a transparent manner and taking into account relevant national and/or sectoral policies and circumstances.	CDM Modalities and Procedures §45c,d	OK
19. The baseline methodology shall exclude to earn CERs for decreases in activity levels outside the project activity or due to force majeure.	CDM Modalities and Procedures §47	OK
20. Provisions for monitoring, verification and reporting shall be in accordance with	CDM Modalities and Procedures §37f	OK

Requirement	Reference	Conclusion
the modalities described in the Marrakech Accords and relevant decisions of the COP/MOP.		

Table 2 Requirements checklist

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
A General description of project activity						
A.1	**Title of the project activity (PS § 31, VVS § 62-63)**					
A.1.1	Does section A.1 of the PDD include a clearly identifiable project title, version number of the PDD and date of the PDD?	/ 1/	DR	☒ Clearly identifiable title of the project activity ☒ Version number of the PDD is included ☒ Date of the PDD is included.		OK
A.1.2	Is the PDD is in accordance with the applicable requirements for completing PDDs?	/ 1/	DR	☒ Yes *If no, list where the PDD is not in accordance:*		OK
A.2	**Description of the project activity (VVS § 64-69 and VVS § 150-157 for small-scale project activities, as applicable)**					
A.2.1	How was the design of the project assessed?	/ 1/ / 48/ / 49/	DR I	*What type is the project?* ☐ Project in existing facility or utilizing existing equipment(s) ☐ Project is either a large scale project or a small scale project with emission reductions exceeding 15 000 tCO_2e per year. In this case, a site visit must be performed. ☐ Project is a bundled small scale project, with each project in the bundle with emission reductions not exceeding 15,000 tCO_2e per year. In such case the number of physical site visits may be based on sampling, if the sampling size is appropriately justified through statistical		OK

MoV = Means of Verification, DR= Document Review, I= Interview, CC= Cross-Checking

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				analysis. ☐ The project is an individual small scale project activity with emission reductions not exceeding 15 000 tCO_2e per year. In this case, DOE may not conduct a physical site visit as appropriate. ☒ Greenfield project *How was the design of the project assessed?* ☐ Physical site inspection ☐ Reviewing available designs and feasibility studies The physical site inspection was performed by DNV on 5 and 6 December 2012.		
A.2.2	If a greenfield project, describe the physical implementation of the project when the validation was commenced.	/ 1/ / 48/ / 49/	DR	During the site visit, it was identified the construction for the weir and the powerhouse is on-going.		OK
A.2.3	If physical site visits were performed based on sampling (only applicable for bundled small scale projects, each with emission reductions not exceeding 15 000 tCO_2e per year), justify the sampling through a statistical analysis:	/ 1/	DR	Not applicable as the project is not a bundled small-scale projects.		OK
A.2.4	Is the description of the proposed CDM project activity as contained in the PDD sufficiently covers all relevant elements, is accurate and that it provides the reader with a clear understanding of the nature of the proposed CDM project activity?	/ 1/ / 4/	DR	Yes, description of the proposed CDM project activity as contained in the PDD sufficiently covers all relevant elements, is accurate and provides the reader with a clear understanding of the nature of the proposed CDM project activity.		OK
A.2.5	If the project activity is implemented in existing facilities or is utilizing existing equipments, is there a clear description of the facilities/equipments that are affected by project activity? Is there a clear list of the pre-project scenario equipment and	/ 1/ / 4/	DR	No, the project activity is a greenfield project.		OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	the post project scenario equipment?					
A.2.6	Does the project design engineering reflect current good practices?	/ 1/ / 4/	DR	Yes. The project activity will use the commonly used technology of turbine coupled to a generator for the electricity generation. The project design engineering involves energy generation by an established practice of tapping hydro power resources. The project design engineering reflects current good practice.		OK
A.2.7	Would the technology result in a significantly better performance than any commonly used technologies in the host country? Is any transfer of technology from any Annex-I Party involved?	/ 1/ / 4/	DR	Yes, the technology is improted from other countries.		OK
A.2.8	Does the project qualify as a small scale CDM project activity as defined in paragraph 6(c) of decision 17/CP.7 on the modalities and procedures for the CDM?	/ 1/ / 4/	DR	Yes, this project qualifies for small-scale CDM type I methodology project activity, as the project activity involves the installation of 14 MW hydropower plant, which is less than the threshold of 15 MW stipulated by type I methodology.		OK
A.2.9	Is the small scale project activity a debundled component of a larger project activity in accordance with the rules defined in appendix C of the simplified modalities and procedures for small-scale CDM project activities?	/ 1/ / 21/ / 48/ / 49/	DR	This small-scale project activity is not a debundled component of a large scale. It has been confirmed from site visit that there is no other registered small scale CDM project activity: a) with the same project participants; and b) in the same project category and technology/measure; and c) registered within the previous 2 years; and d) whose project boundary is with 1 km of the project boundary of the proposed small-scale activity at the closest point.		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
A.3 Participation and authorization (VVS § 38-52)					
A.3.1 Do all participating Parties fulfil the participation requirements as follows:	/ 1/ / 28/	DR	The Letters of Approval (LoA) from both host Parties (Lao PDR and Thailand) and Annex 1 Party (Netherlands) are still pending. Furthermore, the project has two host Parties, this is not in line with paragraph 2 of "Clarification of Host Party for project activities and bundled project activities".	~~CAR 1~~	OK
	Lao PDR (host)		Thailand (host)	Netherlands	
a) Party has ratified the Kyoto Protocol	☐ Yes ☐ No		☐ Yes ☐ No	☐ Yes ☐ No	
b) Party has designated a Designated National Authority	☐ Yes ☐ No		☐ Yes ☐ No	☐ Yes ☐ No	
c) The assigned amount has been determined	☐ Yes ☐ No		☐ Yes ☐ No	☐ Yes ☐ No	
A.3.2 Do the letters of approval meet the following requirements?	/ 1/ / 13/ / 14/	DR	The LoAs from the respective Parties are still pending.	~~CAR 1~~	OK
	Lao PDR (host)		Thailand (host)	Netherlands	~~CAR 1~~ OK
a) LoA confirms that Party has ratified the Kyoto Protocol	☐ Yes ☐ No		☐ Yes ☐ No	☐ Yes ☐ No	
b) LoA confirms that participation is voluntary	☐ Yes ☐ No		☐ Yes ☐ No	☐ Yes ☐ No	
c) The LoA confirms that the project contributes to the sustainable development of the host country?	☐ Yes ☐ No		NA	NA	
d) The LoA refers to the precise project activity title in the PDD	☐ Yes ☐ No		☐ Yes ☐ No	☐ Yes ☐ No	
e) The LoA is unconditional with respect to (a) to (d) above	☐ Yes ☐ No		☐ Yes ☐ No	☐ Yes ☐ No	
f) The LoA is issued by the respective Party's DNA	☐ Yes ☐ No		☐ Yes ☐ No	☐ Yes ☐ No	
g) The LoA was received directly by the DNA or the PP	☐ DNA ☐ PP		☐ DNA ☐ PP	☐ DNA ☐ PP	
h) In case of doubt regarding the authenticity of the letter of approval, describe how it was verified that the letter of approval is authentic					

MoV = Means of Verification, DR= Document Review, I= Interview, CC= Cross-Checking

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
A.3.3	Have all private/public project participants been authorized by an involved Party?	/ 1/	DR	The LoAs from the respective Parties are still pending.	~~CAR 1~~	OK
A.4	**Modalities of communications (VVS § 53-61)**					
A.4.1	How has the corporate identity of all project participants and focal points included in the MoC, as well as the personal identities, including specimen signatures and employment status, of their authorized signatories, been validated?	/ 1/	DR	☐ Directly checking evidence for corporate, personal identity and other relevant documentation; ☐ Notarized documentation; ☐ Written confirmation from the project participant or the coordinating/managing entity that submits to it the MoC statement that all corporate and personal details, including specimen signatures, are valid and accurate. If this case was selected, DNV has confirmed that: ☐ the MoC statement was received from a project participant with whom DNV has a contractual relationship. ☐ the official who submits the MoC statement to the DOE and the official who signed the written confirmation (if a different person) is/are duly authorized to do so on behalf of the respective project participant	~~CAR 2~~	OK
A.4.2	Has the MoC statement been correctly completed and duly authorized? Check that all three requirements listed in the next column are complied with.	/ 1/	DR	☐ The latest version of the form F-CDM-MOC has been used; ☐ The information required as per the F-CDM-MOC, including its annex 1, is correctly	~~CAR 2~~	OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			completed; ☐ The project participantís authorized signatories signing the F-CDM-MOC correspond to the project participantís authorized signatories included in F-CDM-MOC, annex 1.		
A.5 Technical description of the project activity (PS § 31, VVS § 64-69)					
A.5.1 Is the project's location clearly defined?	/ 1/ / 48/ / 49/	DR I	Yes, the project is located in Nam Sana River, Muang Kasi, Phong Ngam District, Vientiane Province with the exact location coordinates of the dam are latitude 19.216038°N, longitude 102.339227°E while the power house is located at latitude 19.204662°N, longitude 102.310886°E as confirmed during the site visit.		OK
A.6 Public funding of the project activity (CDM Modalities and Procedures Appendix B § 2)					
A.6.1 In case public funding from Parties included in Annex I is used for the project activity, have these Parties provided an affirmation that such funding does not result in a diversion of official development assistance and is separate from and is not counted towards the financial obligations of these Parties?	/ 1/ / 51/	DR I	The initial validation did not reveal any information that indicates that the project can be seen as a diversion of ODA. In addition, the Lao PDR DNA has confirmed that the project does not involve ODA.		OK
B Application of a baseline and monitoring methodology					
B.1 Methodology applied (VVS para 70-133 and VVS § 150-153 for small-scale project activities, as applicable)					
B.1.1 Does the project apply an approved methodology and the correct and valid version thereof?	/ 1/ / 18/	DR	The project correctly applies the approved baseline methodology AMS-I.D "Grid connected		OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	If during the course of validation the originally applied version of the methodology expires, a CAR shall be raised in Table 3 of the validation protocol. Any new requirements of the revised version of the methodology not yet validated in Table 2 of the validation protocol shall be validated in Table 3 as part of the assessment of the CAR raised.			renewable electricity generation" version 17 of EB 61 Annex 17.		
B.1.2	If applicable, has any specific guidance provided by the CDM EB in respect to the applied methodology been considered?	/ 1/ / 23/ / 24/ / 25/	DR	Yes, the project has applied the following tools and guidelines; - Tool to calculate the emission factor for an electricity system; - Tool for the demonstration and assessment of additionality; Guidelines on the demonstration of additionality of small scale project activities.		OK
B.1.3	If the project applies a small-scale methodology, does the project also comply with the general guidelines to SSC CDM methodologies, which provides guidelines on equipment capacity, equipment performance/lifetime, baseline identification for type-II/III Greenfield project activities, sampling and other monitoring-related issues?	/ 1/ / 16/ / 18/ / 20/ / 26/	DR	Yes, the project applies a small scale methodology. The project is a Type I project activity as the project has renewable energy unit with the total capacity of 15 MW of electricity. The equipment lifetime has been assessed by DNV using the latest "Tool to determine the remaining lifetime of equipment". The guidelines for baseline identified for type-II/III Greenfield project activity is not applied to the project activity as the project is a Type I project.		OK
B.2	**Applicability of methodology (and tools) (VVS § 73-77)** *Insert a row for each applicability criteria of the applied methodology (and tools)*					
B.2.1	How was it validated that project complies with the following applicability criteria: *This methodology comprises renewable energy generation*	/ 1/ / 5/	DR	The project involves renewable energy generation units; which is hydropower; that supplies electricity to the national power grid as confirmed		OK

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	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	units, such as photovoltaic, hydro, tidal/wave, wind, geothermal, and renewable biomass: *(a) Supplying electricity to a national or a regional grid; or* (b) *Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.*	/ 18/ / 48/ / 49/		during site visit and FSR. The power grid partly comprises of fossil fuel-based power plants as evidenced from the power generation report published by Thailand.		
B.2.2	How was it validated that project complies with the following applicability criteria *Illustration of respective situations under which each of the methodology (i.e. AMS-I.D, AMS-I.F, and AMS-I.A) applies is included in Table 2;* *1. Project supplies electricity to a national/regional grid* *2. Project displaces grid electricity consumption (e.g. grid import) and/or captive fossil fuel electricity generation at the user end (excess electricity may be supplied to a grid)* *3. Project supplies electricity to an identified consumer facility via nationa/regional grid (through a contractual arrangement such as wheeling)* *4. Project supplies electricity to a mini grid system where in the baseline all generators use exclusively fuel oil and/or diesel fuel* *Project supplies electricity to household users (included in the project boundary) located in off grid areas*	/ 1/ / 4/ / 18/	DR	The project supplies the electricity generated from the hydropower plant to the national grid as confirmed from FSR thus this is in line with Option 1 of the Table 2 of the AMS-I.D (version 17).		OK
B.2.3	How was it validated that project complies with the following applicability criteria: *This methodology is applicable to project activities that: (a) Install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) Involve a capacity addition; (c) Involve a retrofit of (an) existing plant(s); or (d) Involve a replacement of (an)*	/ 1/ / 18/	DR	The PDD does not address the applicability of this paragraph as per methodology of AMS-I.D version 17. Thus it is unclear whether this applicability criterion is applicable to the project activity.	~~CAR 3~~	OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	existing plant(s).					
B.2.4	How was it validated that project complies with the following applicability criteria: *Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology:* • *The project activity is implemented in an existing reservoir with no change in the volume of reservoir;* • *The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emissions section, is greater than 4 W/m^2;* *The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m^2.*	/ 1/ / 18/	DR	The PDD does not address the applicability of this paragraph as per methodology of AMS-I.D version 17. Thus it is unclear whether this applicability criterion is applicable to the project activity.	~~CAR 3~~	OK
B.2.5	How was it validated that project complies with the following applicability criteria: *If the new unit has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.*	/ 1/ / 18/	DR	The PDD does not address the applicability of this paragraph as per methodology of AMS-I.D version 17. Thus it is unclear whether this applicability criterion is applicable to the project activity.	~~CAR 3~~	OK
B.2.6	How was it validated that project complies with the following applicability criteria: *Combined heat and power (co-generation) systems are not eligible under this category.*	/ 1/ / 18/	DR	The PDD does not address the applicability of this paragraph as per methodology of AMS-I.D version 17. Thus it is unclear whether this applicability criterion is applicable to the project activity.	~~CAR 3~~	OK
B.2.7	How was it validated that project complies with the following applicability criteria: *In the case of project activities that involve the addition of*	/ 1/ / 18/	DR	The PDD does not address the applicability of this paragraph as per methodology of AMS-I.D version 17. Thus it is unclear whether this	~~CAR 3~~	OK

MoV = Means of Verification, DR= Document Review, I= Interview, CC= Cross-Checking

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.			applicability criterion is applicable to the project activity.		
B.2.8	How was it validated that project complies with the following applicability criteria: *In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.*	/ 1/ / 18/	DR	The PDD does not address the applicability of this paragraph as per methodology of AMS-I.D version 17. Thus it is unclear whether this applicability criterion is applicable to the project activity.	~~CAR 3~~	OK
B.2.9	Is the selected baseline on of the baseline(s) described in the methodology and this hence confirms the applicability of the methodology?	/ 1/ / 18/	DR	Yes, the selected baseline (which is the electricity delivered to the grid by the project activity that otherwise would have been generated by the operation of grid-connected power plants and by the addition of new generation sources) is as described in the methodology and hence confirms the applicability of the methodology.		OK
B.3	**Project boundary (VVS § 82-87)**					
B.3.1	What are the project's system boundaries (components and facilities used to mitigate GHGs)? Are they clearly defined?	/ 1/ / 18/	DR	The project system boundary included weir, diversion tunnel, turbine and generator, on-site transformer, and all power plants connected physically to the national power grid (Lao Central Grid and EGAT Grid in Thailand). This is in line with the paragraph 9 of AMS-I.D (version 17).		OK
B.3.2	Which GHG sources are identified for the project? Does the identified boundary cover all possible sources linked to the project activity? Give reference to documents considered to arrive at this conclusion.	/ 1/ / 18/	DR	For baseline emissions, GHG sources are CO_2 emissions from the electricity grid connected power plants. For the project emissions, GHG sources are CO_2 emissions from the fossil fuel consumed by the back-up system. There is no leakage considered as the energy generating equipment is not transferred from another activity.		OK
B.3.3	Do the system boundaries for the project as described in the		DR	Yes, the system boundaries for the project as		OK

MoV = Means of Verification, DR= Document Review, I= Interview, CC= Cross-Checking

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	PDD fully comply with the project boundaries stipulated by the applied baseline methodology?			described in the PDD are in line with paragraph 9 of AMS-I.D (version 17).		
B.3.4	Does the project involve other emissions sources not foreseen by the methodologies that may question the applicability of the methodology? Do these sources contribute with more than 1% of the estimated emission reductions of the project?	/ 1/ / 18/	DR	The project is not expected to involve other emissions not foreseen by the methodology.		OK
B.4	**Baseline scenario determination and description (VVS § 88-95 / Identification of alternatives to the project activity (VVS § 113-116)** *Ensure that the evaluation of all alternatives provided in the PDD and required by the methodology and also possible alternatives/offshoots of alternatives are discussed. Check that all alternatives required to be considered by the methodology are included in the final PDD. If baseline alternatives required to be considered by the methodology are considered not applicable, please assess the justification for this.*					
B.4.1	Which baseline scenarios have been identified? Is the list of baseline scenarios complete? Does the list include as one of the options that the project activity is undertaken without being registered as a proposed project activity? Does the list contain all plausible alternatives which are viable means of supplying the comparable outputs or services that are to be supplied by the proposed project activity?	/ 1/ / 18/	DR	The baseline scenario is the continuation of the current situation, i.e. the 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 into the grid. Based on AMS-I.D (version 17), there is no alternatives need to be identified.		OK
B.4.2	Could the project activity in absence of the CDM or other baseline alternatives also be implemented by other entities than the CDM project participants? If so, has this also been included in the list of baseline scenarios?	/ 1/ / 18/	DR	Based on AMS-I.D (version 17), there is no alternatives need to be identified.		OK
B.4.3	How have the other baseline scenarios been eliminated in	/ 1/	DR	The baseline scenario is the continuation of the		OK

MoV = Means of Verification, DR= Document Review, I= Interview, CC= Cross-Checking

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	order to determine the baseline?	/ 18/		current situation, i.e. the 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 into the grid. Based on AMS-I.D (version 17), there is no alternatives need to be identified.		
B.4.4	What is the baseline scenario?	/ 1/ / 18/	DR	The project activity is involving the installation of a new grid-connected hydropower plant. Hence, the baseline scenario is 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 into the grid. This is consistent with the paragraph 10 of AMS-I.D (version 17).		OK
B.4.5	Is the determination of the baseline scenario in accordance with the guidance in the methodology?	/ 1/ / 18/	DR	The determination of the baseline scenario is in accordance with the guidance in the methodology.		OK
B.4.6	Has the baseline scenario been determined using conservative assumptions where possible?	/ 1/ / 18/	DR	The applied methodology requires the use of a pre-defined baseline scenario for new grid connected renewable power plant. The determination of the baseline did not require using any other assumptions.		OK
B.4.7	Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies? Does the baseline scenario comply with all applicable and enforced legislation?	/ 1/ / 33/	DR	Initial review of the PDD reveals that national and sectoral policies have been taken into consideration while selecting the baseline scenario. The validation of the project activity did not reveal any laws or regulation compelling the project owner to develop any specific kind of energy source or project.		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.4.8	Is the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?	/ 1/ / 33/	DR	The baseline scenario determination is compatible with the available data and literature; and sources are clearly referenced.		OK
B.4.9	Is the baseline determination adequately documented in the PDD? • All assumptions and data used by the project participants are listed in the PDD and related document to be submitted for registration. The data are properly referenced. • All documentation is relevant as well as correctly quoted and interpreted. • Assumptions and data can be deemed reasonable • Relevant national and/or sectoral policies and circumstances are considered and listed in the PDD. • The methodology has been correctly applied to identify what would occurred in the absence of the proposed CDM project activity	/ 1/	DR	The baseline determination is adequately documented in the PDD: • All assumptions and data used by the project participants are listed in the PDD and related document to be submitted for registration. The data are properly referenced. • All documentation is relevant as well as correctly quoted and interpreted. • Assumptions and data can be deemed reasonable. • Relevant national and/or sectoral policies and circumstances are considered and listed it the PDD. The methodology has been correctly applied to identify what would occur in the absence of the proposed CDM project activity.		OK
B.5 Additionality determination (VVS § 101-129 and VVS § 158-161 for small-scale project activities, as applicable)						
B.5.1	What approach/tool does the project use to assess additionality? Is this in line with the methodology? In case of small-scale CDM project activities, is Attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities applied considering also the "Non-binding best practice examples to demonstrate additionality for SSC project activities".	/ 1/ / 24/ / 25/	DR	The PDD has applied the "Guidelines on the demonstration of additionality of small-scale project activities" and "Tool for the demonstration and assessment of additionality" to demonstrate the additionality of project activity. This is acceptable as the project is a small-scale CDM project activity.		OK
B.5.2	Have the regulatory requirements correctly been taken into account to evaluate the project activity and the alternatives?	/ 1/ / 18/	DR	The applied methodology requires the use of a pre-defined baseline scenario for new grid connected renewable power plant. The regulatory		OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				requirements were correctly applied.		
B.5.3	Is sufficient evidence provided to support the relevance of the arguments made?	/ 1/	DR	Please refer to the Investment Analysis section (Section B.5.11)		OK
B.5.4	What is the project additionality mainly based on (Investment analysis or barrier analysis)?	/ 1/	DR	The project additionality is based on investment analysis.		OK
	Prior consideration of CDM (VVS § 105-112)					
B.5.5	Is the project start date before 2 August 2008 or on/after 2 August 2008?	/ 1/	DR	☒ On or after 2 August 2008; ☐ Before 2 August 2008; *Refer to C.1.1 for the validation of project start date.* The start date is claimed to be 29 November 2011 which is the date of the project participant and the Engineering, Procurement and Construction (EPC) contractor signed the contract. However the contract was not provided to justify this claim. From a cross-check performed by DNV (www.set.or.th/dat/news/201106/11027019.pdf), it was found that the project participant (EdL) has a signed a construction contract for a hydropower project which has the same name (Nam Sana Hydropower Project) with the same capacity (14 MW) and same location (Nam Sana River) on 20 June 2011. Hence it is unclear if the contract signed on 29 November 2011 would represent the earliest financial commitment to the project activity.	~~CL 1~~	OK
B.5.6	If the starting date is on or after 2 August 2008 and before the global stakeholder consultation (or a new methodology proposed or request for revision of an approved methodology is requested), has the DNA and UNFCCC confirmed that the project participants have informed in writing of the project's	/ 1/ / 15/ / 29/	DR	The project participant has notified both host Party DNA and CDM Secretariat on 15 March 2012. However, no evidence has been provided to demonstrate that the project participant has notified the host Party DNA.	~~CL 1~~	OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	intention to seek CDM status within 180 days of the project acidity start date?					
B.5.7	If in addition to the above, the PDD was not published for global stakeholder consultation (or a new methodology proposed or request for revision of an approved methodology is requested) within two years of the initial notification, have project participants every subsequent two years after the initial notification informed the UNFCCC secretariat of the progress of the project activity?	/ 1/	DR	This is not applicable as the PDD has been published for global stakeholder consultation on 1 September 2012.		OK
	Continuous efforts to secure CDM status (only to be completed if starting date is before 2 August 2008)					
B.5.8	What initiatives where taken by the project participants from the starting date of the project activity to the start of validation in parallel with the physical implementation of the project activity?	/ 1/ / 15/	DR	This is not applicable as the project start date is after 2 August 2008 (start date is claimed to be 29 November 2011).		OK
B.5.9	When did the construction of the project activity start?	/ 1/ / 15/	DR	This is not applicable as the project start date is after 2 August 2008 (start date is claimed to be 29 November 2011).		OK
B.5.10	When was the project commissioned?	/ 1/ / 15/	DR	This is not applicable as the project start date is after 2 August 2008 (start date is claimed to be 29 November 2011).		OK
B.5.11	Does the timeline of the project confirm that continuous actions in parallel with the implementation were taken to secure CDM status?	/ 1/ / 15/	DR	This is not applicable as the project start date is after 2 August 2008 (start date is claimed to be 29 November 2011).		OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	Investment analysis (VVS § 117-123) *The list of questions below must be adjusted to the parameters in the investment analysis relevant to the project under validation. All input parameters need to be assessed. Rows B.22 to B.25 need to be adjusted, as necessary, and additional rows must be added similar to rows B.22 to B.25 for other input parameters relevant to the investment analysis.*					
B.5.12	Does the project activity or any of the remaining alternatives generate revenues apart from CDM? Is this reflected in the PDD?	/ 1/ / 2/	DR	Yes, the project activity apart from CDM still generates revenue through the sales of the electricity, which has been reflected in the PDD.		OK
B.5.13	Do any of the alternatives to the project activity involve investment? Is this reflected in the PDD?	/ 1/	DR	There is no alternative to the project that involves investment, which has been reflected in the PDD.		OK
B.5.14	If the project activity is implemented in existing facilities or is utilizing existing equipments, does the investment analysis also consider the overall impact on the operations of the project owner, including any impacts on operational costs and revenues that the project may have (also outside of the project boundaries)?	/ 1/	DR	The project is a greenfield project and does not involve existing facilities or equipment as evidenced from FSR and confirmed during the site visit.		OK
B.5.15	Is the choice of benchmark analysis, investment comparison or simple cost analysis correct?	/ 1/ / 4/ / 49/	DR	As the proposed project generates financial and economic benefits other than CDM related income through the sales of electricity, therefore a benchmark analysis (Option III) is justified for conducting the investment analysis. This is in line with "Tool for the demonstration and assessment of additionality".		OK
B.5.16	Is the benchmark/discount rate the latest available at the time of decision?	/ 1/ / 9/ / 33/	DR	The benchmark selected is a discount rate of 10% which was published by Lao PDR Government on August 2004. Thus, this is available to the project participants during the investment decision on year 2011. In addition, the Lao PDR		OK

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				Government has accepted the usage of discount rate of 10% as the benchmark for the project activity on 24 September 2012 which confirmed the validity of the discount rate. Hence, the discount rate of 10% is deemed acceptable.		
B.5.17	What is the financial indicator? Is it on equity/project basis? Before/after tax? Is the financial indicator in correspondence with the benchmark?	/ 1/ / 2/ / 9/ / 33/	DR	The project activity has applied a pre-tax project IRR as the financial indicator. In the page 15 of the PDD, paragraph 2 stated that the financial indicator is pre-tax project IRR, however in paragraph 6, it is stated that the financial indicator is post-tax project IRR. Hence it is unclear on which is applied (pre-tax or post-tax) as the project IRR. The discount rate is an appropriate benchmark for project IRR.	~~CL 2~~	OK
B.5.18	Are the underlying assumptions appropriate, e.g. what is considered as waste in the baseline is considered to have zero value?	/ 1/ / 2/	DR	No waste in the baseline is considered as the project harness natural resources for the production of electricity.		OK
B.5.19	Does the income tax calculation take depreciation into account? Is the depreciation year in accordance with normal accounting practice in the host country?	/ 1/ / 2/	DR	No tax has been applied in the investment analysis. The depreciation is based on the flat-rate depreciation. Nevertheless, as the project is applying the pre-tax project IRR, hence the depreciation has no impact on the financial analysis.		OK
B.5.20	Is the time period of the investment analysis and operating time of the project realistic? Has salvage value been taken into account? Is working capital returned in the last year of operation?	/ 1/ / 2/ / 4/ / 22/	DR	The project lifetime is expected to have an operating lifetime of 50.5 years which was sourced from the FSR. The financial analysis is calculated for a period of 25 years which is a shorter period than the operating lifetime. This is supported by the Lao PDR Government where the standardised operating concession for financial modelling is 25 years. The selection of	~~CAR 4~~	OK

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Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				25 years in deemed accepted as this is more than maximum period of 20 years (for shorter than lifetime period of the "Guidelines on the assessment of investment analysis". As the financial analysis period is 25 years which is shorter than the operating lifetime of 50.5 years, it is unclear on why there is no fair value has been included in the end of the assessment.		
B.5.21	When a feasibility study report or similar approved by the government is used as the basis for the investment analysis: Can it be confirmed that the values used in the PDD are fully consistent with the FSR and is the period of time between finalization of the FSR and the investment decision adequate?	/ 1/ / 2/ / 4/	DR	The FSR was finalised on November 2010 and thus only within 1 year to the decision to proceed with the project activity which was on year 2011. However, it is unclear if the FSR has been approved by relevant authorities. The consistencies between the values used in the PDD and the FSR are discussed in the respective sections (Section B.5.21 to B.5.25).	~~CL 3~~	OK
B.5.22	How was the amount of output (e.g. sales of electricity) assessed?	/ 1/ / 2/ / 4/	DR	☐ The plant load factor provided to banks and/or equity financiers while applying the project activity for project financing, or to the government while applying the project activity for implementation approval ☐ The plant load factor determined by a third party contracted by the project participants (e.g. an engineering company) ☐ Other approach. *Provide details on how the load factor was validated:* The amount of electricity generated by the project activity is based on the FSR which has estimated that the hydropower plant to have annual electricity generation capacity of 49 550 MWh. This is calculated to the plant load factor of	~~CL 2~~	OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			40.4%. The FSR has taken into consideration of the relevant influencing variables such as the historical and estimated rain fall and river water flow rate, turbine efficiency, transmission losses and provisions for maintenance and breakdown. This is deemed acceptable. The IRR spreadsheet is applying the annual generation capacity of 49 500 MWh which is not consistent with the PDD and FSR.		
B.5.23 How was the output price (e.g. electricity price) assessed?	/ 1/ / 2/ / 4/	DR	☐ Cross-check against third-party or publicly available sources (e.g. invoices or price indices) ☐ Review of feasibility reports, public announcements and annual financial reports related to the project and the project participants *Provide details on how the output price was validated:* The tariff rate of 0.06 USD/kWh (fixed) is based on FSR. During validation, there is no small-scale hydropower CDM registered project in Lao PDR hence DNV has identified the other large-scale hydropower CDM registered projects are receiving tariff at the range of 0.04 to 0.05 USD/kWh which is lower than the project. DNV has further compared the tariff published by Lao PDR, which is 0.044 USD/kWh. Therefore, the tariff rate of 0.06 USD/kWh is deemed reasonable.		OK
B.5.24 How were the investment costs assessed? Were the data available and valid at the time of decision?	/ 1/ / 2/ / 4/	DR	☐ Cross-check against third-party or publicly available sources (e.g. invoices or price indices) ☐ Review of feasibility reports, public announcements, contracts and annual financial reports related to the project and the project	~~CAR 4~~	OK

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				participants *Provide details on how the investment costs were validated:* The investment cost of USD 30.5 million is based on the FSR. According to the FSR, the total cost for the project is USD 26.84 million which will be spent in within the 2 ½ years of construction period. The remaining USD 4.03 million will be spent for renovating the project after 25 years of operation. However, this is not consistent with the PDD and IRR spreadsheet which assumed the total cost of USD 30.5 million to incur within the 2 ½ years of construction period.		
B.5.25	How were the O&M costs assessed? Were the data available and valid at the time of decision?	/ 1/ / 2/ / 4/ / 33/	DR	☐ Cross-check against third-party or publicly available sources (e.g. invoices or price indices) ☐ Review of feasibility reports, public announcements and annual financial reports related to the project and the project participants *Provide details on how the O&M costs were validated:* The operation and maintenance cost is sourced from the FSR, which estimated to be USD 280 000 per year. This is equivalent to 0.92% of the investment cost. This is lower than the standardised parameters for financial modelling published by Lao PDR government which assumes O&M cost of 1.5% of the total capital cost.		OK
B.5.26	Describe the assessment of the other input parameters. Were the data available and valid at the time of decision?	/ 1/ / 2/	DR	☐ Cross-check against third-party or publicly available sources (e.g. invoices or price indices) ☐ Review of feasibility reports, public announcements and annual financial reports	~~CL 2~~	OK

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				related to the project and the project participants *Provide details on how other input parameters were validated:* The project has assumed pre-tax and no financing cost to the project. Hence, all the input values used in the financial analysis have been assessed in Section B.5.16 to B.5.24. Pending closure of clarification for CL 2.		
B.5.27	In case one of the input parameters being the contractually agreed price for an energy carrier (which may prior to implementation of the project activity was not utilized and thus did not have any economic value), such as waste gas, waste heat, CMM or biogas, does the price of the energy carrier agreed between the PP and the producer of the energy carrier represent the actual costs by the producer of the energy carrier for recovering and if necessary treating and transporting the energy carrier?	/ 1/ / 2/	DR	The tariff rate of 0.06 USD/kWh (fixed) is based on FSR. Refer to B.5.23.		OK
B.5.28	Was the financial calculation spreadsheet verified and found to be correct?	/ 1/ / 2/	DR	This is pending on the closure of the CARs and CLs raised.	~~CL 2~~ ~~CL 3~~ ~~CAR 4~~	OK
B.5.29	Sensitivity analysis: Have the key parameters contributing to more than 20% of the revenue/costs during operating or implementation been identified? Has possible correlation between the parameters been considered?	/ 1/ / 2/	DR	Yes, the parameters contributing to more than 20% revenue and costs have been included in the sensitivity analysis (i.e. investment costs, tariff, power generation, and O&M). The sensitivity analysis for the generation capacity is not correct. By increasing the capacity by 5% or 10%, the IRR will decrease to zero. This is not consistent with the PDD.	~~CL 2~~	OK
B.5.30	Sensitivity analysis: Is the range of variations is reasonable in the project context?	/ 1/ / 2/	DR	Yes, the variations to reach the benchmark have been performed and it is deemed reasonable.		OK

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	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.5.31	Have the key parameters been varied to reach the benchmark and the likelihood of this to happen been justified to be small?	/ 1/ / 2/	DR	Yes, justification on why the variation needed to arrive at the benchmark for the identified parameters have been included in the PDD and found to be reasonable and appropriate.		OK
	Barrier analysis (VVS § 124-127)					
B.5.32	Are the barriers identified complimentary to a potential investment analysis? Does the barrier have a clear impact on the financial returns so that it can be assessed in an investment analysis? Each barrier is discussed separately.	/ 1/	DR	The project activity has applied investment analysis as the demonstration of the additionality and barrier analysis was not applied in the additionality arguments.		OK
B.5.33	How were the investment barriers assessed to be real? Are the investment barriers substantiated by a source independent of the project participants?	/ 1/	DR	The project activity has applied investment analysis as the demonstration of the additionality and barrier analysis was not applied in the additionality arguments.		OK
B.5.34	How does CDM alleviate the investment barriers?	/ 1/	DR	The project activity has applied investment analysis as the demonstration of the additionality and barrier analysis was not applied in the additionality arguments.		OK
B.5.35	Is the project activity prevented by the investment barriers and at least one of the possible alternatives to the project activity is feasible under the same circumstances?	/ 1/	DR	The project activity has applied investment analysis as the demonstration of the additionality and barrier analysis was not applied in the additionality arguments.		OK
B.5.36	How were the technological barriers assessed to be real? Are the technological barriers substantiated by a source independent of the project participants?	/ 1/	DR	The project activity has applied investment analysis as the demonstration of the additionality and barrier analysis was not applied in the additionality arguments.		OK
B.5.37	How does CDM alleviate the technological barriers?	/ 1/	DR	The project activity has applied investment analysis as the demonstration of the additionality and barrier analysis was not applied in the additionality arguments.		OK
B.5.38	Is the project activity prevented by the technological barriers and at least one of the possible alternatives to the project	/ 1/	DR	The project activity has applied investment analysis as the demonstration of the additionality		OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	activity is feasible under the same circumstances?			and barrier analysis was not applied in the additionality arguments.		
B.5.39	How were the barriers due to prevailing practise assessed to be real? Are the barriers due to prevailing practise substantiated by a source independent of the project participants? For projects having to apply the "Guidelines on additionality of first-of-its-kind project activities", (a) is the project the first in the applicable geographical area that applies a technology that is different from technologies that are implemented by any other project, which are able to deliver the same output and have started commercial operation in the applicable geographical area before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of the proposed project activity, whichever is earlier? (b) has the project participants selected a crediting period for the project activity that is "a maximum of 10 years with no option of renewal"?	/ 1/	DR	The project activity has applied investment analysis as the demonstration of the additionality and barrier analysis was not applied in the additionality arguments.		OK
B.5.40	How does CDM alleviate the barriers due to prevailing practise?	/ 1/	DR	The project activity has applied investment analysis as the demonstration of the additionality and barrier analysis was not applied in the additionality arguments.		OK
B.5.41	Is the project activity prevented by the barriers due to prevailing practise and at least one of the possible alternatives to the project activity is feasible under the same circumstances?	/ 1/	DR	The project activity has applied investment analysis as the demonstration of the additionality and barrier analysis was not applied in the additionality arguments.		OK
B.5.42	How were the other barriers assessed to be real? Are the other barriers substantiated by a source independent of the project participants?	/ 1/	DR	The project activity has applied investment analysis as the demonstration of the additionality and barrier analysis was not applied in the additionality arguments.		OK
B.5.43	How does CDM alleviate the other barriers?	/ 1/	DR	The project activity has applied investment analysis as the demonstration of the additionality		OK

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	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				and barrier analysis was not applied in the additionality arguments.		
B.5.44	Is the project activity prevented by the other barriers and at least one of the possible alternatives to the project activity is feasible under the same circumstances?	/ 1/	DR	The project activity has applied investment analysis as the demonstration of the additionality and barrier analysis was not applied in the additionality arguments.		OK
	Common practice analysis (VVS § 128-130)					
B.5.45	Does the project apply the latest version of the "Guidelines on common practice" (applicable to projects *Tool for the demonstration and assessment of additionality* / *Combined tool to identify the baseline scenario and demonstrate additionality* or any other methodology requiring the use of the "Guidelines on common practice"?	/ 1/ / 25/	DR	☐ Project apply measure(s) for which "Guidelines on common practice" shall be applied and thus applies the steps of the guidelines ☐ Project does <u>not</u> apply measure(s) for which "Guidelines on common practice" shall be applied ☒ Methodology applied by project does not require use of "Guidelines on common practice" ☐ Project is demonstrated to be first-of-its kind and not common practise analysis is required The project is using to "Guidelines on the demonstration of additionality of small-scale project activities" for the demonstration of additionality.		OK
B.5.46	What is the geographical scope of the common practice analysis? Is this justified?	/ 1/ / 15/ / 25/	DR	The project activity is a small-scale project activity and has applied investment analysis as the demonstration of the additionality. The common practice analysis has not been performed in PDD. This is deemed acceptable as this is in accordance to "Guidelines on the demonstration of additionality of small-scale project activities" and in line with paragraph 128		OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				of VVS.		
B.5.47	What is the scope of technology and size (e.g. capacity of power plant) for the common practice analysis and how has this been justified? For projects applying the "Guidelines on common practice", has the PDD considered similar projects (both CDM and non-CDM) with a capacity or output range as +/-50% of the total design capacity or output of the proposed project activity capacity?	/ 1/ / 15/ / 25/	DR	The project activity is a small-scale project activity and has applied investment analysis as the demonstration of the additionality. The common practice analysis has not been performed in PDD. This is deemed acceptable as this is in accordance to "Guidelines on the demonstration of additionality of small-scale project activities" and in line with paragraph 128 of VVS.		OK
B.5.48	What is the data source(s) used for the common practice analysis?	/ 1/ / 15/ / 25/	DR	The project activity is a small-scale project activity and has applied investment analysis as the demonstration of the additionality. The common practice analysis has not been performed in PDD. This is deemed acceptable as this is in accordance to "Guidelines on the demonstration of additionality of small-scale project activities" and in line with paragraph 128 of VVS.		OK
B.5.49	How many similar non-CDM-projects exist in the region within the scope? For projects applying the "Guidelines on common practice", has the PDD identified all those projects that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation and note their number N_{all}?	/ 1/ / 15/ / 25/	DR	The project activity is a small-scale project activity and has applied investment analysis as the demonstration of the additionality. The common practice analysis has not been performed in PDD. This is deemed acceptable as this is in accordance to "Guidelines on the demonstration of additionality of small-scale project activities" and in line with paragraph 128 of VVS.		OK
B.5.50	How were possible essential distinctions between the project activity and similar activities assessed? For projects applying the "Guidelines on common practice", has the PDD identified those projects that apply technologies that are	/ 1/ / 15/ / 25/	DR	The project activity is a small-scale project activity and has applied investment analysis as the demonstration of the additionality. The common practice analysis has not been		OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	different to the technology applied in the proposed project activity and note their number N_{diff}?			performed in PDD. This is deemed acceptable as this is in accordance to "Guidelines on the demonstration of additionality of small-scale project activities" and in line with paragraph 128 of VVS.		
B.5.51	What is the conclusion of the common practice analysis? For projects applying the "Guidelines on common practice", has the PDD demonstrated that the proposed project activity is not a "common practice" within a sector in the applicable geographical area given that neither the factor F is greater than 0.2 nor N_{all}-N_{diff} is greater than 3.	/ 1/ / 15/ / 25/	DR	The project activity is a small-scale project activity and has applied investment analysis as the demonstration of the additionality. The common practice analysis has not been performed in PDD. This is deemed acceptable as this is in accordance to "Guidelines on the demonstration of additionality of small-scale project activities" and in line with paragraph 128 of VVS.		OK
	Conclusion					
B.5.52	What is the conclusion with regard to the additionality of the project activity?	/ 1/	DR	The additionality of the project activity will be concluded upon the satisfactory response from the project proponent to the CARs and CLs raised.		OK
B.6	**Algorithms and/or formulae used to determine emission reductions (VVS § 96-100)**					
	Data and parameters that are available at validation and that are not monitored					
B.6.1	How was the $EF_{grid,OMsimple,y}$ verified?	/ 1/ / 3/ / 5/ / 23/	DR	The operating margin emission factor of the grid ($EF_{grid,OMsimple,y}$), build margin emission factor of the grid ($EF_{grid,BM,y}$), and combined margin emission factor of the grid ($EF_{grid,CM,y}$) are calculated using the step procedures in "Tool to calculate the emissions factor for an electricity system" (version 2.2.1). In Step 1 (Identify the relevant electricity	~~CL 4~~	OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			system), the project is connected to Lao Central Grid which is also connected to the Thailand National Grid. Therefore, the regional grid of Lao PDR and Thailand is defined as the project electricity system. The PDD stated that the project is connected to the Lao Central Grid. According to the grid system published by Lao PDR Government, there are two central grids in Lao PDR. Hence it is unclear that the project is connected to which central grid. In Step 2 (Choose whether to include off-grid power plants in the project electricity system), the project has not applied this optional step, thus only the grid power plants are included (off-grid power plants are not included). In Step 3 (Select a method to determine the operating margin), the project has selected Simple OM (Option A) with the *ex-ante* option. The calculation of the low-cost/must-run resources is not provided hence it is unclear on how the project can conclude the low-cost/must-run resources constitute less than 50% of total generation. In Step 4 (Calculate the operating margin emission factor according to the selected method), the Option A of the Simple OM is selected to calculate the OM. The PDD stated that Option A of Simple OM (page 21) and Option C of Simple OM (page 43) is used for calculation of OM, however this is not consistent with the ER spreadsheet which uses Option B of Simple OM to calculate the OM.		

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			The project is connected to the regional grid (i.e. Lao PDR and Thailand), however the data used for the OM calculation is based on Thailand only and there is no data from Lao PDR included in the calculation. Clarification is sought on this. In Step 5 (Identify the group of power units to be included in the build margin), the project has only considered the quantity of electricity delivered to grid by most recently built power plant in Thailand. Hence it is unclear on there is no consideration of the most recently built power plant in Lao PDR and why they are not included. In Step 6 (Calculate the build margin emission factor), the option selected for the calculation of BM is not stated in the PDD. In Step 7 (Calculate the combine margin emission factor), the option selected for the calculation of CM is not included. In addition, the calculation of the CM is not presented in ER spreadsheet.		
B.6.2 How was the $EF_{grid,BM,y}$ verified?	/ 1/ / 3/ / 5/ / 23/	DR	The build margin CO_2 emission factor ($EF_{grid,BM,y}$) is calculated using the step procedures in "Tool to calculate the emissions factor for an electricity system" (version 2.2.1). In the assessment in B.6.1 above, it was found that; In Step 5 (Identify the group of power units to be included in the build margin), the project has only considered the quantity of electricity delivered to grid by most recently built power plant in Thailand. Hence it is unclear on there is no consideration of the most recently built power plant in Lao PDR and why they are not included. In Step 6 (Calculate the build margin emission	~~CL 4~~	OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			factor), the option selected for the calculation of BM is not stated in the PDD.		
B.6.3 How was the $FC_{j,y}$ verified?	/ 1/ / 3/ / 5/ / 23/	DR	The amount of each fossil fuel consumption by type of fuel ($FC_{j,y}$) of 0.0554 $kgCO_2$/scf (natural gas), 951.7230 $kgCO_2$/ton (lignite), 2 360.115 $kgCO_2$/ton (bituminous), 3.0026 $kgCO_2$/litre (bunker), and 2.6441 $kgCO_2$/litre (diesel). These were sourced from report published by Thailand authority hence this is in line with the "Tool to calculate the emission factor for an electricity system".		OK
B.6.4 How was the $NCV_{i,y}$ verified?	/ 1/ / 3/ / 5/ / 23/	DR	The net calorific value of the fuel combusted in grid based power plants used in the determination of the emission factor ($NCV_{i,y}$) is not stated in the Section B.6.2 of the PDD hence it is unclear on what are the values applied for the project.	~~CL 5~~	OK
B.6.5 How was the $EF_{CO2,I,y}$ verified?	/ 1/ / 3/ / 5/ / 23/	DR	The emission factor of carbon dioxide gas emitted from fossil fuel combustion in grid based power plants used in the determination of the emission factor ($EF_{CO2,i,y}$) is not stated in the Section B.6.2 of the PDD hence it is unclear on what are the values applied for the project.	~~CL 5~~	OK
B.6.6 How was the $EF_{grid,CM,y}$ verified?	/ 1/ / 3/ / 5/ / 23/	DR	The combined margin emission factor of the grid ($EF_{grid,OM,y}$) is calculated using the step procedures in "Tool to calculate the emissions factor for an electricity system" (version 2.2.1). In the assessment in B.6.1 above, it was found that, in Step 7 (Calculate the combine margin emission factor), the option selected for the calculation of CM is not included. In addition, the calculation of the CM is not presented in ER spreadsheet.	~~CL 4~~	OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	Baseline emissions					
B.6.7	Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/ 1/	DR	Pending the closure of clarifications raised on the inputs used in the calculation of emission reductions (Section B.6.1 to B.6.5).	~~CL 4~~ ~~CL 5~~	OK
B.6.8	Have conservative assumptions been used when calculating the baseline emissions?	/ 1/	DR	Pending the closure of clarifications raised on the inputs used in the calculation of emission reductions (Section B.6.1 to B.6.5).	~~CL 4~~ ~~CL 5~~	OK
B.6.9	Are uncertainties in the baseline emission estimates properly addressed?	/ 1/	DR	There are no major uncertainties in the baseline emission estimates.		OK
	Project emissions					
B.6.10	Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/ 1/ / 18/	DR	The project activity is a run-of-the-river hydropower, hence there is no new reservoir to be built. Therefore the, project emission from hydropower ($PE_{HP,y}$) is assumed as 0 and will be neglected for both *ex-ante* and *ex-post* calculations. This is in line with paragraph 20 of AMS-I.D (version 17). For the emission from diesel backup generators ($PE_{FF,y}$), it was assumed as 0 for *ex-ante*. For *ex-post*, the accurate emission is monitored and calculated during the crediting period. However, there is no formula for provided the *ex-post* calculation of $PE_{FF,y}$ thus it is unclear on how the $PE_{FF,y}$ and this would comply with paragraph 21 of AMS-I.D (version 17).	~~CAR 5~~	OK
B.6.11	Have conservative assumptions been used when calculating the project emissions?	/ 1/ / 18/	DR	This is pending on the CAR raised in B.6.10, on how the emissions from diesel generators would be calculated for the determination of project emissions.	~~CAR 5~~	OK
B.6.12	Are uncertainties in the project emission estimates properly addressed?	/ 1/ / 18/	DR	This is pending on the CAR raised in B.6.10, on how the emissions from diesel generators would	~~CAR 5~~	OK

MoV = Means of Verification, DR= Document Review, I= Interview, CC= Cross-Checking

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				be calculated for the determination of project emissions.		
	Leakage					
B.6.13	Are the leakage calculations documented according to the approved methodology and in a complete and transparent manner?	/ 1/ / 18/	DR	There is no transfer of equipment from another activity as the project is a greenfield. Hence the leakage can be neglected as per paragraph 22 of AMS-I.D (version 17).		OK
B.6.14	Have conservative assumptions been used when calculating the leakage emissions?	/ 1/ / 18/	DR	There is no leakage needs to be considered as per paragraph 22 of AMS-I.D (version 17).		OK
B.6.15	Are uncertainties in the leakage emission estimates properly addressed?	/ 1/ / 18/	DR	There is no leakage needs to be considered as per paragraph 22 of AMS-I.D (version 17).		OK
	Emission Reductions					
B.6.16	Algorithms and/or formulae used to determine emission reductions: • All assumptions and data used by the project participants are listed in the PDD and related document submitted for registration. The data are properly referenced • All documentation is correctly quoted and interpreted. • All values used can be deemed reasonable in the context of the project activity • The methodology has been correctly applied to calculate the emission reductions and this can be replicated by the data provided in the PDD and supporting files to be submitted for registration.	/ 1/	DR	This is pending on the closure of the CARs and CLs raised on the assumption, data, and calculations used by the project participant for the calculation of emission reductions.	~~CAR 5~~ ~~CL 4~~ ~~CL 5~~	OK
B.7	**Monitoring plan (VVS § 131-133)**					
	Data and parameters monitored					
B.7.1	Do the means of monitoring described in the plan comply with the requirements of the methodology?	/ 1/	DR	The following parameters have been included in the monitoring plan; 1. Electricity supplied by the proposed hydropower plant to the grid ($EG_{y,export}$) –	~~CAR 5~~	OK

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				monitored continuously with two-way power meters and will be measured hourly and recorded at least monthly. 2. Electricity supplied by the grid to the proposed hydropower plant ($EG_{y,import}$) – monitored continuously with two-way power meters and will be measured hourly and recorded at least monthly. 3. Net electricity supplied to the grid by the proposed hydropower plant ($EG_{BL,y}$) – calculated using the monitored data from $EG_{y,export}$ and $EG_{y,import}$. 4. Installed capacity of the hydropower plant after the implementation of the project activity (Cap_{PJ}) – monitored yearly using the manufacturer's nameplate. The project has described that a fossil fuel system is used as backup. However the parameter $PE_{FF,y}$, and the parameters from AMS-I.D on the fossil fuel consumption have not been included in the monitoring plan. This is not in line with paragraph 24 of AMS-I.D (version 17).		
B.7.2	Does the monitoring plan contains all necessary parameters, and are they clearly described?	/ 1/	DR	As listed in the Section B.7.2, not all parameters have been included in the monitoring plan.	~~CAR 5~~	OK
B.7.3	In case parameters are measured, is the measurement equipment described? Describe each relevant parameter.	/ 1/	DR	The following parameters have been included in the monitoring plan; 1. Electricity supplied by the proposed hydropower plant to the grid ($EG_{y,export}$) – monitored continuously with two-way power meters and will be measured		OK

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				hourly and recorded at least monthly. 2. Electricity supplied by the grid to the proposed hydropower plant ($EG_{y,import}$) – monitored continuously with two-way power meters and will be measured hourly and recorded at least monthly. 3. Net electricity supplied to the grid by the proposed hydropower plant ($EG_{BL,y}$) – calculated using the monitored data from $EG_{y,export}$ and $EG_{y,import}$. 4. Installed capacity of the hydropower plant after the implementation of the project activity (Cap_{PJ}) – monitored yearly using the manufacturer's nameplate.		
B.7.4	In case parameters are measured, is the measurement accuracy addressed and deemed appropriate? Describe each relevant parameter.	/ 1/	DR	The accuracy and the calibration procedure of the equipment to be applied (including the responsible person/entity who will perform the calibration) have not been included hence this is not in line with the paragraph 98 of PS.	~~CAR 6~~	OK
B.7.5	In case parameters are measured, are the requirements for maintenance and calibration of measurement equipment described and deemed appropriate? Describe each relevant parameter.	/ 1/	DR	The calibration procedure and the maintenance requirements are not included in the monitoring plan.	~~CAR 6~~	OK
B.7.6	Is the monitoring frequency adequate for all monitoring parameters? Describe each parameter.	/ 1/	DR	The following parameters have been included in the monitoring plan; 1. Electricity supplied by the proposed hydropower plant to the grid ($EG_{y,export}$) – monitored continuously with two-way power meters and will be measured hourly and recorded at least monthly. 2. Electricity supplied by the grid to the		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			proposed hydropower plant ($EG_{y,import}$) – monitored continuously with two-way power meters and will be measured hourly and recorded at least monthly. 3. Net electricity supplied to the grid by the proposed hydropower plant ($EG_{BL,y}$) – calculated using the monitored data from $EG_{y,export}$ and $EG_{y,import}$. 4. Installed capacity of the hydropower plant after the implementation of the project activity (Cap_{PJ}) – monitored yearly using the manufacturer's nameplate.		
B.7.7 Is the recording frequency adequate for all monitoring parameters? Describe each parameter.	/ 1/	DR	The following parameters have been included in the monitoring plan; 1. Electricity supplied by the proposed hydropower plant to the grid ($EG_{y,export}$) – monitored continuously with two-way power meters and will be measured hourly and recorded at least monthly. 2. Electricity supplied by the grid to the proposed hydropower plant ($EG_{y,import}$) – monitored continuously with two-way power meters and will be measured hourly and recorded at least monthly. 3. Net electricity supplied to the grid by the proposed hydropower plant ($EG_{BL,y}$) – calculated using the monitored data from $EG_{y,export}$ and $EG_{y,import}$. 4. Installed capacity of the hydropower plant after the implementation of the project activity (Cap_{PJ}) – monitored yearly using the manufacturer's nameplate.		OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	Ability of project participants to implement monitoring plan					
B.7.8	How has it been assessed that the monitoring arrangements described in the monitoring plan are feasible within the project design?	/ 1/	DR	The monitoring arrangements described in the monitoring plan are feasible within the project design as it is required by the methodology. This is provided that the CLs raised in B.7.2. to B.7.7. are closed.		OK
B.7.9	Are procedures identified for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation)?	/ 1/	DR	The monitoring set up is simple, based on DNV expertise of similar projects and sectoral expertise, the monitoring plan is considered feasible within the project design. It should be checked during verification that project management procedures are fully developed and implemented; 1. Handling of emergencies situations; 2. Monitoring, measurement, and reporting; 3. Monitoring data adjustment and data uncertainties; 4. Handling of day-to-day records; 5. Review of reported results and data; 6. Internal audit of GHG project based operational requirements; 7. Project performance review; 8. Corrective actions; and Flooding control procedures.		FAR 1
B.7.10	Are the data management and quality assurance and quality control procedures sufficient to ensure that the emission reductions achieved by/resulting from the project can be reported ex post and verified?	/ 1/	DR	Data management and quality assurance, and quality control procedures are still being developed and will be verified during the verification period.		FAR 1
B.7.11	Will all monitored data required for verification and issuance be kept for two years after the end of the crediting period or the last issuance of CERs, for this project activity, whichever	/ 1/	DR	Yes. All monitored data will be kept for at least two years after the crediting period. This is reflected in PDD Section B.7.2.		OK

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	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	occurs later?					
	Monitoring of sustainable development indicators/ environmental impacts					
B.7.12	Is the monitoring of sustainable development indicators/ environmental impacts warranted by legislation in the host country?	/ 1/ / 51/	DR	The monitoring of sustainable development indicators/ environmental impacts is not warranted by legislation in the host country as confirmed from the interview with the DNA of Lao PDR.		OK
B.7.13	Does the monitoring plan provide for the collection and archiving of relevant data concerning environmental, social and economic impacts?	/ 1/	DR	Please refer to B.7.12.		OK
B.7.14	Are the sustainable development indicators in line with stated national priorities in the host country?	/ 1/	DR	Please refer to B.7.12.		OK
	C Duration of the project activity / crediting period					
	Start date of project activity (VVS § 106 & 112, PS § 57-62)					
C.1.1	How has the starting date of the project activity been determined? What are the dates of the first contracts for the project activity? When was the first construction activity?	/ 1/ / 27/	DR	The start date is claimed to be 29 November 2011 which is the date of the project participant and the EPC contractor signed the contract. However the contract was not provided to justify this claim. In addition, the DNV and performed a cross-check and it was found that the project participant (EdL) has a signed a construction contract for a hydropower project which has the same name (Nam Sana Hydropower Project), same capacity (14 MW), and same location (Nam Sana River) on 20 June 2011. Hence it is unclear if the contract signed on 29 November 2011 would represent the earliest financial commitment to the	~~CL 1~~	OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				project activity.		
C.1.2	Is the stated expected operational lifetime of the project activity reasonable?	/ 1/ / 4/ / 20/	DR	The expected operational lifetime of 50.5 years is based on the FSR. DNV has calculated that if the project operates at 3 539 hours (based on the plant load factor of 40.4%) and the hydro turbines have the technical lifetime of 150 000 hours (based on the default value from "Tool to determine the remaining lifetime of equipment"), the project activity would have a 42.4 years of technical lifetime. Hence the expected lifetime of 50.5 years sourced from the FSR is deemed acceptable. The PDD states that the project has an operational lifetime of 25 years in Figure 6 and 7. However in Section C.1.2, it is stated that the lifetime is 50.5 years.	~~CL 6~~	OK
C.1.3	Is the start date, the type (renewable/fixed) and the length of the crediting period clearly defined and reasonable?	/ 1/ / 4/	DR	Yes, the start of renewable crediting period is in 1 July 2014. This is reasonable considering the project is still undergoing construction stages and the expected time of operation will be in 2014. Updated to 1 January 2015		OK
D Environmental impacts (VVS § 134-137)						
D.1.1	Are there any host country requirements for an Environmental Impact Assessment (EIA), and if yes, is an EIA approved? Does the approval contain any conditions that need monitoring? For small-scale project activities, is an assessment of the environmental impacts of the proposed CDM project activity is required by the host Party?	/ 1/ / 6/ / 8/	DR	Yes, EIA is a requirement for all power generation projects in Lao PDR. The EIA has been approved by Lao PDR Ministry of Natural Resources and Environment on 21 May 2012.		OK
D.1.2	Does the project comply with environmental legislation in	/ 1/	DR	Yes, the project comply with the environmental		OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	the host country?	/ 6/ / 8/		legislation in the host country as evidenced that the EIA report has been approved by local authority.		
D.1.3	Will the project create any adverse environmental effects?	/ 1/ / 6/ / 8/	DR	The project is not likely to create any significant adverse environmental effect.		OK
D.1.4	Have identified environmental impacts been addressed in the project design?	/ 1/ / 6/ / 8/	DR	Yes, the identified environmental impacts have been addressed in the project design.		OK
D.1.5	Has an analysis of the environmental impacts of the project activity been sufficiently described?	/ 1/ / 6/ / 8/	DR	No transboundary impacts are foreseen from the proposed project activity.		OK
D.1.6	Are transboundary environmental impacts considered in the analysis?	/ 1/ / 6/ / 8/		Yes, the project comply with the environmental legislation in the host country as evidenced that the EIA report has been approved by local authority.		OK
E Local stakeholder consultation (VVS § 138-140)						
E.1.1	Have relevant stakeholders been consulted?	/ 1/ / 6/	DR	Yes, two local stakeholder consultations were conducted in the period from 25 August 2010 to 31 August 2010. The local stakeholders' comments were conducted as part of EIA. The consultations were carried out in four affected districts, namely Ban Naxou, Phonngam, Ban Nasangthong, and Ban Namphot. DNV was able to verify that the stakeholders' consultation meetings were held in the presence of respective representatives from the Kasi District. The summary of the stakeholders' consultation meeting were included in the EIA which has been		OK

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				provided to DNV for review.		
E.1.2	Have appropriate media been used to invite comments by local stakeholders?	/ 1/	DR	There is no evidence provided on how the project participants have invited the comments by local stakeholders.	~~CL 7~~	OK
E.1.3	If a stakeholder consultation process is required by regulations/laws in the host country, has the stakeholder consultation process been carried out in accordance with such regulations/laws?	/ 1/ / 51/	DR	The local stakeholder comments process is deemed in line with the national requirements as confirmed by Lao PDR DNA.		OK
E.1.4	Is a summary of the stakeholder comments received provided?	/ 1/	DR	Yes, a summary of the stakeholder comment received is included in PDD. No adverse comments were received.		OK
E.1.5	Has due account been taken of any stakeholder comments received?	/ 1/	DR	Yes, due account has been taken of any stakeholder comments received. It is incorporated into Section E.3 of the PDD.		OK

Table 3 Resolution of corrective action requests and clarification requests

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
CAR 1 1. The LoAs for the host Parties (Lao PDR and Thailand) and Annex 1 Party are not provided. 2. The PDD states that the project has two host Parties, this is not in line with paragraph 2 of "Clarification of Host Party for project activities and bundled project activities" of EB 70 Annex 38.	A.3.1 A.3.2 A.3.3	1. The Host Country (Lao PDR) has confirmed that they will hold a stakeholder consultation which we hope will be this month. After that theLoA should follow quickly. 2. The PDD has been amended so that in accordance with EB 70, Annex 38, there is only one Host Country.	1. The LoA from Annex I Party United Kingdom of Great Britain and Northern Ireland dated 23 December 2014 has been received from the project participant /14/. 2. The PDD has been revised to a single host country, which is Lao PDR. The project physical location (e.g. power generation unit and river) is located in Lao PDR. This is in line with paragraph 2 of "Clarification of Host Party for project activities and bundled project activities" of EB 70 Annex 38 / 28/ which stated that the project activity shall have only one host Party where the project activity is located. The CAR is closed.
CAR 2 The MoC for the project is not provided.	A.4.1 A.4.2	Please see the MOC Form which has been uploaded to the shared folder	The MoC form has been received directly from one of the project participant, Eneco Energy Trade B.V. The MoC (dated 4 October 2012) has nominated both project participants, Electricité du Laos andEneco Energy Trade B.V. as the focal point for the project activity have joint authority to / 10/: a. Communicate in relation to request for forwarding of CER;

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			b. Communicate in relation to request for addition and/or voluntary withdrawal of project participants and focal points, as well as changes to company names, legal status, contract details, and specimen signatures; and c. Communicate on all other project or programme related matters not covered by (a) and (b) above. This CAR is closed.
CAR 3 The PDD does not address all the applicability criteria as per the applied methodology of AMS-I.D (version 17).	B.2.3 B.2.4 B.2.5 B.2.6 B.2.7 B.2.8	Please see the updated PDD which clarifies the applicability of the methodology	The compelte applicability conditions of the AMS-I.D (version 17) has been included in the PDD / 18/ and evidences have been justified to meet the methodology. This CAR is closed.
CAR 4 1. The financial analysis period is 25 years which is shorter than the operating lifetime of 50.5 years, thus it is unclear why fair value has been excluded from the analysis as per paragraph 5 of "Guidelines on the assessment of investment analysis". 2. The investment cost of USD 30.5 million is based on the FSR. According to the FSR, the total cost for the project is USD 26.84 million which will be spent within the 2.5 years of the construction period. The remaining USD 4.03 million will be spent for renovating the project after 25 years of operation. However, this is	B.5.20 B.5.24	1. The period of 25 years has been chosen as this is consistent with "Guidelines on the assessment of investment analysis". In paragraph 3 this states "Guidance: The period of assessment should not be limited to the proposed crediting period of the CDM project activity. Both project IRR and equity IRR calculations shall as a preference reflect the period of expected operation of the underlying project activity (technical lifetime), or ñ if a shorter period is chosen ñ include the fair value of the project activity assets at the end of the assessment period. In general a minimum period of	1. The project participant has estimated that the project has 5% of residual value. The residual cost is calculated based on the assumption of 5% of the total costs from civil works. The 5% residual cost is based on another registered CDM hydropower project in Lao PDR. DNV has checked on all registered hydropower project in Lao PDR and confirmed that only "Xeset II Hydropower Project" (Reference: 5258) has residual value of 5% / 38/. DNV has also reviewed the financial modeling published by the Lao PDR government website and which did not specify on

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
not consistent with the PDD and IRR spreadsheet which assumed the total cost of USD 30.5 million to incur within the 2.5 years of construction period. This is not consistent with paragraph 3 of the "*Guidelines on the Assessment of Investment Analysis*" which states that "*the IRR calculation may include the cost of major maintenance and/or rehabilitation if these are expected to be incurred during the period of assessment*".		10 years and a maximum of 20 years will be appropriate. The IRR calculation may include the cost of major maintenance and/or rehabilitation if these are expected to be incurred during the period of assessment. Project participants are requested to justify and DOEs are requested to validate the appropriateness of the period of assessment in the context of the underlying project activity, without reference to the proposed CDM crediting period." The selection of a 25 year period is also consistent with industry practice in the IPP sector, where the Government of Laos issues a 25 year concession and power purchase agreement to project developers. The spreadsheet has been amended to reflect the Fair Value (Residual Value) of the civil works – power house, weir headrace, penstock etc.). 2. Please refer to Table 9.1 in the Feasibility Study which refers to a total cost of USD 30.50m. This gives a detailed breakdown of the costs (and has been used to estimate the Fair Value in Year 25). The figure of USD 30.50m ***does not include*** finance costs, but it does include other realistic costs such as engineering costs and contingencies, to	the residual value. Thus the assumed residual cost applied in the project is deemed acceptable. 2. The investment cost IRR spreadsheet / 2/ and the PDD have been revised to USD 26.84 million which is consistent with the FSR / 4/. As the FSR stated that the remaining cost of USD 4.03 million is for refurbishment and allowed the project to operate up to 50.5 years / 4/. As the financial period is assumed to be 25 years, the refurbishment cost has been excluded and the residual value has been included. This will increase the conservativeness of the project IRR and thus it is acceptable. This CAR is closed.

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		reach the final budget.	
CAR 5 It was clarified on-site that the project activity would depend on diesel generator set for start-up purposes, which would lead to project emission from fossil fuel combustion ($PE_{FF,y}$). 1. The PDD did not specify the formula for the *ex-post* calculation of ($PE_{FF,y}$) as per paragraph 21 of AMS-I.D (version 17); 2. This source of project emission was not included in the monitoring plan. Further information is needed on how the project would monitor the emission originating from the back-up diesel generator set as per paragraph 21 of AMS-I.D (version 17).	B.6.10 B.7.1	1. This is now included in the PDD. 2. This has now been included in the Emissions Reductions calculation and the monitoring plan.	1. The formula in the PDD has been included and it is specified that Option A from the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" is selected for the calculation of the project emissions / 19/. 2. For the project emission from fossil fuel combustion, the PDD has been revised and the following parameters have been included in the monitoring plan; a. Quantity of fuel type i combusted in process j during the year y ($FC_{i,j,y}$) – monitored continuously b. Weighted average net calorific value of fuel type i in year y ($NCV_{i,j}$) – calculated c. Weighted average CO_2 emission factor of fuel type i in year y ($EF_{CO2,j,y}$ -) – calculated DNV has checked that the monitoring of these parameters is in line with the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" as required by AMS-I.D / 19/. This CAR is closed.

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
CAR 6 The accuracy and the calibration procedure of the equipment to be applied (including the responsible person/entity who will perform the calibration) have not been included hence this is not in line with the paragraph 98 of Project Standard.	B.7.3	Please see the amended PDD which refers to the calibration and meter checking which is contained in the standard EdL PPA	The electricity meter used in the project activity will have accuracy of class 0.2S and able to measure the electricity input and output within +0.2% of the accuracy value. The electricity meters will be calibrated by qualified laboratory and the calibration frequency will be in line with IEC 60687. This CAR is closed.
CL 1 1. The start date is claimed to be 29 November 2011 which is the date of the project participant and the EPC contractor signed the contract. During the site visit, it was confirmed that the EPC has been signed. However the contract was not provided to justify this claim. From a cross-check performed by DNV (www.set.or.th/dat/news/201106/11027019.pdf), it was found that the project participant (EdL) has a signed a construction contract for a hydropower project which has the same name (Nam Sana Hydropower Project), same capacity (14 MW), and same location (Nam Sana River) on 20 June 2011. Further clarification is sought regarding the project starting date to ensure this is the earliest date of implementation, construction, and real action. 2. The PDD stated that the host Party DNA has been notified however, no evidence has been	B.5.5 C.1.2	1. The EPC contract was indeed signed in June 2011, but work could not commence because of a number of factors. One major factor was the fact of the rainy season, which generally does not end until the end of October each year. After the end of the rainy season, the parties committed to what they had signed in June. A further factor is that the main construction could not start until the IEE had been approved. No projects in Laos can start at all until the social and environmental documentation is in order. 2. Please see form which was signed by Mr. Syamphone, the Director of Climate Change at WREA, the Lao DNA.	1. The starting date of the project activity is after 19 September 2011, which is the date that the Project Participant and the EPC Contractor committed to the obligations in the pre-agreed EPC Contract, which was signed on 20 June 2011 / 32/, by starting work on access road after authorisation is given by the local authority. The authorisation was given as the cabinet has given verbal approval on the Initial Environmental Examination (IEE) of the project, while the official approval was given on 21 May 2012 / 8/. 2. A CDM notification form for this project was sent to the DNA of Lao PDR on 19 March 2012, regarding the commencement of the project and its intention to seek CDM status. DNV has checked the notification and is able to confirm that the receipt of notification by DNA of Lao PDR through the

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
provided to demonstrate that the project participant has notified the host Party (Lao PDR) DNA.			interview held in the DNA's office and an official letter sent on 15 March 2012 / 11/. This CL is closed.
CL 2 Further clarification is sought for the following; 1. In page 15 of the PDD, paragraph 2 stated that the financial indicator is a pre-tax project IRR, however in paragraph 6, it is stated that the financial indicator is post-tax project IRR. Hence it is unclear on which is applied (pre-tax or post-tax) as the project IRR. 2. The IRR spreadsheet is applying the annual generation capacity of 49 500 MWh which is not consistent with the PDD and FSR. 3. Clarification is sought for the sensitivity analysis in the IRR spreadsheet for the generation capacity which shows that increasing the capacity by 5% or 10%, the IRR will decrease to zero. This is not consistent with the PDD. 4. Clarification is sought on the date of decision to invest in the project.	B.5.16 B.5.22 B.5.27	1. These are all pre-tax IRRs and the documents have been updated accordingly. 2. This has been corrected to achieve consistency. 3. The spreadsheet cell references have been corrected. 4. The final decision to invest in the project was only taken after all approvals had been received, which is standard practice in Laos. No project can move ahead until the IEE has been approved and this was received in late 2011. Any documents signed before that date are contingent upon approval by the government and cannot come into force until approval has been gained.	1. The PDD has been revised and it is now consistent with IRR spreadsheet / 2/ which is using pre-tax project IRR as the financial indicator in the financial analysis. 2. The IRR spreadsheet / 2/ has been revised and it is now consistent with the PDD and FSR / 4/. 3. The sensitivity analysis in the IRR spreadsheet / 2/ has been revised and it is now consistent with the PDD. 4. The date of the decision making was on the date on signing of the EPC Contract, which was signed on 20 June 2011 / 32/. This CL is closed.
CL 3 A list of chronological events has been included in the PDD demonstrating the prior CDM consideration and activities leading to the implementation of the project activity.	B.5.20	Additional Copies of Documents submitted and specific references highlighted. These documents have all been uploaded but we would request the DOE to note the confidentiality of certain agreements – especially consulting and other	DNV has reviewed the documents provided and confirmed the following information are correct; a) The FSR (dated November 2010) was prepared by NarawatPatanakarn Public Company Limited / 4/.

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
Nevertheless, documentation is required for the substantiation of these events. In addition, clarifications are requested on: a) the entity which prepared the FSR; b) the mandatory host country approval of the Feasibility Study Report (FSR); and c) the notification of CDM consideration to the Laos DNA.		appointments. The FSR was prepared by the Narawat Construction Company, who appointed Team Consulting for the Social and Environmental aspects of the FSR. The Host Country Approval is "de facto" in the formal Letters of Approval which have been uploaded. The Laos DNA acknowledgement of the Prior Consideration Form has been uploaded. This was done in a meeting in Vientiane. The Thai DNA was also approached initially and a Prior Consideration Form was sent. However, following the changes in regulations referred to above, their Host Country Approval is no longer necessary. However, a copy of their acknowledgement of the Prior Consideration is also available for the sake of completeness.	b) The Government of Lao PDR (host country) has approved the IEE for the project activity on 21 May 2012 / 8/. c) A CDM notification form for this project was sent to the DNA of Lao PDR on 19 March 2012, regarding the commencement of the project and its intention to seek CDM status. DNV has checked the notification and is able to confirm that the receipt of notification by DNA of Lao PDR through the interview held in the DNA's office and an official letter sent on 15 March 2012 / 11/. This CL is closed.
CL 4 1. The PDD stated that the project is connected to the Lao Central Grid. According to the grid system published by Lao PDR Government, there are two central grids in Lao PDR. Hence it is unclear which central grid the project will be connected to; 2. The calculation of the low-cost/must-run resources is not provided hence it is unclear on how the project can conclude the low-cost/must-run resources constitute less than	B.6.2	1. The Project will connect to what is referred to as the Central C1 Grid in the PDD 2. Please see the updated spreadsheet and source documents 3. This is now consistent – Option B 4. Please see the amended spreadsheet	1. The project activity will be connected to the C1 Central Grid which is linked to Thailand national grid / 44// 45// 46/. 2. Based on the information published by Thailand Government / 44// 45// 46/; for the last five years (from year 2006 to 2010) / 3/, the low cost/must run constitute for these five year period is averaged to 6.32% and this is less than 50% of total generation. This is in line with the Simple OM as per "*Tool to*

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
50% of total generation. 3. The PDD stated that Option A of Simple OM (page 21) and Option C of Simple OM (page 43) is used for calculation of OM, however this is not consistent with the ER spreadsheet which uses Option B of Simple OM to calculate the OM. 4. The project is connected to the regional grid (i.e. Lao PDR and Thailand), however the data used for the OM calculation is based on Thailand only and there is no data from Lao PDR included in the calculation. Clarification is sought on this. 5. In Step 5 (Identify the group of power units to be included in the build margin), the project has only considered the quantity of electricity delivered to grid by most recently built power plant in Thailand. Hence it is unclear on there is no consideration of the most recently built power plant in Lao PDR and why they are not included. 6. In Step 6 (Calculate the build margin emission factor), the option selected for the calculation of BM is not stated in the PDD. 7. In Step 7 (Calculate the combine margin emission factor), the option selected for the calculation of CM is not included. In addition, the calculation of the CM is not presented in ER spreadsheet.		which includes the Lao generation (which is all LCMR and included). 5. Please see the amended spreadsheet and the data supplied by EdL. 6. The PDD has been updated. 7. This is shown in the spreadsheet under the tab Thailand BM.	*calculate the emission factor for an electricity system*" / 24/. 3. Based on the information published by Thailand Government / 44// 45// 46/; the OM was calculated by total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system which is in line with Option B of "*Tool to calculate the emission factor for an electricity system*" / 24/. DNV has checked the revised PDD and it is now consistent with the Option B applied in the ER calculation / 7/. 4. Based on the information published by Electricite Du Laos (the electricity utility company in Lao PDR) / 39// 40// 41// 42// 43/, the power generation in Lao PDR is dominated by hydropower. As the power generation is from the Lao PDR side is sourced from hydropower which is Low Cost/Must Run resource, hence the calculation of OM is solely based on the data from Thailand side. This is in line with paragraph 40 of "*Tool to calculate the emission factor for an electricity system*" / 24/. 5. Electricite Du Laos (EdL) has published that the electricity generation in Lao

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			PDR) / 39// 40// 41// 42// 43/ is sourced from hydropower hence the calculation of BM for the project activity is based on the data from Thailand grid. This is acceptable. 6. The Build Margin (BM) emission factor was calculated by *ex-ante* (Option 1) in that 2010 data was used as the most recent information available on plants already built for sample group m at the time of validation. The sample group m consists of the power plant capacity additions in the electricity system that comprise 20% of the system generation (32 934.25 GWh) and that have been built most recently (10 815.57 GWh). The BM is calculated as the generation weighted average emission factor of the sample group m and arrived to be 0.4231 tCO2/MWh / 3/. 7. The option selected for the calculation of CM is stated as Option A. This is shown clearly in the PDD and ER spreadsheet / 7/. This CL is closed.
CL 5 1. The net calorific value ($NCV_{i,y}$) of the fuel combusted in grid connected power plants used in the determination of the emission	B.6.4 B.6.5 B.6.6	1. The PDD has been updated 2. The PDD has been updated 3. These are the IPCC default values and	1. The $NCV_{i,y}$ used in the determination of the grid emission factor has been included in the Section B.6.2 of the revised PDD.

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
factor is not stated in the Section B.6.2 of the PDD; 2. The emission factor of carbon dioxide gas emitted from fossil fuel combustion in grid based power plants used in the determination of the emission factor ($EF_{CO2,i,y}$) is not stated in the Section B.6.2 of the PDD. 3. Further clarification is sought regarding the $NCV_{i,y}$ and $EF_{CO2,i,y}$ used to ensure the values used are in compliance with the "*Tool to calculate the emission factor for an electricity system*".		the monitoring.	2. The $EF_{CO2,i,y}$ used in the determination of the grid emission factor has been included in the Section B.6.2 of the revised PDD. 3. The $NCV_{i,y}$and $EF_{CO2,i,y}$ sourced from Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National Greenhouse Gas Inventories / 36/ which is in line with "*Tool to calculate the emission factor for an electricity system*" / 24/. This CL is closed.
CL 6 1. It is unclear in the PDD if the electricity generation of 49 550 MW net or gross; 2. Page 11 of the PDD refers to Figure 6 and Figure 7 for the grid connection, but Figure 6 and 7 in the PDD are describing on investment analysis; 3. The PDD states that the project has an operational lifetime of 25 years in Figure 6 and 7. However in Section C.1.2, it is stated that the lifetime is 50.5 years; 4. Clarification is sought on the appropriateness for the assumed operational lifetime of the project activity of 50.5 years.	C.1.3	1. This is the power delivered to the Grid 2. All references are now consistent (PDD updated) 3. This has been amended for consistency. 4. Please see the comments above	1. The electricity generation of 49 550 MW is net which is delivered to the grid. 2. The PDD has been revised and it is now referring to the correct figures. 3. In the revised PDD, the operation lifetime has been revised from 50 years to 25 years. 4. The operation lifetime of the project has been revised from 50.5 years to 25 years. According to the FSR / 4/, after 25 years of operation, the electrical and mechanical work of the project needs to be refurbished. Thus it is expected

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			project activity has the lifetime of 25 years. This CL is closed.
CL 7 A copy of the media used in the invitation to the stakeholder consultation, attendance list and stakeholder meeting minutes needs to be provided to DNV for review.	E.1.2	Copies of presentations and minutes have been uploaded to the dropbox folder. This is Appendix 4 of the IEE Report.	DNV has reviewed the stakeholder consultations which was conducted on 25-31 August 2010 and reported as part of the IEE / 6/ and confirmed that no adverse comment was found. Furthermore as this has been included into approved and confirmed during the site visit, hence in DNV's opinion, the stakeholder consultation has been conducted in line with the local regulations. This CL is closed.

Table 4 Forward action requests

Forward action request	Reference to Table 2	Response by project participants
FAR 1 It should be checked during verification that project management procedures are fully developed and implemented; 1. Handling of emergencies situations; 2. Monitoring, measurement, and reporting; 3. Monitoring data adjustment and data uncertainties; 4. Handling of day-to-day records;	B.7.9 B.7.10	EdL is an experienced operator of power plants with a history going back to 1959. The Project Owner is fully aware of the CDM requirements which are additional to the other safety, emergency and other operational requirements of any power plant. The Environmental Management Division of EdL (based in Head Office) will work closely with the plant managers to ensure that the items referred to in FAR 1 are communicated with the CDM Monitoring Team

Forward action request	Reference to Table 2	Response by project participants
5. Review of reported results and data; 6. Internal audit of GHG project based operational requirements; 7. Project performance review; 8. Corrective actions; and 9. Flooding control procedures.		

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APPENDIX B

CURRICULA VITAE OF THE VALIDATION TEAM MEMBERS

SIMON WONG YON SING

Simon Wong holds a Bachelor's Degree in Chemical Engineering with Environmental Engineering, with a year experience in the field of design and operation/maintenance of wastewater treatment as part of working in wastewater design & equipment supply services. His experience in designing and maintaining the wastewater treatment systems covers the fields of various manufacturing and chemical industries in Malaysia.

He has experience of more than 7 years in validation and verification of numerous CDM projects in DNV, both in Malaysia and abroad. His qualification, industrial experience and experience in CDM demonstrate his sufficient sectoral competence in Energy Generation from Renewable Energy Sources, Waste Handling and Disposal, Thermal energy generation from fossil fuels and biomass and Animal Waste Management System. In addition, he has participated in Energy Productivity trainings which allow him to assist and play an active role in energy efficiency related work.

FATHULLAH AKMAL KHALID

Fathullah Akmal Khalid holds 2 Bachelor degrees majoring in both Chemical Engineering and Commerce from The University of Melbourne, Australia. Prior to joining DNV, Fathullah had experience in cement manufacturing as a manufacturing engineer in a few Malaysian cement plants. During the course of his previous employment, he was involved in a number of plant upgrading and improvement projects. Fathullah is also a member of The Institution of Chemical Engineers (IChemE) and Engineers Australia.

LIM YAP HONG

Lim Yap Hong holds a Bachelor Degree in Chemistry with an overall experience of around 4 years. Prior to joining DNV having 3 years' experience in laboratory industry covering method development, training, international ring test, sample analysis, instrumental calibration and commissioning. His experience covers the fields of agricultural analysis, quality control in food and feed, as well as quality assessment in environmental waste. He has also been actively involved in method compliance on international standards such as AOAC, AACC, AOCS, EPA, EN, DIN, and ASTM.

WAN HASLIZA SM JAMALUDDIN

Wan Hasliza SM Jamaluddin Holds a Bachelor's Degree in Chemical Engineering. Having an overall experience of around eleven years. Prior to joining DNV having four years in the field of project management for natural gas pipeline construction and four years on the implementation of Montreal Protocol for Malaysia. Her experience covers the fields of construction and environmental management. She has experience of around four years in validation and verification of CDM projects in DNV in South East Asia region. Her qualification, industrial experience and experience in CDM demonstrate her sufficient sectoral competence in "Waste Handling and Disposal" and "Energy Generation from Renewable Energy Sources".

SESHAN RANGANATHAN

Seshan Ranganathan holds a Bachelor's Degree in Chemical Engineering and has done diploma course in Management and completed the graduate ship course in Industrial Engineering and has an overall working experience of around twenty nine years. Prior to joining DNV has around twenty four years experience in Chemical process industry (fertilizer & petrochemical manufacturing) covering production, technical services including energy audits and efficiency studies, waste heat recovery, efficiency studies of boilers ,power plants , safety audits and pollution control activities including waste water treatment, project management, corporate planning, sales, logistics in fertilizer & petrochemical industry . Have undergone training for HAZOP and risk analysis studies.Subsquently involved in carrying out HAZOP/HAZAN in process design of LPG handling facility and in the operating Ammonia and Urea fertiliser plants, inorganic chemical plants. Have carried out energy audits of Fertiliser and Petrochemical plants.Exprienced in the preparation of feasibility reports for chemical process plants. With respect to the thermal power plant the job assignment included the monitoring of flue gas exit temperatures, excess air used efficiency of fuel additives, condition of boiler refractory, insulation of steam lines etc. The experience also includes 5 years in process design & engineering for chemical process industry wherein was involved in developing process flow diagrams, mass and energy balance and data sheets for equpiments.

He is qualified validator and verifier for CDM projects and is carrying out the same for the past five years. He has completed the EMS lead auditor course (ISO 14001:2004 - Environmental Management System Auditor / Lead Auditor Program and attended DNV Training Programme on Corporate GHG Inventory, carbon foot printing courses and sustainability. His qualification, industrial experience and experience in CDM demonstrate his sufficient sectoral competence in areas of (a) 1.1 Thermal energy generation from fossil fuels and Biomass including thermal electricity from solar (b) 1.2 Energy generation from renewable energy sources (c) 2.2 Heat distribution (d) 5.1/11.1/12.1 Chemical Processes Industries and (e) 13.1 Waste handling and disposal.

LAI CHEE KEONG

Lai Chee Keong holds a Bachelor Degree in Applied Science majoring in Environmental Biology, a Master Degree in Environmental Engineering and a Post Graduate Diploma in Accounting and Finance. He possesses a combined Asian & International experience of more than 17 years in the field of environmental consulting and environmental auditing. His experience also covers the fields of environmental management and environmental impact assessment for various on-shore industries such as petro-chemical plants, general chemical plants, residential developments and industrial park developments.

He has also been actively involved in Management System audits such as ISO 9001, ISO 140001 and OHSAS 18001 standards in various industrial sectors for more than 7 years in DNV.

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