



VALIDATION REPORT

Papaloate Hydroelectric Project in El Salvador

REPORT No. 2007-2087

REVISION No. 01

DET NORSKE VERITAS



VALIDATION REPORT

DET NORSKE VERITAS
CERTIFICATION AS

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Approved by: Michael Lehmann	Organisational unit: Climate Change Services
Client: Sociedad Hidroelectrica Papaloate S.A.	Client ref.: Karla Ramos

Project Name: Papaloate Hydroelectric Project
Country: El Salvador
Methodology: AMS-I.D.
Version: 13
GHG reducing Measure/Technology: Power generation from hydro resources.
ER estimate: 43 518 tCO₂e during 7 years (first crediting period).

Size

- ☐ Large Scale
☒ Small Scale

Validation Phases:

- ☒ Desk Review
☒ Follow up interviews
☒ Resolution of outstanding issues

Validation Status

- ☒ Corrective Actions Requested
☒ Clarifications Requested
☒ Full Approval and submission for registration
☐ Rejected

In summary, it is DNV's opinion that the Papaloate Hydroelectric Project in El Salvador, as described in the PDD version 10 of 27 February 2010, meets all relevant UNFCCC requirements for the CDM and all relevant host Party criteria and correctly applies the baseline and monitoring methodology AMS-I.D. (Version 13). Hence, DNV requests the registration of the project as a CDM project activity.

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Report title: Papaloate Hydroelectric Project in El Salvador		
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Key words:

Climate Change
 Kyoto Protocol
 Validation
 Clean Development Mechanism

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Abbreviations

AES/CLESA	Compañía de Luz Eléctrica de Santa Ana / Santa Ana Electrical Energy Company
BM	Building Margin
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction(s)
CL	Clarification Request
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
DNV	Det Norske Veritas
DNA	Designated National Authority
FAR	Forward Action Request
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
LoA	Letter of Approval
MARN	Ministerio de Medio Ambiente y Recursos Naturales de El Salvador. Ministry of Environment and Natural Resources
MP	Monitoring Plan
NGO	Non Governmental Organization
OM	Operating Margin
PDD	Project Design Document
PHP	Papaloate Hydroelectric Project
QA/QC	Quality Assurance/Quality Control
SIGET	Superintendencia General de Electricidad y Telecomunicaciones de El Salvador. General Committee of Electricity and Telecommunications.
UNFCCC	United Nations Framework Convention for Climate Change



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1 EXECUTIVE SUMMARY – VALIDATION OPINION

Det Norske Veritas Certification AS (DNV) has performed a validation of the Papaloate Hydroelectric Project in El Salvador. The validation was performed on the basis of UNFCCC criteria for the Clean Development Mechanism and host Party criteria as well as criteria given to provide for consistent project operations, monitoring and reporting.

The review of the project design document, related technical information, site visit, interview with local interest parties have provided DNV with sufficient evidence to determine the fulfilment of the establish criteria.

The project participant is Sociedad Hidroelectrica Papaloate S.A. de C.V.. of El Salvador. The participating Party - El Salvador as host Party - meets all relevant participation requirements and has provided written approval of voluntary participation in the project. The Papaloate Hydroelectric Project received the Letter of Approval from the DNA of El Salvador.

The project correctly applies the approved methodology for small scale activities type I – Renewable Energy Projects I.D. “Grid Connected Renewable Electricity Generation”, version 13.

The project will generate renewable energy which will displace the use of electric energy generated by thermal electric installations that are the common generation method in El Salvador. Hence, the proposed project will reduce the emission of CO₂ with clean energy generation, and with a clear long-term contribution 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 of 6 271 tCO₂e per year over the first 7 year crediting period. All the calculations for the emission reduction forecast has been verified and crosschecked and it is deemed likely that the stated amount is achieved given that the underlying assumptions do not change.

The monitoring methodology AMS-I.D has been applied correctly. The monitoring plan has been clearly identified. The procedures for monitoring, operating and maintenance have been elaborated.

Local stakeholders’ comments were invited through public discussion in local papers as a local law requirement. No comments were received

The competence requirement to the personnel in the project is planned for activities such operation, maintenance, measurement and monitoring procedures. The continual development of this activity during the project operation is foreseen.

In summary, it is DNV opinion that the Papaloate Hydroelectric Project in El Salvador as described in the PDD version 10 dated of 27 February 2010 meets all relevant UNFCCC requirements for the CDM and all relevant El Salvador criteria and correctly applies the approved baseline and monitoring methodology for small scale activities type I – Renewable Energy Projects I.D. “Grid Connected Renewable Electricity Generation” Version 13.

DNV thus request the registration of the Papaloate Hydroelectric Project as a CDM project activity.



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2 INTRODUCTION

Sociedad Hidroelectrica Papaloate S.A. de C.V. has commissioned Det Norske Veritas Certification AS (DNV) to perform a validation of the Papaloate Hydroelectric Project in El Salvador (hereafter called “the project”). This report summarises the findings of the validation of the project, performed on the basis of UNFCCC criteria for the CDM, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to Article 12 of the Kyoto Protocol, the 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 to the project design. In particular, the project's baseline, monitoring plan, and the project's compliance with relevant UNFCCC and host Party criteria are validated in order to confirm that the project design, as documented, is sound and reasonable and meets the identified criteria. Validation is a requirement for all CDM projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of certified emission reductions (CERs).

2.2 Scope

The validation scope is defined as an independent and objective review of the project design document (PDD) /1/. The PDD is reviewed against the criteria stated in Article 12 of the Kyoto Protocol, the simplified modalities and procedures for small-scale CDM project activities and the relevant decisions by the CDM Executive Board, including the approved baseline and monitoring methodology AMS-I.D (Version 13) /4/

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



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3 METHODOLOGY

The validation consisted of the following three phases:

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

The following sections outline each step in more detail.

3.1 Desk Review of the Project Design Documentation

The following table lists the documentation that was reviewed during the validation:

- /1/ Project Design Document for the “Papaloate Hydroelectric Project”. Version 1 of 08 August 2007, version 5 of 14 September 2007, version 6 of 11 May 2009, version 7 of 27 October 2009, version 8 of 13 November 2009 and version 10 of 27 February 2010.
- /2/ Set of drawings of the “Proyecto Hidroelectrico Papaloate” Papaloate Hydroelectric Project Prepared by *INGENDEHSA*, Engineering Company. Dated 12 October 2007.
- /3/ CDM Executive Board, Validation and Verification Manual. Version 01 and 01.1.
- /4/ CDM Executive Board: Simplified baseline and monitoring methodology AMS-I.D – Grid connected renewable electricity generation. Version 13.
- /5/ CDM Executive Board: Tool to calculate the emission factor for an electricity system. Version 1.1. Annex 12 of EB 35 report.
- /6/ Letter of Approval by the El Salvador DNA Ministry of Environment and Natural Resources (MARN) Ministerio de Medio Ambiente y Recursos Naturales. Dated 22 October 2007.
- /7/ Environmental Management Plan. Plan de Manejo Ambiental. Juayúa-Nahuizalco, Departamento de Sonsonate, El Salvador.
- /8/ Resolucion MARN-No.-453-2004. Environmental permission for the construction of the Hydroelectric project. Aceptation of Environmental Management Plan. Dated 05 July 2004.
- /9/ Environmental Impact Assessment. Lic. Juan José Medrano. Ing. José Hermes Landaverde García. Dated February 2000.
- /10/ Resolution agreement of the Juayua micro-region Mayors (Construction Permit) of the Papaloate Hydroelectric Project. Acuerdo de Visto Bueno de los alcaldes de la Microrregion de Juayúa sobre “Proyecto Hidroelectrico Papaloate”. Juayúa, Salcoatitán, Santa Catarina Masahuat y Nahuizalco. Dated 26 September 2007.
- /11/ Public communication by Juayua Mayor Engineer Rafael Orlando Contreras Gamez about the realization of work for the Papaloate Hydroelectric Project. Dated 23 January, 2007.
- /12/ IPCC: Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories Reference Manual.



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- /13/ List of stakeholders consulted and evidence of meetings and communications.
- /14/ Excel files with the calculation of the Emission Factor. Data from National Grid Operator.
- /15/ Contract of Energy Purchase from Papaloate Hydroelectric Project to National Grid Operator in El Salvador. Agreement 351-E-2007. Dated December 20, 2007.
- /16/ Electronic Dossier. Stakeholder consultation. Evidence collected: Newspaper announcement. Invitation letter to stakeholders in the region, dated 04/07/2002. Letter of the Municipality of Juayua's Mayor Rafael Orlando Contreras Gomez. Dated 23/January/2007. Ministerio de Medio Ambiente y Recursos Naturales, requirement letter of public consulting for projects, dated 01/February/2002.
- /17/ Electronic Record. Bank communication about the low revenues of the project as indicated by Claudio Otero, Head Structure Finance, Grupo Terra and Patricia Pineda, Corporate Executive, Banco Salvadoreño. Dated February 16th, 2005.
- /18/ Electronic Record. MKV. Machine House Supplier. Document with description of the engineering decisions, among them: rotation speed, type of turbine, voltage selected, documentation included. This information is dated: September 13th, 2005.
- /19/ Promoción del Mecanismo de Desarrollo Limpio y de la Energía Renovable de Pequeños Proyectos a través de Esquemas de Reconversión de Deuda por Naturaleza. (Promotion of the Clean Development Mechanism and the Renewable Energy for Small Scale Projects by means of re-conversion of debt into Nature. Dated December 2001.
This document was developed by Geo Ingenieria Ingenieros Consultores S.A. for exclusive use of the PNUD (Program of United Nations for Development) in the "Workshop of debt re-conversion into nature and social responsible investment" this was held on December 13,14, 2001.
- /20/ Ministry of Environment and Natural Resources (MARN) website. www.marn.gob.sv.
- /21/ *Annual Report*. AES Corporation, 2005
- /22/ *General Superintendency for electricity and Telecommunications El Salvador* www.siget.gob.sv
- /23/ Article on El Salvador Newspaper relating to the on short term energy development in El Salvador. <http://www.laprensa.com.sv/economia/486994.asp>
- /24/ El potencial del Corredor Biológico Mesoamericano de Centroamérica en el Mecanismo de Desarrollo Limpio. Comisión Centroamericana de Ambiente y Desarrollo (CCAD). July 2002.
- /25/ Certification issued by the Undersigned Manager of the Hidroelectric Plant on 14 January 2009.
- /26/ CDM validation and verification proposal: Validation & verification of the Papaloate 2 MW Hydroelectric small-scale CDM Project in El Salvador. Issued on 12 January 2006 by DNV.
- /27/ E-mail sent on 07 February 2006 from DNA of El Salvador to project developer which states that the DNA will support small-scale projects like Papaloate Hydroelectric



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- Project.
- /28/ E-mail sent on 08 February 2006 from DNA of El Salvador to Grupo Terra which states the last official emission factor for the grid.
 - /29/ Letter of Commitment between CDM brokers and Hidroelectrica Papaloate S.A. de C.V. 08 February 2006.
 - /30/ Turbines purchase invoice issued on 13 February 2006 by Wasserkraft Volk AG Turbinenfabrik und Ingenieurbüro (WKV).
 - /31/ Letter of Commitment between CDM brokers and Hidroelectrica Papaloate S.A. de C.V.. 22 June 2006.
 - /32/ Short form agreement signed between DNV and the Sociedad Hidroelectrica Papaloate S.A. on 10 August 2007.
 - /33/ Letter of Intent signed between Hidroelectrica Papaloate S.A. de C.V. and Corporación Andina de Fomento (CAF) on 27 June 2008.
 - /34/ CDM Emission Reductions Purchase Agreement by and between Hidroelectrica Papaloate S.A. de C.V. and Corporación Andina de Fomento on 26 September 2008.
 - /35/ WKV EE Specifications. 13 September 2005.
 - /36/ Incentive law #426: Ley de Incentivos Fiscales para el Fomento de las Energías Renovables en la Generación de Electricidad. 20 December 2007.
 - /37/ Article 68 of the General Law of Electricity stated by General Superintendence of Electricity and Telecommunications (SIGET).
 - /38/ Feasibility Study Report (FSR) of Papaloate Hydroelectric Project by Ingendehsa S.A. de C.V. on 21 May 2005.
 - /39/ Financial Analysis Spreadsheets and Emission Reduction Spreadsheet.
 - /40/ Letter of Approval by the DNA of Netherlands Ministry of Housing, Spatial Planning and Environment. Dated 23 April 2009.
 - /41/ Tax Law of El Salvador (Ley de impuestos sobre renta de El Salvador):
http://www.bancohipotecario.com.sv/Red_Hipotecario/Asesor_Legal/Ley_de_impuesto_sobre_la_renta_de_El_Salvador.pdf
 - /42/ Electricity tariff:
Energy Statistical bulletin nº 10 2008. General Superintendence of Electricity and Telecommunications (SIGET). May 2009.
<http://www.siget.gob.sv/documentos/electricidad/estadisticas/boletin20080.pdf>
Energy Statistical bulletin nº 9 2007. General Superintendence of Electricity and Telecommunications (SIGET). June 2008.
<http://www.siget.gob.sv/documentos/electricidad/estadisticas/boletin20070.pdf>
Energy Statistical bulletin nº 8 2006. General Superintendence of Electricity and Telecommunications (SIGET). August 2007.
<http://www.siget.gob.sv/documentos/electricidad/estadisticas/boletin20060.pdf>
Energy Statistical bulletin nº 7 2005. General Superintendence of Electricity and



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Telecommunications (SIGET). May 2006.

<http://www.siget.gob.sv/documentos/electricidad/estadisticas/boletin20050.pdf>

Energy Statistical bulletin n° 6 2004. General Superintendence of Electricity and Telecommunications (SIGET). May 2005.

<http://www.siget.gob.sv/documentos/electricidad/estadisticas/boletin20040.pdf>

/43/ Inflation rate: Central Bank of El Salvador - BCR

http://www.sieca.org.gt/Publico/CA_en_cifras/Boletin_Estadistico/16.1/Inflacion.pdf

/44/ Papaloate's financial report dated 31 December 2008.

/45/ Sociedad Hidroelectrica Papaloate SA de CV: agreement by e-mail for removal as project participants of Corporación Andina de Fomento and the Ministry of Housing, Spatial Planning and Environment of the Netherlands, e-mail dated on 29 March 2010.

The main changes between the version of the PDD version 1 of 08 August 2007 /1/ which was published for 30 days stakeholders commenting period and the final version (version 10 dated 27 February 2010 /1/) of the PDD which is submitted for registration are:

- Simplified baseline and monitoring methodology AMS-I.D Version 13 is adopted in PDD version 6 while PDD version 1 adopted an earlier methodology version (AMS-I.D version 12);
- The PDD is revised according to the resolutions of raised CAR's and CL's;
- Revised the additionality as per EB 41 requirements;
- Revised the description of CDM consideration and project's starting date.

3.2 Follow-up Interviews with Project Stakeholders

On 08 October 2007 DNV performed a site visit and interviews with project stakeholders to confirm selected information and to resolve issues identified in the document review. Sergio Cabral from DNV Mexico conducted the site visit. The main topics of the interviews and the project stakeholders are summarized in the table below.

	Date	Name	Organization	Topic
/46/	2007-10-08	Rafael Orlando Contreras	Mayor of Juayua Municipality.	<ul style="list-style-type: none"> - Contribution to sustainable development - Characteristics of the Juayua municipality - Legal Framework and permits. - Cooperation from Sociedad Hidroelectrica Papaloate S.A. de C.V. to reforestation, and other community cooperation including educative centres. - Electricity provision



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				characteristics in the zone and black outs.
				- Demographic and economic characteristics of the municipality and the region.
/47/	2007-08-09	Ministry of Environment and Natural Resources (MARN) Ministerio de Medio Ambiente y Recursos Naturales	DNA	<ul style="list-style-type: none"> - Project's contribution for sustainable development in El Salvador. - Project additionality - Process to obtain the Letter of Approval - Legal Framework - Legal compliance of the project.
/48/	2007-10-08	-Ms. Karla Ramos	Grupo Terra	<ul style="list-style-type: none"> -Project management - risk and barriers - PDD development - Project development - Baseline determination - Applicability of the selected methodology - Emission reduction calculation. - Stakeholders consultation process and results. - Project technology, operation, maintenance and monitoring.
/49/	2007-10-08		Grupo Terra	<ul style="list-style-type: none"> - Project development – equipment and devices installation - Generator characteristics

3.3 Resolution of Outstanding Issues

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



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- It organises, details and clarifies the requirements a CDM project is expected to meet;
- It ensures a transparent validation process where the validator will document how a particular requirement has been validated and the result of the validation.

The validation protocol consists of three tables. The different columns in these tables are described in the figure below. The completed validation protocol for the Papaloate Hydroelectric Project is enclosed in Appendix A to this report.

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

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

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



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

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

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

Figure 1. Validation protocol tables



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3.4 Internal Quality Control

The validation report underwent a technical review before requesting registration of the project activity. The technical review was performed by a technical reviewer qualified in accordance with DNV's qualification scheme for CDM validation and verification.

3.5 Validation Team

The validation team consists of the following personnel:

<i>Role/Qualification</i>	<i>Last Name</i>	<i>First Name</i>	<i>Country</i>	<i>Type of involvement</i>					
				Desk review	Site visit / Interviews	Reporting	Supervision of work	Technical review	Expert input
CDM validator / Technical team leader	Leiroz	Andrea	Brazil			x	x		
GHG auditor	Cabral	Sergio	Mexico	x	x	x			
GHG auditor	Lara	Barbara	Mexico			x			
Sector expert	Díaz	Ricardo	Mexico						x
Technical reviewer (draft)	Sharma	Anjana	India					x	
Technical reviewer (final)	Deng	Cuiping	China					x	

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

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 revised and resubmitted project design documentation, version 10, dated 27 February 2010 /1/.

4.1 Participation Requirements

The project participant is Sociedad Hidroelectrica Papaloate S.A. de C.V. from El Salvador. The participating Parties - El Salvador as host party – meet all relevant participation requirements and have provided written approval of voluntary participation in the project.



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El Salvador fulfils the requirements to participate in a CDM project activity. It has ratified the Kyoto Protocol and established DNA, Ministry of Environment and Natural Resources (MARN - Ministerio de Medio Ambiente y Recursos Naturales). The DNA of El Salvador has issued the letter of approval (LOA) on 22 October 2007 authorising the project participant. It has also confirmed the projects contribution to the sustainable development of El Salvador /6/.

During validation, the Ministry of Housing, Spatial Planning and Environment of the Netherlands and Corporación Andina de Fomento (CAF) of Venezuela were planning to join as project participants. The Papaloate Hydroelectric Project received the Letter of Approval from the DNA of (dated 23 April 2009) /40/. However, at the time of requesting registration, the Modalities of Communication had not yet been signed. By agreement between all the project participants, the Ministry of Housing, Spatial Planning and Environment of the Netherlands and Corporación Andina de Fomento (CAF) of Venezuela were therefore removed from the project activity as project participants /45/.

Validation did not reveal any information that this project results in the diversion of official development assistance to El Salvador. As stated in the LoA issued by the DNA of the , the public funding involved does not result in a diversion of official development assistance /40/.

4.2 Project Design

The Papaloate hydroelectric Project (PHP) is a run-of-river hydroelectric power project located in the south western region of El Salvador. The total installed capacity of the project is 2 MW. During the site visit DNV was able to verify the actual conditions of installation of the PHP. The main characteristics of the equipment and the civil works was verified on site, technical information was verified from the manufacturer information /18/ and verified against the information label in equipment. Some important data from this comparison are: Net head: 246.41; Speed 720 RPM; Type of turbine, Pelton; Generator 13.2 kV; the dispositions to ensure the correct operations of the equipment were verified during the site visit, the dispositions includes the verification of the construction of the civil installations, the river dam, the filters to remove sand, the valves and control equipment. Other aspects verified were the construction of the pipeline to the machine house, the installations of the machine house and the construction of the outlet to send the water back to the river.

The energy produced will be delivered to the grid by a transmission line.

As established in the local environmental laws and regulations all the dispositions required by authorities were addressed /7//8//9/, the reforestation compromise is an example of these dispositions.

The project proponent participated in a workshop of the Program of United Nations for Development (PNUD) on 13 December 2001. The commissioning date is 01 September 2007. The hydro power plant started operation tests in December 2007, and has been in commercial operation since January 2008.

A 7 year renewable crediting period is selected (with the potential of being renewable twice), and it is expected to start on 01 May 2010.

The starting date of the project activity indicated in the PDD is 13 February 2006 which corresponds to the date when the electromechanical equipment was purchased.

Based in the engineering information from manufacturer the expected lifetime of the project is 50 years /6//11//10/.



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The project is expected to bring regional continuity of electric supply, contributing to the economic development of the region, among other social, environmental and economic benefits. Moreover, the PHP can contribute to El Salvador sustainable development objectives.

The project is not a de-bundled component of a larger project activity. Sociedad Hidroelectrica Papaloate S.A. does not have another CDM project activity with the same technology or project category, registered within the previous 2 years and whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

4.3 Baseline Determination

The project applies the approved baseline methodology AMS-I.D (Version 13) – “Grid connected renewable electricity generation”/4/, in combination with Tool to calculate the emission factor for an electricity system /5/.

The methodology is applicable to the proposed project and is justified since: (i) it is a renewable energy based power generation project which is connected to the grid and (ii) the installed capacity of the project is 2 MW which is less than the qualifying limit of 15 MW for type I small scale project activities. This information has been verified during the site visit.

The project boundary has been defined as the geographical location of the proposed project and the power plants connected to the national distribution grid i.e. Santa Ana Electrical Energy Company (AES – CLESA). The selected sources and gases are justified for the project activity.

Emission sources and gases included in the project boundary are:

	<i>GHGs involved</i>	<i>Description</i>
Baseline emissions	CO ₂	The Salvadoran grid (Santa Ana Electrical Energy Company – AES-CLESA).
Project emissions	N/A	Project emission is regarded as zero as the project is a renewable energy project.
Leakage	N/A	According to AMS-I.D, being a hydropower project where the renewable energy technology equipment is not transferred from another activity or to another activity, no leakage is accounted for.

The baseline scenario has been selected in accordance with the baseline methodology. In the absence of project activity, the same amount of electricity would have been generated by the operation of some grid connected fossil fuel based power plants.

The baseline for the project is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO₂e/kWh) calculated in accordance with Tool to calculate the emission factor for an electricity system /5/ as a combined margin. The operating margin (OM) and build margin (BM) emission coefficient for the project will be determined *ex-ante*. The baseline emission factor for the national distribution grid, AES – CLESA, is established based on the approved methodology.



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DNV considers the baseline scenario realistic and credible.

4.4 Additionality

The additionality of the proposed project is demonstrated by applying the Attachment A to Appendix B to the simplified modalities and procedures for small-scale CDM project activities.

4.4.1 CDM consideration and continued action to secure CDM status.

The selected starting date of the project is 13 February 2006, corresponding to the date of the turbines purchase /30/. On the basis of EB 41 Para 67, it is DNV's opinion that this is the correct date to represent the earliest of the dates at which the implementation or construction of the project activity began. The following chronological events, evidences of which have been checked by DNV, demonstrate that the CDM benefits were considered prior to the starting date of the project activity:

On **1/12/2001** a CDM case study was developed by Geoingeniería S.A. in order to establish that Papaloate as a small scale project would have difficult in assigning funds for the CDM studies needed to register the CDM project. /19/

On **1/07/2002** Papaloate is included in a study for Potential CDM projects in Central America by Central American Commission of Environment and Development (CCAD). /24/

On **16/02/2005** the project owner received an e-mail from Bank of El Salvador that stated the bank worry about the low IRR of the project. /18/

On **15/06/2005** the Board of Directors decided that CDM was essential for the approval of the project. A Certification was issued by the undersigned Manager of the Hydroelectric Plant property of Sociedad Hidroelectrica Papaloate S.A. de C.V. on 14 January 2009 to confirm this information. /25/

On **12/01/2006** the project owner (Sociedad Hidroelectrica Papaloate S.A. de C.V.) received from DNV a validation and verification proposal. /26/

On **07/02/2006** the project developer (Grupo Terra) received from the DNA of El Salvador a correspondence about CDM opportunities. /27/

On **08/02/2006** a correspondence with the last official baseline of El Salvador (emission factor for the year 2004) was received from the DNA of El Salvador. /28/

On **09/02/2006** a letter of commitment is made between Sociedad Hidroelectrica Papaloate S.A. de C.V. and a CDM brokers for the sale and purchase of CERs. /29//30/

On **13/02/2006** the turbines manufactured by WKV were purchased. /30/

On **22/06/2006** a letter of commitment is made between Sociedad Hidroelectrica Papaloate S.A. de C.V. and a CDM brokers for the development of the PDD, validation and sale and purchase of CERs. /31/

On **10/08/2007** a short form agreement was signed between DNV and the Sociedad Hidroelectrica Papaloate S.A. de C.V. to conduct the validation of the project. /32/

On **23/08/2007** due to fallen negotiations the term sheet with CDM broker was ended.

On **08/10/2007** the site visit was done.

On **22/10/2007** the project activity received the Letter of Approval from the DNA of El Salvador. /6/

On **1/2/2008** project commissioned upon the signing of the PPA on February 2008.



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On **27/06/2008** a Letter of Intent was signed between Sociedad Hidroelectrica Papaloate S.A. de C.V. and Corporación Andina de Fomento (CAF) for the purchase of the CERs. /33/

On **26/09/2008** a CDM Emission Reductions Purchase Agreement was signed between Sociedad Hidroelectrica Papaloate S.A. de C.V. and Corporación Andina de Fomento. /34/

By verifying the evidences mentioned above, DNV has confirmed that these evidences are reliable and the benefits of the CDM were a decisive factor in the project participant's decision to proceed with the project activity and that continuing and real actions were taken to secure CDM status for the project activity in parallel with its implementation.

4.4.2 Investment Barrier

The project developer identified CDM as a means to overcome the investment barriers to proceed with the project. A financial analysis was presented to the Bank of El Salvador in order to obtain financing for the project activity.

4.4.2.1 Investment analysis: Choice of approach

Since the proposed project generates financial and economic benefits through the sales of electricity other than CDM-related income, a benchmark analysis is applicable.

4.4.2.2 Investment analysis: Benchmark selection

According to Article 68 of the General Law of Electricity as stated by General Superintendence of Electricity and Telecommunications (SIGET) /37/, a project-IRR of 10 % (before tax) of a project is regarded as benchmark for investing in hydropower plants in El Salvador.

4.4.2.3 Investment analysis: Input parameters

All the parameters used in the financial analysis, except for the fair value, income tax and electricity tariff, have been sourced from the Feasibility Study Report (FSR) /38/ developed by Ingendehsa S.A. de C.V. on 21 May 2005, which can thus be considered information provided by an independent and recognized source.

The fair value of 0 and the income tax of 25%, considered for the financial analysis have been sourced from Tax Law of El Salvador (Ley de impuestos sobre renta de El Salvador) /41/. DNV was able to verify this law, and thus these parameters applied are deemed reasonable.

The tariff of 0.06895 US\$/kWh, considered for the financial analysis, has been sourced from Energy Statistical bulletin n° 6 2004 /42/ which was the most recent data available at the time of the investment decision. DNV was able to verify this power tariff approval document issued by the SIGET /42/, and thus this parameter applied is deemed reasonable. The FSR /38/ had earlier used a lower expected tariff of 0.064 US\$/kWh. It was seen that on considering the actual tariff as issued by the SIGET /42/, increased the project-IRR of the project activity from 8.19% to 9.13%, which is still below the benchmark of 10%.

DNV compared the input parameters for the financial analysis included in the PDD with the parameters stated in the FSR, the power tariff document issued by SIGET /42/ and the fair value and income tax sourced from Tax Law of El Salvador /41/, and was able to confirm that the values applied are consistent with the values stated in the mentioned document.

The FSR was developed on 21 May 2005 /38/ and thus 9 months prior to the decision to proceed with the project activity (i.e. the starting date of the project) which was on 13 February 2006 /30/. Given this relative short period of time between conclusion of the FSR



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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 and that it is thus reasonable to assume that the FSR has been the basis of the decision to proceed with the investment in the project.

There is no other similar proposed CDM project to compare the input parameters used in the financial analysis. There are only two CDM project in El Salvador with different installed capacity (UNFCCC ref. 2424 with an installed capacity of 99.4 MW and UNFCCC ref. 2607 with an installed capacity of 64.42 MW).

Thus, the input parameters used in the financial analysis were compared with actual data reported for the proposed CDM project, by comparing the investment costs, electricity tariff, O&M costs.

Investment cost: the project started operation on January 2008. The investment cost data were taken for the FSR prepared on May 2005 /38/ and was designate to be 3 902 909 US\$, lower than the real static investment of 5 123 075 US\$ stated in the Papaloate's Financial Report issued on 31 December 2008 /44/.

Annual O&M costs: these have been calculated according to the data from the FSR /38/. The O&M annual costs of 167 628 US\$ for a power generation of 9 931 MWh considered for the proposed project activity is reasonable and conservative when compared to actual real costs (188 438 US\$ for a power generation of 6 870.60 MWh) stated in the Papaloate's Financial Report issued on 31 December 2008 /44/.

Tariff: The value used in the financial analysis accounted to 68.95 US\$/MW has been sourced from Energy Statistical bulletin n° 6 2004 /42/ which was the most recent data available at the time of the investment decision. The real value accounted to 85.19US\$/MW considering the weighted average energy tariff of the past year 2008 (income/annual generation) /44/.

It was seen that on considering the actual data, decreased the project-IRR of the project activity from 9.13% to 4.86%, which is below the benchmark of 10%.

DNV was able to confirm that the input parameters used in the financial analysis are reasonable and adequately represent the economic situation of the project.

4.4.2.4 Investment analysis: Calculation and conclusion

The project-IRR calculations were provided in a spreadsheet and verified by DNV /39/. The assumptions used in the calculations were deemed to be correct by DNV. The project-IRR over 20 years without CDM revenues is 9.13%, which confirms that the project in the absence of CDM benefits and compared to the benchmark is not financially attractive. With CER revenues the project-IRR increases to 9.50%, which is still below the benchmark.

4.4.2.5 Investment analysis: Sensitivity analysis

Moreover, 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. Variations of the total investment, annual operational and maintenance costs, electricity output and on-grid tariff were checked by calculating the variation necessary to reach the benchmark and then discussing the likelihood for that to happen. None of the parameters in the sensitivity analysis are considered to have any significant positive correlation.

- Static total investments: If the total investments decrease by 5.95%, the project-IRR will reach the benchmark of 10%. As stated in the PDD, investment costs applied in the project activity were based on the information from the FSR /38/. However, DNV



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- was able to confirm an increase of 31.26% in investment costs /44/. Therefore, the static total investment is not likely to decrease by more than 3.4%.
- Annual O & M cost: By reducing the O & M cost by 18.70%, the project-IRR reaches the benchmark. Since the O & M costs were considered in the FSR /38/ as 4% of the total investment and considering the average inflation rate of 4.28% during the last 4 years (2003-2006) /43/, this is highly unreasonable.
 - Power tariff: As per PDD, to reach the 10% benchmark, power tariff must increase 4.95%, which is not likely to happen. As per FSR /38/, the average tariff determined as per Spot market does not vary more than 8.98% during the period 1999 to 2003. This information was checked in the SIGET web site /22/. However, considering historical statistics from January 2003-August 2007 (validation starting date) (2003 – 0.07193 US\$/kWh, 2004 – 0.06895 US\$/kWh, 2005 – 0.07843 US\$/kWh, 2006 – 0.0889 US\$/kWh, 2007 – 0.09399 US\$/kWh) /42/, the average tariff decreased from 2003 to 2004 and increased more than 2.8% per year after 2004. Thus, there is trend to increase the electricity tariff. However, as discussed above in section 4.4.2.3, considering the real static investment of 5 123 075 US\$ and the actual real annual O&M costs of 188 438 US\$ for a power generation of 6 870.60 MWh) stated in the Papaloate's Financial Report issued on 31 December 2008 /44/ and the real tariff value of 85.19US\$/MW considering the weighted average energy tariff of the past year 2008 (income/annual generation) /44/ the project-IRR of the project activity decreases from 9.13% to 4.86%, which is below the benchmark of 10%. Therefore, it is unlikely that the increased tariff will make the project-IRR reach the benchmark.
 - The project IRR will reach the 10% benchmark if net electricity generation increases by 4.95%. Yet the net electricity generation has been calculated based on the water flow data of the past 39 years (1964-2003) measured by the third party, and the data reflects the reality of the electricity generation /38/.

The sensitivity analysis shows that with a small variation of the electricity tariff, the project-IRR of the proposed project reaches the benchmark.

In conclusion, the investment analysis has shown that the project activity is unlikely to be the most financially attractive option. While the sensitivity analysis has shown that the project activity is likely to be the most financially attractive option. DNV is able to confirm this conclusion.

4.4.3 Barrier due to prevailing practice: It was discussed that projects such as Papaloate Hydroelectric Project are not widely observed and commonly carried out in El Salvador. According to the project developer, twenty years ago, the region of Central America had a large amount of hydropower. Nowadays, due to the liberalization of power sector with an increased reliance on short term Power Purchase Agreements (PPAs) and increased availability of resources and reduced costs associated with fossil fueled facilities, the use of fossil fuels in this region increased.

As stated in the PDD, renewable energy projects are inherently disadvantaged by the structure of the electricity markets. According to the project developer, the liberalization of the Salvadoran market has resulted in a competitive market that places a great emphasis on short-term “spot market” prices and a premium on existing generation and new generation



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investments that have very short construction lead times and low initial capital cost, such as thermal plants. The references quoted in the PDD have been checked and are found correct.

The small hydro projects are not common practice in El Salvador, this can be verified in the data from MARN and AES-CLESA /20/,/21/,/22/. This data were traced and verified in documents made available to DNV during the site visit. Hence, the installation of a small hydro project is not a common practice in El Salvador.

As verified on General Superintendent of Electricity and Communication (SIGET) (<http://www.siget.gob.sv/documentos/electricidad/estadisticas/boletin20072024.pdf> - database 2007) only 34.4% of the El Salvador's installed capacity comes from hydro projects. Moreover, it was confirmed the increase of fossil fuel fired power plants.

Given the above barriers, it is sufficiently demonstrated that the project is a likely baseline scenario for at least the 7 years crediting period and that emission reductions thus are not additional to what would otherwise have occurred.

4.5 Monitoring

PHP applies the approved baseline and monitoring methodology AMS-I.D (Version 13) – “Grid connected renewable electricity generation” /4/, in combination with Tool to calculate the emission factor for an electricity system /5/. The selected monitoring methodology is adequately applied for PHP that is a grid-connected renewable power generation using hydraulic energy.

Given that the emission factor is calculated ex-ante and according to the monitoring methodology AMS-I.D, the only data to be monitored is the net electricity supplied to the grid by the project.

Concerning leakage, no sources of emissions were identified according to AMS-I.D.

4.5.1 Parameters determined ex-ante

The combined margin emission factor is determined *ex-ante* based on the most recent information available. The parameters are listed in below table:

Data and Parameters	Unit	Value applied	Source of data used
Installed Capacity of the project activity	MW	2.0	FSR /38/
Operating margin of AES – CLESA (OM)	tCO ₂ /MWh	0.6747	MARN, SIGET 2004-2006, IPCC 2006 /20/ /22/ /12/
Building Margin of AES – CLESA (BM)	tCO ₂ /MWh	0.5780	
Emission factor of AES – CLESA (CM)	tCO ₂ /MWh	0.626	



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4.5.2 Parameters monitored ex-post

The operating margin and build margin emission factor are determined *ex-ante* as described above; therefore the parameter monitored *ex-post* is the net electricity generation from the proposed project activity.

Details of data to be collected, frequency of data recording and data recording format are described in the PDD.

All data will be kept for two years after the end of the last crediting period.

The electricity generated by the hydropower plant and supplied to the grid will be monitored with a calibrated meter. The generated energy by the power plant will be multiplied by the combined margin emission coefficient for the grid. The main electricity meter is Circutor type A model CIRWAT with 0.2S accuracy. The electricity meter would be calibrated according to grid operator AES-CLESSA requirements. In case the main meter does not work properly, the back-up meter reading with the same accuracy will replace the main meter reading. In addition, this data will be verified cross checking the sales receipt from the owner of the grid and the data display in the measurement device before to be delivered to the grid.

4.5.3 Management system and quality assurance

Operation and management of PHP will be carried out by Sociedad Hidroeléctrica Papaloate SA de CV. Support will be given by Grupo Terra, an operator of more than 400 MW of renewable energy plants in Honduras. The training needs of the personnel will be carried out with the support of Grupo Terra.

The shift operator at charge will record the net generation of PHP at least monthly. This data shall be obtained from the metering system of the plant at the feed-in point to the grid. The meter used for this purpose must be an industrial quality sealed meter. The data must be cross-checked with the metering and billing information provided by the grid operator.

There will be available for operation of the installation operations procedures, QA/QC procedures, specifications for calibration of equipment, and maintenance.

The simplified monitoring methodology AMS-I.D and the DNA of El Salvador dos not require the monitoring of social and environmental indicators.

4.6 Estimate of GHG Emissions

The emission reduction 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:

- 1) Baseline emissions: Baseline emissions (BE_y in tCO_2) are the product of the baseline emissions factor (EF_y in tCO_2/MWh) times the net electricity supplied by the project activity to the grid (EG_y in MWh).
- 2) Project emissions: There are no emissions from the project as the net electricity delivered to the grid has been used for the calculation of emissions reduction.
- 3) Leakage: No leakage has to be considered for the proposed project activity. The electricity generating equipment is not transferred from any other activity. The project was implemented with new equipment, hence no leakage is expected.

The baseline emission factor for the project is determined *ex-ante* as a combined margin,



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consisting of combination of the operating margin (OM) and build margin (BM) according to “*Tool to calculate the emission factor for an electricity system*”, version 1.1 /5/.

The PDD was published on 7 September 2007 with the data for calculation of the grid emission factor at the time of validation of the project to the latest data available; Unidad de Transacciones of El Salvador 2004-2006.

The system boundary for the grid electricity system affected by the project is defined as the system of the Salvadoran grid (Santa Ana Electrical Energy Company – AES-CLESA). Annual Energy Outlook, EIA-AEO 2007 values for the net calorific value of each type of fossil fuel, IPCC 2006 default values for emission factors for the fuel and the total electricity delivered to the Salvadorian grid were selected and deemed reasonable.

The combined margin emission coefficient for the grid is determined *ex-ante* for the 7 years crediting period following AMS-I.D, based on the most recent information available. It has been calculated as the weighted average ($w_{OM} = 0.5 : w_{BM} = 0.5$) of the operating margin and the build margin emission factors.

As the El Salvador’s electric grid has more than 50% of low-cost-must-run, the simple adjusted OM method was considered for the determination of the operating margin (OM). The build margin emission coefficient (BM) was calculated considering the most recent 20% power plants capacity additions (in MWh) in the electricity system.

The operating margin (OM) emission coefficient and the build margin (BM) emission are calculated to be 0.6747 tCO₂e/MWh is 0.5780 tCO₂e/MWh, resulting in a combined margin emission coefficient of 0.626 tCO₂e/MWh (weighted average of the build and operating margin). The annual electricity delivered to the Salvadorian grid is expected to be 9 931 MWh.

The estimated amount of GHG emission reductions from the project is 43 518 tCO₂e during the selected first 7-year crediting period (with potential of being renewed twice), resulting in estimated average annual emission reductions of 6 217 tCO₂e.

The baseline emission estimate can be replicated using the data and parameter values provided in the PDD and supporting files submitted for registration. The data sources mentioned have been verified by DNV.

In summary, the GHG calculations are complete and transparent, and the data accuracy has been verified.

4.7 Environmental Impacts

PHP made available to DNV the Environmental Impact Assessment (EIA) /8/, this assessment has been done in accordance with El Salvador Environmental regulations. The EIA correctly addresses the potential environmental impacts, and outline the action plan to fulfill the legal requirements regarding the environmental impacts.

This EIA was accepted by the MARN (environmental authority) resolution MARN-No-453-2004, among other legal documents /6//7//9//10/.

4.8 Comments by Local Stakeholders

Information about PHP was published on 20 December 2001 in two Salvadorian newspapers, *La Prensa Grafica* and *El Diario de Hoy*. A description about the project activity was given and stakeholders were invited to provide their comments and questions.



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This activity is mentioned in the MARN resolution MARN-No-453-2004 /8/. In accordance to the information reviewed from the project proponent and the MARN resolution no comments were received. No further actions seemed necessary.

4.9 Comments by Parties, Stakeholders and NGOs

The PDD of 08 August 2007 was made publicly available on UNFCCC website (<http://cdm.unfccc.int/Projects/Validation/DB/P9RYND8ZJPMGTATILFG8SVXRN2MH4V/view.html>) and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 08 September 2007 to 07 October 2007.

No comments were received.

APPENDIX A

CDM VALIDATION PROTOCOL FOR SMALL – SCALE CDM PROJECT ACTIVITIES

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. No Annex I Party has been confirmed at the time of requesting registration
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 CAR-2
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	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	CDM Modalities and	Ok

Requirement	Reference	Conclusion
system for estimating GHG emissions and a national registry in accordance with Kyoto Protocol Article 5 and 7.	Procedures §31b	
About additionality		
10. Reduction in GHG emissions shall be additional to any that would occur in the absence of the project activity, i.e. a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity.	Kyoto Protocol Art. 12.5c, CDM Modalities and Procedures §43	OK
About forecast emission reductions and environmental impacts		
11. The emission reductions shall be real, measurable and give long-term benefits related to the mitigation of climate change.	Kyoto Protocol Art. 12.5b	OK
About small-scale project activities (if applicable)		
12. The proposed project activity shall meet the eligibility criteria for small scale CDM project activities set out in § 6 (c) of the Marrakech Accords and shall not be a debundled component of a larger project activity.	Simplified Modalities and Procedures for Small Scale CDM Project Activities §12a,c	OK
13. The proposed project activity shall confirm to one of the project categories defined for small scale CDM project activities and use the simplified baseline and monitoring methodology for that project category.	Simplified Modalities and Procedures for Small Scale CDM Project Activities §22e	OK
14. If required by the host country, an analysis of the environmental impacts of the project activity is carried out and documented.	Simplified Modalities and Procedures for Small Scale CDM Project Activities §22c	OK
About stakeholder involvement		

Requirement	Reference	Conclusion
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	The PDD of 08 August 2007 was made publicly available on UNFCCC website (http://cdm.unfccc.int/Projects/Validation/DB/P9RYND8ZJPMGTATILFG8SVXRN2MH4V/view.html) and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 08 September 2007 to 07 October 2007. No comments were received.
Other		
17. The baseline and monitoring methodology shall be previously approved by the CDM Executive Board.	CDM Modalities and Procedures §37e	OK
18. A baseline shall be established on a project-specific basis, in a transparent manner and taking into account relevant national and/or sectoral policies and circumstances.	CDM Modalities and Procedures §45c,d	OK
19. The baseline methodology shall exclude to earn CERs for decreases in activity levels outside the project activity or due to force majeure.	CDM Modalities and Procedures §47	OK
20. The project design document shall be in conformance with the UNFCCC CDM-PDD format.	CDM Modalities and Procedures Appendix B, EB Decision	OK
21. Provisions for monitoring, verification and reporting shall be in accordance with the modalities described in the Marrakech	CDM Modalities and Procedures §37f	OK

Requirement	Reference	Conclusion
Accords and relevant decisions of the COP/MOP.		

Table 2 Requirements Checklist

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
A. General Description of Project Activity <i>The project design is assessed.</i>					
A.1. Project Boundaries <i>Project Boundaries are the limits and borders defining the GHG emission reduction project.</i>					
A.1.1. Are the project's spatial boundaries (geographical) clearly defined?	/1/	DR	The project is located in the Department of Sonsonate, Juayúa-Nahuizalco, El Salvador. Papaloate SHP is located at the following geographical coordinates: Intake coordinates: UTM latitude 299950 and longitude 1419408. Powerhouse coordinates: UTM latitude 298009 and longitude 1420564.		OK
A.1.2. Are the project's system boundaries (components and facilities used to mitigate GHGs) clearly defined?	/1/	DR	The project boundary has been defined as the geographical location of the proposed project and the power plants connected to the national distribution grid i.e. Santa Ana Electrical Energy Company (AES – CLESA). The selected sources and gases are justified for the project activity.		OK
A.2. Participation Requirements <i>Referring to Part A, Annex 1 and 2 of the PDD as well as the CDM glossary with respect to the terms Party, Letter of Approval, Authorization and Project Participant.</i>					
A.2.1. Which Parties and project participants are participating in the project?	/1/	DR	The project participants are Sociedad Hidroelectrica Papaloate S.A. de C.V. from		OK

* MoV = Means of Verification, DR= Document Review, I= Interview
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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			El Salvador, the Ministry of Housing, Spatial Planning and Environment of the and Corporación Andina de Fomento (CAF) of Venezuela acting as intermediary for the benefit of the State of the for the purchase of CERs. The participating Parties - El Salvador as host party and as Annex I Party – meet all relevant participation requirements.		
A.2.2. Have all involved Parties provided a valid and complete letter of approval and have all private/public project participants been authorized by an involved Party?	/1/	DR	DNV requests written approval of voluntary participation from the DNA of . In addition, project participants are requested to clarify if public funding by the is involved in the project.	CAR-2	OK
A.2.3. Do all participating Parties fulfil the participation requirements as follows: - Ratification of the Kyoto Protocol - Voluntary participation - Designated a National Authority	/1/	DR	Yes, El Salvador and Netherlands fulfil all requirements.		OK
A.2.4. Potential public funding for the project from Parties in Annex I shall not be a diversion of official development assistance.	/1/	DR	Validation did not reveal any information describing that this project can be considered as any kind of official development assistance to El Salvador.		OK
A.3. Technology to be employed <i>Validation of project technology focuses on the project engineering, choice of technology and competence/ maintenance needs. The validator should ensure that environmentally safe and sound technology and know-how is used.</i>					

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
A.3.1. Does the project design engineering reflect current good practices?	/1/	DR	The project design engineering reflects good practice. Papaloate SHP utilizes one Pelton turbines with an installed capacity of 2 MW.		OK
A.3.2. Does the project use state of the art technology or would the technology result in a significantly better performance than any commonly used technologies in the host country?	/1/	DR	There was no transfer of technology.		OK
A.3.3. Does the project make provisions for meeting training and maintenance needs?	/1/	DR	The training needs of the personnel will be carried out with the support of Grupo Terra.		Ok
A.4. Contribution to Sustainable Development <i>The project's contribution to sustainable development is assessed.</i>					
A.4.1. Has the host country confirmed that the project assists it in achieving sustainable development?	/1/	DR	The DNA of El Salvador has issued the letter of approval (LOA) on 22 October 2007 authorising the project participant. It has also confirmed the projects contribution to the sustainable development of El Salvador.		Ok
A.4.2. Will the project create other environmental or social benefits than GHG emission reductions?	/1/	DR	The project is expected to bring regional continuity of electric supply, contributing to the economic development of the region, among other social, environmental and economic benefits. Moreover, the PHP can contribute to El Salvador sustainable development objectives.		OK
A.5. Small scale project activity <i>It is assessed whether the project qualifies as small-scale CDM project activity</i>					

* MoV = Means of Verification, DR= Document Review, I= Interview
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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
A.5.1. Does the project qualify as a small scale CDM project activity as defined in paragraph 6 (c) of decision 17/CP.7 on the modalities and procedures for the CDM?	/1/	DR	Yes the installed capacity of the project will be 2 MW, which is less than the stipulated limit of 15 MW the project thus qualifies as a small scale CDM project activity as Type I, Category D as defined in paragraph 6 (C) of decision 17/CP7 on the modalities and procedures for the CDM		OK
A.5.2. Is the small scale project activity not a debundled component of a larger project activity?	/1/	DR I	The proposed project is not a de-bundled component of any larger scale project. The project boundary is not within 1 km radius of any other proposed mall scale CDM project.		OK
B. Project Baseline <i>The validation of the project baseline establishes whether the selected baseline methodology is appropriate and whether the selected baseline represents a likely baseline scenario.</i>					
B.1. Baseline Methodology <i>It is assessed whether the project applies an appropriate baseline methodology.</i>					
B.1.1. Does the project apply an approved methodology and the correct version thereof?	/1/	DR	Yes. As a removable energy project, the Papaloate project will provide all the energy to the grid. The total installed capacity is 2 MW several times minor than 15 MW that is the defined limit for Small Scale Project Activities. The project is in line with the applied methodology of AMS-I.D. "Grid connected renewable electricity generation" dated 10 August 2007.		OK
B.1.2. Are the applicability criteria in the baseline methodology all fulfilled?	/1/	DR	Yes, the applicability criteria are fulfilled, as a renewable energy project the electricity generated will be delivery to the Grid. There is not available at the moment of site audit a	CAR-1	OK

* MoV = Means of Verification, DR= Document Review, I= Interview
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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			signed contract with the Grid administrator AES-CLESA		
B.2. Baseline Scenario Determination <i>The choice of the baseline scenario will be validated with focus on whether the baseline is a likely scenario, and whether the methodology to define the baseline scenario has been followed in a complete and transparent manner.</i>					
B.2.1. What is the baseline scenario?	/1/	DR	The baseline scenario is the current practice of generation of electricity by means of thermal power plants in El Salvador.		OK
B.2.2. What other alternative scenarios have been considered and why is the selected scenario the most likely one?	/1/ /7/ /9/	DR	Not applicable.		OK
B.2.3. Has the baseline scenario been determined according to the methodology?	/1/ /4/	DR	Yes. The methodology AMS-I.D. is correctly used.		OK
B.2.4. Has the baseline scenario been determined using conservative assumptions where possible?	/1/	DR	Yes conservative assumption where made to the baseline scenario and conservative values where used in the calculations. The grid values reported are the values from national grid operator.		OK
B.2.5. Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies, macro-economic trends and political aspirations?	/7/ /8/ /9/ /10/ /11/	DR I	<p>All relevant national, sector and local, policies, regulations and department rules and disciplines considered for the project.</p> <p>Information regarding municipality functions and relation has been taken into account.</p> <p>The project is located in a tourist region, several blackouts take place in the region then the project</p>		OK

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			will alleviate some of the energy demand in the zone, this was taken into account in the project development and counts with the supports of local and regional Majors. All information regarding this issue was made available to DNV.		
B.2.6. Is the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?	/1/	DR	Yes, the information is available and compatible. The literature and references have a clear reference in the PDD.		OK
B.2.7. Have the major risks to the baseline been identified?	/1/ /8/ /9/ /10/	DR I	Yes, in the information available to DNV the mayor risk had been identifying. This major risk is that the lack of incentives for renewable generation lead to obtain energy from the traditional thermal sources.		OK
B.3. Additionality Determination <i>The assessment of additionality will be validated with focus on whether the project itself is not a likely baseline scenario.</i>					
B.3.1. Is the project additionality assessed according to the methodology?	/1/ /4/ /19/ /20/ /21/ /22/ /23/	DR	The additionality is correctly assess; the Attachment A to appendix B of the simplified modalities and procedures for CDM small-scale project was used. All the information made available to DNV reviewed and crosschecked. This information includes: reports from Ministry of Environment and Natural Resources; Data obtained from the <i>General Superintendency for electricity and Telecommunications El Salvador</i> ; technical information from the technology supplier; data on the national		OK

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			<p><i>press; the regulatory timeline among other information recorded in the Section 3.1</i></p> <p>The PDD does not mention the benchmark applied to compare the IRR of the project. In addition, a discount rate of 12 % is applied for the NPV analysis; however the source of this value is not mentioned. DNV requests documented evidences to confirm the information above.</p> <p>DNV was not able to confirm that the input parameters used in the financial analysis are reasonable and adequately represent the economic situation of the project. Evidence is to be provided for the assumed input parameters. In addition, the input values should be valid and applicable at the time of the investment decision taken by the project participant.</p> <p>As stated in the PDD, the project-IRR without CDM revenues is 10.40%, which confirms that the project in the absence of CDM benefits and compared to the benchmark is not financially attractive. With CER revenues the project IRR increases to 13.52%, which is above the benchmark. DNV was not able to confirm whether the IRR is above or below the benchmark selected due to lack of information in the PDD.</p> <p>DNV requests a simplified copy of the</p>	<p>CAR-4</p> <p>CAR-5</p> <p>CAR-6</p>	

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			<p>investment analysis spreadsheet which has to be enclosed for the CDM registration. The spreadsheet provided is very confused and it is not possible to check in a transparent way the IRR and NPV calculation. The Guidance on the Assessment of Investment Analysis (version 2, Annex 45 of EB 41 report) should be used. Moreover, the spreadsheet should be provided in English.</p> <p>A sensitivity analysis should be included to assess whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions.</p> <p>Regulatory barrier: The PDD sustain that while a renewable energy incentive law was entered into force after project starting date on later on 20 December 2007, the proposed project activity has competitive disadvantages when compared to other more recent renewable energy projects (as the new incentive regulation is applicable to plants of which implementation have started after this incentive law was implemented). DNV emphasizes that while any identified barriers should be based on the relevant aspects available prior to the time of the decision/implementation of the project, such competitive disadvantage can not be regarded as a barrier for the project implementation.</p>	<p>CAR-7</p> <p>CAR-8</p>	

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			<p>Project participants are thus requested to amend the PDD accordingly.</p> <p>Legislative barrier: As stated in the PDD, the construction of a project with renewable resources requires information and authorizations like feasibility study, EIA document, water concession contract, EIA authorization and municipality authorization. During the Water Concession Contract process there is no differentiation of the categorization for small scale or large scale hydro projects. As a consequence of the delay to approval the process, small hydro power projects are affected. Consequently, the development of the project is constantly postponed affecting the feasibility of the project activity.</p> <p>In DNV's opinion, this could not be considered as a legislative barrier. The problem here is related to the delays to apply the law. DNV also emphasize the use of the term "Legislative barrier" is not appropriated in the context of "A" delay which, in a first view, was not caused by any "legislative" related aspect.</p>	CAR-9	
B.3.2. Are all assumptions stated in a transparent and conservative manner?	/1/	DR	All the information regarding the project activity were made available to DNV for the assessment. The information is transparent and conservative.		OK
B.3.3. Is sufficient evidence provided to support the relevance of the arguments made?	/1/	DR	Yes. All the activities relevant to the project are		OK

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		I	supported with enough evidence.		
B.3.4. If the starting date of the project activity is before the date of validation, has sufficient evidence been provided that the incentive from the CDM was seriously considered in the decision to proceed with the project activity?	/1/ /17// 19/	DR I	<p>The selected starting date of the project is 13 February 2006, corresponding to the date of the turbines purchase. On the basis of EB 41 Para 67, it is DNV'S opinion that this is the correct date to represent the earliest of the dates at which the implementation or construction of the project activity began. The following chronological events, evidences of which have been checked by DNV, demonstrate that the CDM benefits were considered prior to the starting date of the project activity:</p> <p>On 1/12/2001 a CDM case study was developed by Geoingeniería S.A. in order to establish that Papaloate as a small scale project would have difficult in assigning funds for the CDM studies needed to register the CDM project.</p> <p>On 1/07/2002 Papaloate is included in a study for Potential CDM projects in Central America by Central American Commission of Environment and Development (CCAD).</p> <p>On 16/02/2005 the project owner received an e-mail from Bank of El Salvador that stated the bank worry about the low IRR of the project.</p> <p>On 15/06/2005 the Board of Directors decided that CDM was essential for the</p>		OK

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			<p>approval of the project. A Certification was issued by the undersigned Manager of the Hidroelectric Plant property of Hidroelectrica Papaloate S.A. de C.V. on 14 January 2009 to confirm this information.</p> <p>On 12/01/2006 the project owner (Grupo Terra) received from DNV a validation and verification proposal.</p> <p>On 07/02/2006 the project developer (Grupo Terra) received from the DNA of El Salvador a correspondence about CDM opportunities.</p> <p>On 08/02/2006 a correspondence with the last official baseline of El Salvador (emission factor for the year 2004) was received from the DNA of El Salvador.</p> <p>On 08/02/2006 a letter of commitment is made between Hidroelectrica Papaloate S.A. de C.V. and a CDM brokers for the sale and purchase of CERs.</p> <p>On 13/02/2006 the turbines manufactured by WKV were purchased.</p> <p>On 22/06/2006 a letter of commitment is made between Hidroelectrica Papaloate S.A. de C.V. and a CDM brokers for the development of the PDD, validation and sale and purchase of CERs.</p> <p>On 10/08/2007 a short form agreement was signed between DNV and the Sociedad Hidroelectrica Papaloate S.A. to conduct the validation of the project.</p>		

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			<p>On 23/08/2007 due to fallen negotiations the term sheet with CDM broker was ended.</p> <p>On 08/10/2007 the site visit was done.</p> <p>On 22/10/2007 the project activity received the Letter of Approval from the DNA of El Salvador.</p> <p>On 1/2/2008 project commissioned upon the signing of the PPA on February 2008.</p> <p>On 27/06/2008 a Letter of Intent was signed between Hidroelectrica Papaloate S.A. de C.V. and Corporación Andina de Fomento (CAF) for the purchase of the CERs.</p> <p>On 26/09/2008 a CDM Emission Reductions Purchase Agreement was signed between Hidroelectrica Papaloate S.A. de C.V. and Corporación Andina de Fomento.</p> <p>By verifying the evidences mentioned above, DNV has confirmed that these evidences are reliable and the benefits of the CDM were a decisive factor in the project participant's decision to proceed with the project activity and that continuing and real actions were taken to secure CDM status for the project activity in parallel with its implementation. All the information with this regard were made available to DNV.</p>		
<p>B.4. Calculation of GHG Emission Reductions – Project emissions</p> <p><i>It is assessed whether the project emissions are stated according to the methodology and whether the</i></p>					

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<i>argumentation for the choice of default factors and values – where applicable – is justified.</i>					
B.4.1. Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/ /14/	DR	Project emissions are considered zero for this project, as the net electricity delivered to the grid has been used for the calculation of emissions reduction.		OK
B.4.2. Have conservative assumptions been used when calculating the project emissions?	/1/ /14/	DR	See B.4.1.		OK
B.4.3. Are uncertainties in the project emission estimates properly addressed?	/1/ /14/	DR	See B.4.1.		OK
B.5. Calculation of GHG Emission Reductions – Baseline emissions <i>It is assessed whether the baseline emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.</i>					
B.5.1. Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/ /14/	DR	Baseline emissions are calculated by multiplying the electricity exported by the project activity to the grid with an ex-ante determined baseline grid emissions factor. The system boundary for the grid electricity system affected by the project is defined as the system of the Salvadoran grid (Santa Ana Electrical Energy Company – AES-CLESA). The combined margin emission coefficient for the grid is determined ex-ante in accordance with Tool to calculate the		OK

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			<p>emission factor for an electricity system as required by AMS-I.D. In order to justify the calculation of the grid emission factor, the Project Participants need to consider in section B.1 of the PDD the Tool to calculate the emission factor for an electricity system.</p> <p>As the El Salvador's electric grid has more than 50% of low-cost-must-run, the simple adjusted OM method was considered for the determination of the operating margin (OM). The build margin emission coefficient (BM) was calculated considering the most recent 20% power plants capacity additions (in MWh) in the electricity system.</p> <p>The simple adjusted method is a variation of the Simple method, but the main difference where the power sources (including imports) are separate in low-cost/must-run power sources and other power sources (i.e. Geothermal).</p> <p>The calculation of the low-cost-must-run is not correct in the spreadsheet provided. Moreover, the lambda factor calculation is not provided. Thus, DNV was not able to check whether the combined margin emission coefficient value is correct or not.</p>	<p>CAR-3</p> <p>CAR-11</p>	
B.5.2. Have conservative assumptions been used when calculating the baseline emissions?	/1/ /14/	DR	See B.5.1.	<p>CAR-3</p> <p>CAR-11</p>	OK

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B.5.3. Are uncertainties in the baseline emission estimates properly addressed?	/1/ /14/	DR	See B.5.1.	CAR-3 CAR-11	OK
B.6. Calculation of GHG Emission Reductions – Leakage <i>It is assessed whether leakage emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.</i>					
B.6.1. Are the leakage calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR	According to appendix B of small scale CDM project activity modalities, leakage calculation is only needed if the renewable energy technology is transferred from another activity. There is no equipment transferring from another activity to the project activity, then there is no leakage.		OK
B.6.2. Have conservative assumptions been used when calculating the leakage emissions?	/1/	DR	See B.6.1		OK
B.6.3. Are uncertainties in the leakage emission estimates properly addressed?	/1/	DR	See B.6.1		OK
B.7. Emission Reductions <i>The emission reductions shall be real, measurable and give long-term benefits related to the mitigation of climate change.</i>					
B.7.1. Are the emission reductions real, measurable and give long-term benefits related to the mitigation of climate change.	/1/ /14/	DR	Yes. The emission reductions are fully described, are real, measurable and give long term benefits in mitigation of the climate		OK

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			change. The estimated amount of GHG emission reductions from the project is 43 518 tCO ₂ e during the selected first 7-year crediting period (with potential of being renewed twice), resulting in estimated average annual emission reductions of 6 217 tCO ₂ e.		
B.8. Monitoring Methodology <i>It is assessed whether the project applies an appropriate monitoring methodology.</i>					
B.8.1. Is the monitoring plan documented according to the approved methodology and in a complete and transparent manner?	/1/	DR I	Yes, the approved monitoring methodology AMS-I.D (Version 13) – “Grid connected renewable electricity generation”, in combination with Tool to calculate the emission factor for an electricity system has been used.		OK
B.8.2. Will all monitored data required for verification and issuance be kept for two years after the end of the crediting period or the last issuance of CERs, for this project activity, whichever occurs later?	/1/	DR I	The project document does not report if all data will be kept for two years after the end of the last crediting period	CL3	OK
B.9. Monitoring of Project Emissions <i>It is established whether the monitoring plan provides for reliable and complete project emission data over time.</i>					
B.9.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for estimation or measuring the greenhouse gas emissions within the project	/1/ /14/	DR	The project is a small hydro power generation unit, no project emissions expected. This was verified during the site visit.	CL4	OK

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boundary during the crediting period?			DNV requests further clarification about provisions for emergency start-ups.		
B.9.2. Are the choices of project GHG indicators reasonable and conservative?	/1/	DR	See B.9.1	CL 4	OK
B.9.3. Is the measurement method clearly stated for each GHG value to be monitored and deemed appropriate?	/1/	DR	See B.9.1	CL 4	OK
B.9.4. Is the measurement equipment described and deemed appropriate?	/1/	DR	See B.9.1	CL 4	OK
B.9.5. Is the measurement accuracy addressed and deemed appropriate? Are procedures in place on how to deal with erroneous measurements?	/1/	DR	See B.9.1	CL 4	OK
B.9.6. Is the measurement <i>interval</i> identified and deemed appropriate?	/1/	DR	See B.9.1	CL 4	OK
B.9.7. Is the <i>registration, monitoring, measurement</i> and <i>reporting</i> procedure defined?	/1/	DR	See B.9.1	CL 4	OK
B.9.8. Are procedures identified for <i>maintenance</i> of monitoring equipment and installations? Are the calibration intervals being observed?	/1/	DR	See B.9.1	CL 4	OK
B.9.9. 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	See B.9.1	CL 4	OK

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B.10. Monitoring of Baseline Emissions <i>It is established whether the monitoring plan provides for reliable and complete baseline emission data over time.</i>					
B.10.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining baseline emissions during the crediting period?	/1/	DR	<p>All the relevant data for the project operation are fulfilled. The emission factor is determined ex-ante, and the monitoring plan only requires the measurement of the electricity generated. The electricity generated by the hydropower plant and supplied to the grid will be monitored with a calibrated meter. The generated energy by the power plant will be multiplied by the combined margin emission coefficient for the grid. This data will be verified cross checking the sales receipt from the owner of the grid and the data display in the measurement device before to be delivered to the grid.</p> <p>According to the Tool to calculate the emission factor for an electricity system, combined margin CO₂ emission factor (EF_{grid,CM,y}), the Operating margin CO₂ emission factor (EF_{OM}) and Build margin CO₂ emission factor (EF_{BM}) need to be specified ex-ante in section B.6.2 of the PDD.</p>	CAR-10	OK
B.10.2. Are the choices of baseline GHG indicators reasonable and conservative?	/1/	DR	Yes. Based on traceable data.		OK
B.10.3. Is the measurement method clearly stated for each baseline indicator to be monitored and also	/1/	DR	Yes. The requested information by methodology has been considered into the planning.		OK

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deemed appropriate?					
B.10.4. Is the measurement <i>equipment</i> described and deemed appropriate?	/1/	DR	Comply with National Grid criteria.		OK
B.10.5. Is the measurement <i>accuracy</i> addressed and deemed appropriate? Are procedures in place on how to deal with erroneous measurements?	/1/	DR	Yes. Comply with National Grid criteria.		OK
B.10.6. Is the measurement <i>interval</i> for baseline data identified and deemed appropriate?	/1/	DR	Yes. There is a continuous monitoring of the main data.		OK
B.10.7. Is the registration, <i>monitoring</i> , <i>measurement</i> and <i>reporting</i> procedure defined?	/1/	DR	Yes. To comply with the national grid operator requirements.		OK
B.10.8. Are procedures identified for <i>maintenance</i> of monitoring equipment and installations? Are the calibration intervals being observed?	/1/	DR	Yes. To comply with the national grid operator requirements.		OK
B.10.9. Are procedures identified for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation)	/1/	DR	Yes. To comply with the national grid operator requirements.		OK
B.11. Monitoring of Leakage <i>It is assessed whether the monitoring plan provides for reliable and complete leakage data over time.</i>					
B.11.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining leakage?	/1/	DR	Regarding leakage, no sources of emissions were identified. The electricity generating equipment is not transferred from any other		OK

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			activity. The project was implemented with new equipment, hence no leakage is expected.		
B.11.2. Are the choices of project leakage indicators reasonable and conservative?	/1/	DR	See B.11.1.		OK
B.11.3. Is the measurement method clearly stated for each leakage value to be monitored and deemed appropriate?	/1/	DR	See B.11.1.		OK
B.12. Monitoring of Sustainable Development Indicators/ Environmental Impacts <i>It is assessed whether choices of indicators are reasonable and complete to monitor sustainable performance over time.</i>					
B.12.1. Is the monitoring of sustainable development indicators/ environmental impacts warranted by legislation in the host country?	/1/ /6/ /7/ /8/ /10/	DR I	The simplified monitoring methodology AMS-I.D does not require the monitoring of social and environmental indicators. Project participants are requested to confirm whether the DNA of El Salvador requires the monitoring of social and environmental indicator.	CL-5	OK
B.12.2. Does the monitoring plan provide for the collection and archiving of relevant data concerning environmental, social and economic impacts?	/1/	DR I	See B.12.1.	CL-5	OK
B.12.3. Are the sustainable development indicators in line with stated national priorities in the Host Country?	/1/	DR I	See B.12.1.	CL-5	OK

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B.13. Project Management Planning <i>It is checked that project implementation is properly prepared for and that critical arrangements are addressed.</i>					
B.13.1. Is the authority and responsibility of overall project management clearly described?	/1/	DR I	Yes. The authority of the overall management of the project is clearly described. See section B.7.2 of the PDD.		OK
B.13.2. Are procedures identified for training of monitoring personnel?	/1/	DR I	Yes. The previous experience of this operator in electricity generation allows to make easier the training.		OK
B.13.3. Are procedures identified for emergency preparedness for cases where emergencies can cause unintended emissions?	/1/	DR I	There is no possibility of unintended emissions.		OK
B.13.4. Are procedures identified for review of reported results/data?	/1/	DR I	There is a consideration to cross check the data with the national grid operator.		OK
B.13.5. Are procedures identified for corrective actions in order to provide for more accurate future monitoring and reporting?	/1/	DR I	Yes. To comply with the national grid operator requirements.		OK
C. Duration of the Project/ Crediting Period <i>It is assessed whether the temporary boundaries of the project are clearly defined.</i>					
C.1.1. Are the project's starting date and operational lifetime clearly defined and evidenced?	/1/ /19/	DR I	Yes. Based in the available information for the technology used the expected period for the project are 50 years. The starting date of the project activity indicated in the PDD is 13 February 2006		OK

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			which corresponds to the date when the electromechanical equipment was purchased.		
C.1.2. Is the start of the crediting period clearly defined and reasonable?	/1/	DR I	A 7 year renewable crediting period is selected (with the potential of being renewable twice), and it is expected to start on 01 May 2010. The crediting period could not start before the registration of the project.	CL-2	OK
D. Environmental Impacts <i>Documentation on the analysis of the environmental impacts will be assessed, and if deemed significant, an EIA should be provided to the validator.</i>					
D.1.1. Has an analysis of the environmental impacts of the project activity been sufficiently described?	/6/ /7/ /8/ /9/ /10/	DR I	Yes. There is the Environmental impact assessment. Dated February 2000. There are several documents describing the project proponent responsibility in environmental matters. A good example is the letter signed by Mayors of the Juayua micro-region.		OK
D.1.2. Are there any Host Party requirements for an Environmental Impact Assessment (EIA), and if yes, is an EIA approved?	/6/ /7/ /8/ /9/ /10/	DR I	Yes. There is the Environmental impact assessment. Dated February 2000. There are several legal documents describing the project's proponent responsibility in environmental matters.		OK
D.1.3. Will the project create any adverse environmental effects?	/6/ /7/ /8/ /9/ /10/	DR I	There is not any declaration from the authority that any law or regulation is not fulfilled.		OK

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D.1.4. Are transboundary environmental impacts considered in the analysis?	/6/ /7/ /8/ /9/ /10/	DR I	Yes. A good example is the letter signed by Mayors of the Juayua micro-region.		OK
D.1.5. Have identified environmental impacts been addressed in the project design?	/6/ /7/ /8/ /9/ /10/	DR I	The design of the project must comply with environmental regulation to be build. All regulation has been accomplished.		OK
D.1.6. Does the project comply with environmental legislation in the host country?	/6/ /7/ /8/ /9/ /10/	DR I	Yes. All legal documentation made available to DNV.		OK
D.1. For Small-scale projects					
D.1.1. Does host country legislation require an analysis of the environmental impacts of the project activity?	/6/ /7/ /8/ /9/ /10/	DR I	Yes. There is the Environmental impact assessment. Dated February 2000. There are several documents describing the project proponent responsibility in environmental matters. A good example is the letter signed by Mayors of the Juayua micro-region.		OK
D.1.2. Does the project comply with environmental legislation in the host country?	/6/ /7/ /8/ /9/	DR I	Yes. All legal documentation made available to DNV.		OK

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	/10/				
D.1.3. Will the project create any adverse environmental effects?	/6/ /7/ /8/ /9/ /10/	DR I	There is not any declaration from the authority that any law or regulation is not fulfilled.		OK
D.1.4. Have environmental impacts been identified and addressed in the PDD?	/1/ /7/ /8/ /9/	DR I	Yes. Section D describes clearly the environmental impacts. The set of conclusions includes the analysis during construction phase, and the operation of the project.		OK
E. Stakeholder Comments <i>The validator should ensure that stakeholder comments have been invited with appropriate media and that due account has been taken of any comments received.</i>					
E.1.1. Have relevant stakeholders been consulted?	/11/ /16/	DR I	The project is inserted in the middle of a tourist corridor, the for this reason a critical issue is the commitment of the region Mayor representing several sectors of the community. The evidence presented to DNV shows that the main group of stakeholders has been consulted.		OK
E.1.2. Have appropriate media been used to invite comments by local stakeholders?	/11/ /16/	DR I	Yes. Local media and legal framework was used to communicate the interested parties, including newspapers and letters.		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?	/11/ /16/	DR I	Yes. The evidence shows that the adequate consultation process has been carried out and in interview with national DNA about legal framework the project fulfils the requirements.		OK

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CDM Validation Protocol – Report No. 2007-2087, rev. 01

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
E.1.4. Is a summary of the stakeholder comments received provided?	/11/ /16/	DR I	Yes. Although no comments were received. The local legal framework verifies that all the consultation process including community, municipality among other interested parties was held answering all the requirements of the interested parties if any.		OK
E.1.5. Has due account been taken of any stakeholder comments received?	/11/ /16/	DR I	Yes. Although no comments were received. The local legal framework verifies that all the consultation process including community, municipality among other interested parties was held answering all the requirements of the interested parties if any. In the other hand, all the evidence available and interviews held in place with the Juayua Major let know that all the main issues were solved accordingly.		OK

* MoV = Means of Verification, DR= Document Review, I= Interview
 CDM Validation Protocol – Report No. 2007-2087, rev. 01

Table 2b: Additional requirements checklist for VVM version 1 (EB 44)

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
A.1. Letter of approval					
A.1.1 Is the LoA received directly from the DNA or through the project participant.		DR	<p>The LoA was received through the project participant.</p> <p>The DNA of El Salvador has issued the letter of approval (LOA) on 22 October 2007 authorising the project participant. It has also confirmed the projects contribution to the sustainable development of El Salvador.</p> <p>DNV requests written approval of voluntary participation from the DNA of . In addition, project participants are requested to clarify if public funding by the is involved in the project.</p>	CAR-2	Ok
A.2. Project design					
A.2.1 Does the PDD describe the CDM project activity with all relevant elements in a transparent and accurate way?			Yes, please see Table 2 A.3.1		Ok
A.2.2 Has the CDM project activity at the start of the validation been constructed or does the CDM project activity use existing facilities or equipment?			<p>No. The starting date of the project activity indicated in the PDD is 13 February 2006 which corresponds to the date when the electromechanical equipment was purchased</p> <p>Please see Table 1 question 22 and Table 2 C.1.1</p>		Ok
A.2.3 Is the project a large scale project, a small scale project with average annual emission reductions above 15 000 tonnes or a bundled small scale project? Has on-site visit been carried out?			Yes, please see Table 2 B.5.1 and B.5.2		Ok
A.2.4 Does the project activity involved alteration of existing			No, the entire project will use new equipment		Ok

* MoV = Means of Verification, DR= Document Review, I= Interview
 CDM Validation Protocol – Report No. 2007-2087, rev. 01

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
installations? If so, have the differences between pre-project and post-project activity been clearly described in the PDD?			Please see Table 2 A.3.1		
A.3. Project emissions not addressed by the methodology					
A.3.1 Does the methodology describe all project emission source for the project activity that contributes all 1% of the emission reductions? Sources that the methodology considers not to take into account are not relevant (e.g. cement and iron consumption for building hydropower plants).			Yes, Only CO ₂ from electricity produced by fossil fuel Please see Table 2 B.2.1, B.2.2 and B.5.1		Ok
A.4. Documentation of baseline emissions					
A.4.1 Documentation of the baseline determination: a. 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. b. All documentation is relevant as well as correctly quoted and interpreted. c. Assumptions and data can be deemed reasonable d. Relevant national and/or sectoral policies and circumstances are considered and listed in the PDD. e. The methodology has been correctly applied to identify what would occurred in the absence of the proposed CDM project activity			Yes. Please see Table 2- B.1.1, B.2.1 and B.2.2		Ok
A.5. Documentation of the calculations					
A.5.1 Algorithms and/or formulae used to determine emission reductions <ul style="list-style-type: none"> 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 			Yes, Please See Table 2 B.4 and B.5		Ok

* MoV = Means of Verification, DR= Document Review, I= Interview
 CDM Validation Protocol – Report No. 2007-2087, rev. 01

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
<p>interpreted.</p> <ul style="list-style-type: none"> • 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. 					
A.6. Implementation of the monitoring plan					
A.6.1 How were the plans for implementation of the monitoring plan, data management, QA/QC procedures assessed? To what extent can the emission reductions achieved by the project be monitored ex-post and verified later by a DOE?			Yes, please see Table 2 B.8, B.9 and B.10		Ok
A.7. CDM consideration prior to starting date					
A.7.1 The prior consideration of CDM for the project activity complies with EB41 annex 46			Yes, Please see Table 2 B.3.4		Ok

Table 3 Resolution of Corrective Action and Clarification Requests

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
CAR 1 There is not available at the moment of site audit a signed contract with the Grid administrator AES-CLESA.	B.1.2	The information of the contract with the grid operator has been updated.	OK. The contract was checked by DNV. This CAR is closed.
CAR 2 DNV requests written approval of voluntary participation from the DNA of . In addition, project participants are requested to clarify if public funding by the is involved in the project.	A.2.2	We have included the Letter of approval from the DNA of Netherlands and we clarify that Public funding from the State of the Netherlands is received, this does not result in a diversion of official development assistance and is separate from and not counted towards the financial obligations of the State of the Netherlands in that respect. As stated in the LoA Ref. IZ/2009030650 dated April 23rd, 2009.	A copy of the LoA was send to the DOE. As stated in the LoA issued by the DNA of the , the public funding involved does not result in a diversion of official development assistance. Therefore, this CAR is closed.
CAR 3 In order to justify the calculation of the grid emission factor, the Project Participants need to consider in section B.1 of the PDD the latest version of the Tool to calculate the emission factor for an electricity system.	B.5.1 B.5.2 B.5.3	According to AMS I.D (Grid connected renewable electricity generation) Version 13, the emission factor of the electricity system has been determined by applying the latest version of the <i>Tool to calculate the emission factor for an electricity system</i> ; Version 1.1 EB 35, Annex 12.	The Tool to calculate the emission factor for an electricity system was included in section B.1 of the revised PDD (version 2 dated 11 May 2009). Therefore, this CAR is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
		This has been described in section B.1 of the PDD Version 6, dated 28/04/2009	
<p>CAR 4</p> <p>The PDD does not mention the benchmark applied to compare the IRR of the project. In addition, a discount rate of 12 % is applied for the NPV analysis; however the source of this value is not mentioned. DNV requests documented evidences to confirm the information above.</p>	B.3.1	<p>The application of a discount rate applicable to electricity generation activities emerge with the reforms to the General Electricity Law made on 2007, that is why in the agreement 29-E-2007 the value is fixed in 12%; in consequence for 2004 – 2005 there is no value approved by the SIGET.</p> <p>A communication from the SIGET (Please refer to the communication dated as of 17 April 2009), states that the correct value for the discount rate to apply to the project is the one stated in the Art. 68 in the General Electricity Law, value fixed as 10%.</p> <p>SIGET: general superintendence of electricity and telecommunications (El Salvador).</p>	<p>OK.</p> <p>DNV has verified the revised PDD and confirmed the benchmark applied to the financial analysis.</p> <p>The CAR is closed.</p>

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
		<p>General electricity law: http://www.siget.gob.sv/documentos/electricidad/legislacion/general_law_of_electrical_power0.pdf article 68</p> <p>Therefore, the benchmark applied to compare the project IRR has been determined as: 10%.</p> <p>The benchmark value has been determined (in accordance to the guidelines on investment analysis EB 41, Annex 45) in 11 – 14.</p>	
<p>CAR 5</p> <p>DNV was not able to confirm that the input parameters used in the financial analysis are reasonable and adequately represent the economic situation of the project. Evidence is to be provided for the assumed input parameters. In addition, the input values should be valid and applicable at the time of the investment decision taken by the project participant.</p>	B.3.1	<p>Evidence was provided over the assumed input parameters (in accordance to the guidelines on investment analysis EB 41, Annex 45) with the current rules established for the investment analysis. The values used are those at the time of the investment decision. Such input parameters are defined in section B.5 table 4 and in the financial spreadsheets.</p>	<p>Ok. DNV was able to verify the feasibility study /40/ of the project activity and the other documents provided by project participant such as General law of electricity and tax law of El Salvador.</p> <p>The CAR is closed.</p>

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>CAR 6</p> <p>As stated in the PDD, the project-IRR without CDM revenues is 10.40%, which confirms that the project in the absence of CDM benefits and compared to the benchmark is not financially attractive. With CER revenues the project IRR increases to 13.52%, which is above the benchmark. DNV was not able to confirm whether the IRR is above or below the benchmark selected due to lack of information in the PDD.</p> <p>DNV requests a simplified copy of the investment analysis spreadsheet which has to be enclosed for the CDM registration. The spreadsheet provided is very confused and it is not possible to check in a transparent way the IRR and NPV calculation. The Guidance on the Assessment of Investment Analysis (version 2, Annex 45 of EB 41 report) should be used. Moreover, the spreadsheet should be provided in English.</p>	B.3.1	<p>The calculations in the spreadsheet were revised and follow the Guidance on the Assessment of Investment Analysis (version 2, Annex 45 of EB 41 report). The calculations were done transparently with such references taken from the following sources for:</p> <p>Benchmark rate: http://www.siget.gob.sv/documentos/eletricidad/legislacion/general_law_of_electrical_power0.pdf article 68</p> <p>Income tax value: Tax law of El Salvador</p> <p>The spreadsheet has the complete calculation in English and can be checked.</p>	<p>DNV was able to verify the updated spreadsheet and confirmed the investment analysis.</p> <p>The CAR is closed.</p>
<p>CAR 7</p> <p>A sensitivity analysis should be included to assess whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions.</p>	B.3.1	<p>The Sensitivity Analysis was included in the PDD to justify that the financial attractiveness is coherent to reasonable variations in the critical assumptions. The concepts used for the sensitivity are:</p> <ul style="list-style-type: none"> • Capital Expenditures 	<p>OK.</p> <p>The re-preparing sensitivity analysis has been in place.</p> <p>The CAR is closed.</p>

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
		<ul style="list-style-type: none"> • Generation variation • Operating Costs • Electricity tariff 	
<p>CAR 8</p> <p>Regulatory barrier: The PDD sustain that while a renewable energy incentive law was entered into force after project starting date on later on 20 December 2007, the proposed project activity has competitive disadvantages when compared to other more recent renewable energy projects (as the new incentive regulation is applicable to plants of which implementation have started after this incentive law was implemented). DNV emphasizes that while any identified barriers should be based on the relevant aspects available prior to the time of the decision/implementation of the project, such competitive disadvantage can not be regarded as a barrier for the project implementation. Project participants are thus requested to amend the PDD accordingly.</p>	B.3.1	This barrier has been amended as stated by DOE.	<p>The revised version of the PDD (version 6) was assessed by DNV and section B.5 was updated.</p> <p>The CAR is closed.</p>
<p>CAR 9</p> <p>Legislative barrier: As stated in the PDD, the construction of a project with renewable resources requires information and</p>	B.3.1	The barrier has been changed to Delay in the application of the law. This barrier still stands due to the fact that it is a barrier that is present for renewable	Ok. DNV was able to verify the revised PDD (version 6) and confirmed that the delays to apply the law were not considered as a barrier.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>authorizations like feasibility study, EIA document, water concession contract, EIA authorization and municipality authorization. During the Water Concession Contract process there is no differentiation of the categorization for small scale or large scale hydro projects. As a consequence of the delay to approval the process, small hydro power projects are affected. Consequently, the development of the project is constantly postponed affecting the feasibility of the project activity.</p> <p>In DNV's opinion, this could not be considered as a legislative barrier. The problem here is related to the delays to apply the law. DNV also emphasize the use of the term "Legislative barrier" is not appropriated in the context of "A" delay which, in a first view, was not caused by any "legislative" related aspect.</p>		<p>energy projects in the country, The government institution in charge of the issuance of the environmental license is MARN, and it established through a World Bank study, that the institution has a lack of efficiency in the procedures for these projects which leads to 2 year delays and that in the case of the project activity lead up to a 4 year delay. A Fossil fuel plant such as the 50 MW Talnique Power Plant took 7 to 8 months as confirmed by a communication between the Environmental unit of a Government company Comisión Ejecutiva Hidroeléctrica del Río Lempa , CEL. According to a study developed for El Salvador by the InWEnt (German Development) and CLACDS, Latin-American Centre of Competitive and Sustainable Development, Renewable energy project are subject to an 11 months to 3 year process to obtain all permits.</p>	<p>The CAR is closed.</p>
<p>CAR 10 According to the Tool to calculate the emission factor for an electricity system,</p>	<p>B.10.1</p>	<p>The Emission factor, Operating Margin and Build Margin have been specified ex-ante in section B.6.2 of the PDD.</p>	<p>Ok. DNV was able to verify in the revised PDD that the parameters were included in section B.6.2.</p>

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
combined margin CO ₂ emission factor (EF _{grid,CM,y}), the Operating margin CO ₂ emission factor (EF _{OM}) and Build margin CO ₂ emission factor (EF _{BM}) need to be specified ex-ante in section B.6.2 of the PDD.			DNV was also able to confirm that IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories were applied as required by the Tool to calculate the emission factor for an electricity system to determine the CO ₂ emission factor for the fossil fuels (diesel and fuel oil). The CAR is closed
CAR 11 The calculation of the low-cost-must-run is not correct in the spreadsheet provided. Moreover, the lambda factor calculation is not provided. Thus, DNV was not able to check whether the combined margin emission coefficient value is correct or not.	B.5.1 B.5.2 B.5.3	The spreadsheet has been revised and has been corrected. The lambda calculation has been included in the baseline.	OK. The emission factor calculation has been in place. The CAR is closed.
CL 1 The PDD does not clearly specify the “Step 1. Identification of alternatives to the project activity consistent with current laws and regulations.” of the “tool for the demonstration and assessment of additionality”.	B.2.2	The version 5 of the PDD includes a detailed explanation of the component of the additionality of the project.	OK. Closed.
CL 2 The crediting period could not start before the	C.1.2	The crediting period is 1 May 2010 or on the date of registration on the CDM	The crediting period was updated in the

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
registration of the project.		project, whichever is later.	revised version of the PDD. This CL is closed.
CL 3 The project document does not report if all data will be kept for two years after the end of the last crediting period.	B.8.2	The PDD has included that the data will be kept for 2 years after the end of the last crediting period and it can be seen in section B.6.2, B.7.1, B.7.2 and Annex 4 of the PDD	The monitoring plan was updated in the revised version of the PDD. This CL is closed.
CL 4 DNV requests further clarification about provisions for emergency start-ups.	B.9.1 B.9.2 B.9.3 B.9.4 B.9.5 B.9.6 B.9.7 B.9.8 B.9.9	The provisions of emergency start up have been included in the Monitoring Plan and can be seen in Annex 4, Yet this is not requested by the methodology AMS ID Version 13 due to the fact the project does not contain leakage.	The monitoring plan was updated in the revised version of the PDD. This CL is closed.
CL 5 Project participants are requested to confirm whether the DNA of El Salvador requires the monitoring of social and environmental indicator.	B.12.1 B.12.2 B.12.3	The DNA (which is MARN) does not require the monitoring of social environmental indicators as it would be stated in the Environmental Resolution (DNV has a copy) and it is confirmed by the DNA in correspondence to Papaloate stating that in the framework of CDM, the DNA does not monitor social and environmental indicators.	Ok. This CL is closed.
CL 6 In the past several hydropower projects were built in El Salvador. Hence, the technology barrier presented in the PDD is not considered as a barrier that prevents the project from	B.3.1	SIGET information about construction trends of hydro and thermal power plants show that there is a significant increase in the construction of thermal power plants from 2002 to date, while	The project participant removed the technological barrier assessment from the PDD. Additionality is demonstrated by an investment barrier and barrier due to prevailing practice.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
implementation. There is sufficient competence in El Salvador to install a hydropower turbine even if it is a new type of turbine. Project participant is requested to provide further clarification in order to confirm the technology barrier.		the construction of hydropower plants has decreased since 2005. Nonetheless, the technological barrier was removed from the PDD.	This CL is closed.

APPENDIX B

CERTIFICATES OF COMPETENCE



CERTIFICATE OF COMPETENCE

Sergio Cabral

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

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

Høvik, 9 January 2009

Michael Lehmann

Michael Lehmann

Technical Director, Climate Change Services



CERTIFICATE OF COMPETENCE

Anjana Sharma

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

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

Høvik, 9 January 2009

Michael Lehmann

Michael Lehmann

Technical Director, Climate Change Services



CERTIFICATE OF COMPETENCE

Andrea Leiroz

Qualification in accordance with DNV's Qualification Scheme CDM/JI (ICP-8-1-CDMJ1-i1)

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

Høvik, 1 September 2009

Michael Lehmann

Michael Lehmann
Technical Director, Climate Change Services



CERTIFICATE OF COMPETENCE

Barbara Lara

Qualification in accordance with DNV's Qualification scheme for CDM/JI (ICP-9-8-i1-
CDMJi-i1)

<i>GHG Auditor:</i>	Yes		
<i>CDM Validator:</i>		<i>JI Validator:</i>	--
<i>CDM Verifier:</i>	--	<i>JI Verifier:</i>	--
<i>Industry Sector Expert for Sectoral Scope(s):</i>	--		

Høvik, 2 May 2008

Michael Lehmann

Michael Lehmann

Technical Director, Climate Change Services



CERTIFICATE OF COMPETENCE

Cuiping Deng

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

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

Høvik, 1 September 2009

Michael Lehmann

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Technical Director, Climate Change Services



CERTIFICATE OF COMPETENCE

Ricardo Díaz

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

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

Høvik, 18 November 2009

Michael Lehmann

Michael Lehmann

Technical Director, Climate Change Services