

VALIDATION OPINION – CREDITING PERIOD RENEWAL
LAGEO, S.A. DE C.V., BERLIN GEOTHERMAL PROJECT, PHASE TWO

LaGeo, S. A. de C. V.
(SALVADOR)

UNFCCC Registration Ref. No. 0297

REPORT NO. CDMRE-13-001-02

JANUARY, 2014

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Date of first issue:	01/11/2013	Project N°:	CDMRE-13-001-02
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Version N°:	02	Last version date:	January 2014
Client:	LaGeo, S. A. de C. V.	Client ref:	CDMRE-13-001

ICONTEC has performed the validation of the request for renewal of the crediting period for the project LaGeo, S.A. de C.V., Berlin Geothermal Project, Phase Two in Salvador on the basis of UNFCCC criteria for the CDM, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to Article 12 of the Kyoto Protocol, the CDM modalities and procedures and the subsequent decisions by the CDM Executive Board. This validation report summarizes the findings of the validation of the request for renewal of the crediting period.

The proposed project activity under process for renewal of the crediting period is based on methodology ACM0002, version 14.0.0, “Consolidated Methodology for Grid-Connected Electricity Generation from Renewable Sources”. The project involved the increment of the power generation capacity at the existing Berlin Geothermal Power Plant through the drilling of additional geothermal wells and the installation of a new condensation power unit of 44MW in February 2, 2007.

The Project Activity exploits the resource of the Berlin Geothermal Field characterized by a depth between 1,000 and 1,500 masl in the range of 280-300°C, 115 bar pressure, and good rock permeability. Reservoir dimensions and characteristics are enough to sustain a 44 MW power plant for the entire life of the Project Activity, with an expected field depletion of about 1% per year.

In the situation existing prior to the implementation of the Project Activity, the existing facility consists of a geothermal plant with a total installed capacity of 62.985 MW that would continue to supply electricity to the grid at historical levels, therefore the baseline scenario is the continuation of operation of the existing power plant.

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

In summary, it is ICONTEC’s opinion that the project LaGeo, S.A. de C.V., Berlin Geothermal Project, Phase Two, as described in the version 21 of the project design document, meets all relevant UNFCCC requirements for the CDM and all relevant host country criteria and correctly applies the baseline and monitoring methodology ACM0002, version 14.0.0. Hence, ICONTEC is requesting the renewal of the crediting period of the project as CDM project activity.

VALIDATION OPINION – CREDITING PERIOD RENEWAL



Report No:	CDMRE-13-001-02	Subject Group:	1. Energy industries (renewable-/ non renewable sources)
Report title: LaGeo, S. A. de C. V., Berlin Geothermal Project, Phase Two			
Work verified by:	Francy Ramirez, ICONTEC technical reviewer SS 1 Fernando Gomez, ICONTEC technical expert reviewer SS 1		
Technical review date:	21/11/2013	Number of pages:	65

This report should not be read without reference to the annex A, Validation Protocol.

Abbreviations

CAR	Corrective Action Request
CDM	Clean Development Mechanism
CERs	Certified emission reductions
CL	Clarification Request
CO ₂ e	Equivalent Carbon Dioxide
DNA	Designated National Authority
DOE	Designated Operational Entity
MR	Monitoring Report
GHG	Greenhouse Gases
ICONTEC	Colombian Institute of Technical Standards and Certification (Instituto Colombiano de Normas Técnicas y Certificación)
IPCC	Intergovernmental Panel on Climate Change
MoC	Modalities of Communication
PDD	Project Design Document
UNFCCC	United Nations Framework Convention for Climate Change
VVS	CDM Validation and Verification Standard
PCP	CDM Project Cycle Procedure
PS	CDM Project Standard
UT	Transactions Unit (Unidad de Transacciones)
SIGET	General Superintendence of Electricity and Telecommunications (Superintendencia General de Electricidad y Telecomunicaciones)
MARN	Salvadorian Ministry of Environment and Natural Resources (Ministerio de Ambiente y Recursos Naturales)
CNE	Salvadorian National Energy Conseil (Consejo Nacional de Energía)
GWP	Global Warming Potential
S/N	Serial Number
CONACYT	National Council of Science and Technology (Consejo Nacional de Ciencia y Tecnología)
MASL	Meters Above Sea Level

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1. INTRODUCTION

LaGeo, S. A. de C. V commissioned ICONTEC to perform the validation opinion for the request for crediting period renewal of LaGeo, S.A. de C.V., Berlin Geothermal Project, Phase Two (hereafter called “the project”).

The assessment was performed in accordance with the section 11 of the CDM VVS, version 05.0, section 12.9.1 of the CDM PS, version 05.0, section 9 of the CDM PCP, version 05.0 and the methodological tool “*Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period*”, version 03.0.1.

The assessment included:

- a) An impact of new relevant national and/or sectoral policies and circumstances on the baseline taking into account relevant EB guidance with regard to renewal of the crediting period at the time of requesting renewal of crediting period.
- b) The correctness of the application of an approved baseline methodology for the determination of the continued validity of the baseline or its update, and the estimation of emission reductions for the applicable crediting period.

1.1. OBJECTIVE

The purpose of a validation opinion for the request for crediting period renewal is to have an independent third party assess of the project activity. In particular is reassessed the validity of the original baseline, the estimated emission reductions, the monitoring plan, and the project’s compliance with relevant UNFCCC requirements and criteria from the host country.

1.2. SCOPE

ICONTEC carries out audits according to its ethics code and internal procedures for carrying out validation, verification and renewal of CDM project activities, which, in turn, are based on the UNFCCC requirements and host countries criteria. Likewise, ICONTEC focuses on the identification of significant risks for CER generation, and verification of the mitigation during its audits.

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

1.3. GHG PROJECT DESCRIPTION

ICONTEC had the opportunity to verify the following description in the on-site visit to the project:

Project Parties: LaGeo, S. A. de C. V.

Title of project activity:	LaGeo, S.A. de C.V., Berlin Geothermal Project, Phase Two
Project Location:	Latitude 13.524801, Longitude -88.509223.
Methodology :	ACM0002, version 14.0.0 Consolidated methodology for grid-connected electricity generation from renewable sources /3/.
Project's crediting period:	7 years, renewable.
Estimated amount of emission reductions over the chosen crediting period:	150,171 tCO ₂

LaGeo, S.A. de C.V., Berlin Geothermal Project, Phase Two is a 44 MW geothermal power unit that uses a condensation unit to produce electricity to be supplied to the national interconnected grid at Berlin Geothermal Plant. This power unit is named Unit 3.

The project activity uses condensing units and includes the following facilities: TR-18, TR 17 and TR-19 platform wells, a steam and water conveyor systems, a power generation equipment, an electricity measurement system and auxiliary services.

The geothermal fluid from the wells flows to separators, where is separated in steam and liquid phases. Then, the steam is delivered through the surface pipelines to the powerhouse and the remaining high temperature flow is delivered to the geothermal reservoir through the reinjection wells at TR-19 platform.

The powerhouse is equipped with a turbine and a synchronous generator; the steam drives the turbine to produce electricity that is sent to the grid through a line transmission. In order to avoid geothermal resource depletion, the steam used in the powerhouse passes to a condenser to return it to liquid phase before is injected back into earth through a reinjection well.

The GHG project considered can be classified as a CDM project in the sector 1, Energy industries (renewable/non-renewable sources), according to the List of Sectoral Scopes of UNFCCC.

The project start date was February 2nd 2007 and the starting date of the second crediting period is expected on January 1st 2014.

2. METHODOLOGY

The validation opinion for a crediting period renewal consists of the following three phases:

- i) A desk review of the updated project design document
- ii) On site assessment and interviews with project stakeholders
- iii) Resolution of outstanding issues and the issuance of a final validation opinion.

As mentioned in clause 1.2 of this report ICONTEC, based on its ethics code and internal procedures, carries out validation, verification and renewal of CDM project activities

(which, in turn, are based on the UNFCCC requirements) focused on the identification of significant risks for CER generation and the verification of the contribution to climate change mitigation.

All documentation reviewed during the validation process has been including in chapter 5 - references.

The validation protocol resulting from the validation opinion for a crediting period renewal for LaGeo, S.A. de C.V., Berlin Geothermal Project, Phase Two is enclosed in Annex A of this report.

Findings established during the renewal can be seen as:

- A non-fulfillment of validation protocol criteria, or
- An identified risk to the fulfillment of the project objectives

The findings could take the form of a Corrective Action Request (CAR), Forward Action Request (FAR) or a Clarifications Request (CL).

Corrective action requests (CAR) are issued where:

The project participants have made mistakes which directly influence the ability of the project activity to achieve real, measurable and additional emission reductions;

The CDM requirements have not been met; or

There is a risk that emission reductions cannot be monitored or calculated

A Forward Action Request is made to highlight issues related to project implementation that will require review during the next verification of the project activity.

A Clarification Request is required when information is insufficient or not clear enough to establish whether a requirement has been met.

ICONTEC resolves or “closes out” CARs and CLs only if the project participants rectifies the PDD or provides additional explanations or evidence that satisfies ICONTEC’s concerns. VVS (v 05.0) paragraph 28.

This validation opinion report for a crediting period renewal explains the issues raised, the responses provided by the project participants, the means of validation of such responses and references to any resulting changes in the PDD or supporting annexes. VVS (v 05.0) paragraph 29.

2.1. FOLLOWUP INTERVIEWS

ICONTEC performed interviews with project stakeholders to confirm the selected information and to resolve issues identified during the desk review. The main topics of the interview are summarized in Table 1.

Table 1: Follow up Interview

DATE	PLACE	INTERVIEW DELEGATE	ORGANIZATION	INTERVIEW TOPICS
24, 25 AND 26 APRIL 2013	LAGEO, S.A. DE C.V OFFICES AND GEOTHERMAL PLANT	ALAIDE GONZALEZ CDM CONSULTANT	ENERGÍA Y MEDIO AMBIENTE	PROJECT DESCRIPTION, BASELINE AND MONITORING METHODOLOGY
		JAIME HERNANDEZ CHEMICAL ANALYST	LAGEO, S.A. DE C.V	MONITORING METHODOLOGY
		RUBEN ANTONIO LOY CDM RESPONSIBLE FOR LAGEO, S.A. DE C.V		PROJECT DESCRIPTION, BASELINE AND MONITORING METHODOLOGY
		CARLOS ALBERTO GUZMAN COMMERCIAL MANAGER		MONITORING METHODOLOGY
		ROBERTO RENDEROS CHEMICAL LABORATORY DIRECTOR		MONITORING METHODOLOGY
24, 25 AND 26 APRIL 2013	LAGEO, S.A. DE C.V OFFICES AND GEOTHERMAL PLANT	LUIS ALBERTO FRANCO ENVIRONMENTAL SPECIALIST	LAGEO, S.A. DE C.V	PROJECT DESCRIPTION, BASELINE AND MONITORING METHODOLOGY
		DANILO ESCOBAR INTRUMENTATION AND CONTROL COORDINATOR		MONITORING METHODOLOGY
		VICTOR ANIBAL RODRIGUEZ GEOTHERMAL MEASURES MANAGER		MONITORING METHODOLOGY
		CARLOS ERNESTO MALGER COORDINATOR OF OPERATIONS		PROJECT DESCRIPTION, BASELINE AND MONITORING METHODOLOGY
		ALVARO MARAVILLA PLANT OPERATOR		PROJECT OPERATION

2.2. RESOLUTION OF CLARIFICATION AND CORRECTIVE ACTION REQUESTS

Corrective action and clarification requests raised by ICONTEC were presented to the project participants and resolved through communication and meetings between LaGeo, S. A. de C. V and ICONTEC. To guarantee the transparency of the renewal process, the concerns raised and the response provided by the project participants were documented in more detail in the validation protocol in Annex A.

LaGeo, S. A. de C. V, submitted the request for renewal of the crediting period on April 15th 2013 /18/.

Since modifications to the project design document were necessary to resolve ICONTEC's concerns, the client updated the PDD by assessing the validity of the original/current baseline and updating it at the renewal of the crediting period. After of review the last version of the revised PDD /14/, ICONTEC issued the validation report to the request for renewal of the crediting period.

2.3. INTERNAL QUALITY CONTROL

This report includes the validation findings that underwent a technical review before being submitted to the project participants.

The technical review and the quality control of the process were performed by an internal technical reviewer in accordance with the ICONTEC's internal procedures for carrying out validation, verification and renewal of CDM project activities. The technical reviewers are qualified in accordance with ICONTEC's professional qualification scheme for CDM project activities.

2.4. VALIDATION TEAM

The validation team consists of the following personnel:

Table 2: Validation Team

ROLE	LAST NAME	FIRST NAME	COUNTRY
LEAD AUDITOR	DUQUE	ANGELA	COLOMBIA
TECHNICAL EXPERT	GRISALES	CRISTIAN	COLOMBIA

The validation team is qualified in accordance with ICONTEC's qualification scheme for CDM project activities.

3. VALIDATION FINDINGS

3.1. OVERVIEW

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 Annex A.

3.2. GENERAL REQUIREMENTS

3.2.1. APPROVAL AND AUTHORIZATION

The project participant of the project is: LaGeo, S. A. de C. V.

The participation of the project participant has been approved by the Salvadorian Ministry of Environment and Natural Resources /19/, DNA of San Salvador under letter of approval dated on 31/10/2005 (see latest version of PDD /14/, section F).

ICONTEC verified the continued validity of the project's approval by reviewing the validity of the letter of approval issued by the official DNA.

3.2.2. MODALITIES OF COMMUNICATION

For the renewal of the crediting period, there were changes to the list of project participants reported in the PDD along with the change in the authorized focal point of the project. ICONTEC raised CL 5 in order to ask about the abovementioned and by reviewing the approvals of the annex 2 of the MoC for both changes, the finding was closed.

The approval by the UNFCCC for changes in the MoC was made on 17/02/2012, 06/06/2013, 24/09/2013 and 26/09/2013.

The approval of the withdrawal of CAF as a PP was made on 04/10/2013.

ICONTEC verified that all the changes abovementioned were notified to the secretariat in accordance with the paragraph 305 of the VVS /1/ and paragraph 246 of the PCP/6/.

ICONTEC verified that the PP submitted the request for renewal of crediting period of the registered CDM project activity *LaGeo, S. A. de C. V., Berlin Geothermal Project, Phase Two*, registration number N° 0297 on April 15, 2013 by reviewing the email /20/ sent to cdmregistration@unfccc.int and secretariat@unfccc.int where it was attached the updated version of the PDD /14/. The request for renewal was made within 180 days prior to the date of expiration of the current crediting period.

3.3. PROJECT DESIGN

The project activity requesting renewal of crediting period is an extension of the Berlin Geothermal Power Plant /21/ through the drilling of additional geothermal wells. The project exploits the resource of the Berlin Geothermal Field characterized by a depth between 1,000 and 1,500 masl, temperature in the range of 280 to 300 °C, 115 bar pressure, and good rock permeability. Reservoir dimensions and characteristics are enough to sustain a 44 MW power plant for the entire life of the project, with an expected field depletion of about 1% per year.

The current project process is characterized for a “flash” or condensing power plant, which takes advantage of the high temperature in the geothermal reservoir of Berlin. The field produces a mixture of steam and water that is extracted through the production wells. The steam and water is separated in a cyclonic separator, then it is piped to the power station where drives the turbine to produce electric power. The steam is condensed after leaving the turbine, creating a partial vacuum and thereby, maximizing the power generated by the turbine-generator. The steam is usually condensed in a direct contact condenser. In a direct contact condenser, the cooling water from the cooling tower is sprayed onto and mixed with the steam. Then, the condensed steam forms part of the cooling water circuit, and a substantial portion is subsequently evaporated and dispersed into the atmosphere through the cooling tower. Excess cooling water called blow down is disposed of in shallow injection wells.

The electricity produced by the synchronous generator is transformed from 13.8 kV to 115 kV at Berlin electric substation before to be sent to the grid. The voltage and current transformers of the electricity metering system are located at the 115 kV bus of the step-up substation that is the delivery point. The instrument transformers send the voltage and

current signals to the main and secondary electricity meters located in the control room of the power plant.

The project activity was registered using the methodology ACM0002, version 04/2/ *“Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources”* and for the renewal of the crediting period is applying the version 14.0.0 of the same methodology /3/.

The project boundary in accordance with ACM0002 version 14.0.0 is defined as the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to. Given that, the produced electricity is feeding into the grid, the boundary includes the Salvadorian National Grid /21/. ICONTEC verified the reported project boundary by reviewing the single line diagram of the Salvadorian Electricity System, issued by the official grid operator in San Salvador UT /21/.

During the validation CL 8 was raised in order to ask about the description of the project boundary, physically delineating the project activity and the analysis for the GHG source “CO₂ emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants”. The PP included the requested information in the latest version of the revised PDD /14/ and the finding was closed.

The emissions sources and GHGs involved in the project are the CO₂ emissions from electricity generation in fossil fuel fired by power plants in the national interconnected system and fugitive emissions of carbon dioxide and methane due to release of non-condensable gases from produced steam in the geothermal field.

The relevant sections of the project design document relating to the baseline, estimated emission reductions and the monitoring plan were updated in the revised PDD (version 21, dated on 28/01/2014) /14/ using an approved baseline and monitoring methodology as follows:

- Methodology: ACM0002, version 14.0.0 /3/.
- Guidelines for completing the project design document form version 01.0 /5/.
- Project design document form (F-CDM-PDD), version 04.1 /22/.

As per VVS version 05.0 /1/ the latest approved version of a baseline and monitoring methodology, applied in the original PDD /14/ of the registered CDM project activity, is used.

The project activity was registered with the approved methodology, ACM0002, version 04.

Since version 04 of ACM0002 is no longer valid, the PDD for the renewal crediting period was revised in line with the approved methodology ACM0002 version 14.0 /3/, which is the latest version of the applied methodology at the time of submitting the revised PDD and is currently valid.

ICONTEC raised CL 7 in order to ask about the fulfillment of the project activity with the applicability conditions requested in ACM0002, version 14.0. The PP justified each one of the conditions in the latest version of the PDD /14/ and the finding was closed.

The criteria applicability of the latest version for the applied methodology /3/ was verified by ICONTEC, as follows:

Table 3: Methodology Applicability Conditions Analysis

	Applicability condition	Means of validation
ACM0002 version 14.0	The Project Activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit.	During the onsite visit ICONTEC verified that the used resource is the steam coming from the Geothermal field, which is feeding a new power unit (capacity addition of 44MW) beside to the existing Berlin Geothermal Power Plant.
	In the case of capacity additions, retrofits or replacements (except for capacity addition projects for which the electricity generation of the existing power plant(s) or unit(s) is not affected): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity addition or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the Project Activity.	ICONTEC verified that the existent power plants started operations in 1992, and were retrofitted in 1999 (unit 1 started operations on September 7 th 1999 and unit 2 started in October 1 st 1999) through the review of the letter N°0759/13 /23/ issued by the official grid operator UT, where the above mentioned dates are reported. These events occurred prior to the start of a minimum historical reference of five years and not capacity additions have been undertaken between the start of this minimum historical reference period and the implementation of the project activity.
ACM0002 Version 14.0	<p>In case of hydro power plants, one of the following conditions must apply:</p> <ul style="list-style-type: none"> - The Project Activity is implemented in an existing single or multiple reservoirs, with no change in the volume of any of reservoirs; or - The Project Activity is implemented in an existing single or multiple reservoirs, where the volume of any of reservoirs is increased and the power density of each reservoir, as per the definitions given in the Project Emissions section, is greater than 4 W/m²; or - The Project Activity results in new single or multiple reservoirs and the power density of each reservoir, as per the definitions given in the Project Emissions section, is greater than 4 W/m². 	ICONTEC during the onsite visit verified that the current project activity is the energy generation by using the geothermal capacity of the Berlin Geothermal Field and there is not involving any kind of hydro power potential in the project.
	The methodology is not applicable to the following:	ICONTEC during the onsite visit verified that the current project activity is the energy generation by using the geothermal capacity of the Berlin

	Applicability condition	Means of validation
	<ul style="list-style-type: none"> - Project activities that involve switching from fossil fuels to renewable energy sources at the site of the Project Activity, since in this case the baseline may be the continued use of fossil fuels at the site; - Biomass fired power plants; - Hydro power plants that result in new reservoirs or in the increase in existing reservoirs where the power density of the power plant is less than 4 W/m2. 	Geothermal Field and there is not involved neither hydro power potential nor biomass power plants in the project.
	In the case of retrofits, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is “the continuation of the current situation, that is to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance”.	ICONTEC during the onsite visit and by reviewing the registered project design document /14/ verified that there is not another proposed project activity to be implemented in the baseline different to the proposed CDM project activity and that the current power equipment still is in use and undertaking the maintenance activities as usual.
Tool to calculate the emission factor for an electricity system Version 04.0	This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects).	ICONTEC during the onsite visit and by reviewing the files of the project design /14/, energy sales to the grid /15/ and power connection to the grid /21/ could verified that the project activity is the substitution of grid energy by the generation of clean power energy through the use of geothermal potential.
Tool to calculate the emission factor for an electricity system Version 04.0	Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off-grid power plants. In the latter case, the conditions specified in “Appendix 2: Procedures related to off-grid power generation” should be met. Namely, the total capacity of off-grid power plants (in MW) should be at least 10 per cent of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh) should be at least 10 per cent of the total electricity generation by grid power plants in the electricity system; and that factors which negatively affect the reliability and stability of the grid are primarily due to constraints in generation and not to other aspects such as transmission capacity.	ICONTEC during the onsite visit and by reviewing the files of emission factor calculation /10/ verified that the Salvadorian Combine Margin Grid Emission Factor was calculated only taking into account grid power plants.
	In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country.	ICONTEC by reviewing the list of Annex I Countries /8/ could verified that Salvador does not belong to the Annex I Countries.

	Applicability condition	Means of validation
	Under this tool, the value applied to the CO ₂ emission factor of biofuels is zero.	ICONTEC during the onsite visit and by reviewing the fuel type used for power plants in El Salvador /17/ verified that the value applied in the CO ₂ emission factor calculation files for biofuels has been zero.

The greenhouse gas emissions occurring within the project boundary as a result of its implementation are all addressed by the applied methodology. There are no greenhouse gas emissions within the project boundary and caused by the implementation of the project activity that contribute to more than 1% of the expected annual emission reductions and that are not addressed by the applied methodology. This was verified by ICONTEC by means of the onsite visit.

ICONTEC concluded that the project description, as reported in the revised PDD version 21 /14/, is sufficiently complete and accurate to meet CDM requirements for renewal crediting period.

3.4. VALIDITY OF THE ORIGINAL/CURRENT BASELINE

The validity of the original / current baseline was assessed using methodology ACM0002, version 14.0 /3/ and tool for the assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period, version 03.0.1/9/.

ICONTEC raised CAR 2 given that in the version 19 of the PDD /14/ the PP had not established the baseline scenario for the renewal of the crediting period none in accordance with the latest version of ACM0002, version 14.0 /3/ nor with the section 7.2.5 of the CDM Project Standard /7/ nor with the Methodological Tool, “Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period”, version 03.0.1/9/. The PP updated the PDD and reassessed the baseline scenario as follow:

Step 1: Assess the validity of the current baseline for the next crediting period

The baseline scenario approved by UNFCCC in the registered PDD in accordance with ACM0002, version 04.0 was:

“The Project Activity, a greenhouse gas (GHG) free power generation project, will result in GHG emissions reductions as the result of the displacement of electricity generation from fossil-fuel thermal plants that would have otherwise dispatched to the grid.

The baseline emission factor for the Project Activity is calculated as a combined margin of the operating and build margin emission factors. For the purpose of determining the build and the operating margin emission factors, the project electricity system is defined by the spatial extent of the power plants that can be dispatched without significant transmission constraints. Similarly, the connected electricity system is defined as an electricity system that is connected by transmission lines to the project electricity system and in which power plants can be dispatched without significant transmission constraints (Salvadoran interconnected grid)”

The baseline scenario that applies to the renewal of the crediting period (from ACM0002 version 14.0) is:

“In the absence of the CDM Project Activity, the existing facility would continue to supply electricity to the grid at historical levels, until the time at which the generation facility would likely be replaced or retrofitted ($DATE_{BaselineRetrofit}$). From that point of time onwards, the baseline scenario is assumed to correspond to the Project Activity, and no emission reductions are assumed to occur”.

Taking into account that the baseline scenario reported in the registered PDD does not match with the one that applies from the latest version of ACM0002 /3/, The PP reassessed the baseline scenario as follow:

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies

ICONTEC verified that the relevant mandatory national and sectoral policies which have come into effect after the submission of the project activity for validation, and that could affect the project activity are:

- The National Salvadorian Energy Policy 2010-2024 /24/, which seeks to promote the energy renewable sources in order to diversify the energy matrix in El Salvador.
- The Fiscal Incentive Law /25/, which seeks to promote the use of renewable resources for the electricity generation. It entered into force in December 28, 2007 for new investment projects.

ICONTEC verified that the abovementioned policies do not restrict the electricity generation from fossil-fuel thermal plants and are not doing mandatory the investment in renewable projects. Also these policies are not retroactive to the projects that began before their adoption. (The older one was promulgated in December 2007 and the project activity began in 2006).

Hence ICONTEC deems that the current baseline scenario is in compliance with the relevant mandatory national and or sectoral policies.

Step 1.2: Assess the impact of circumstances

ICONTEC during the onsite visit assessed the impact of circumstances existing at the time of requesting renewal of the crediting period on the current baseline emissions and found that the proposed baseline by ACM0002, version 14.0.0 /3/ did not match with the one reported in the registered PDD. ICONTEC raised CAR 2 in order to request the assessment of the continued validity of the baseline for the renewal. The PP reassessed the current baseline scenario based on the ACM0002 methodology, version 14.0.0 and the finding was closed.

Step 1.3: Assess whether the continuation of use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested.

During the onsite visit it was verified by ICONTEC that the updated baseline scenario of the project activity has been working with the same equipment reported in the registered PDD (units 1 and 2 of Berlín Geothermal Plant) without any investment. Units 1 and 2 of Berlín Geothermal Plant, started commercial operations in 1999 and have a typical lifetime of approximately 30 years as ICONTEC verified by reviewing the Geothermal Energy Association Report /26/. Hence the technical life of the existent equipment exceeds the crediting period for which renewal is requested.

Step 1.4: Assessment of the validity of the data and parameters

For the renewal of the crediting period the PP updated the emission factor of the grid and the GWP by using the most recent information of the national grid and the most recent IPCC default values.

ICONTEC raised CAR 3 given that the PP had not chosen the appropriated set of power units that comprises the larger annual electricity generation (SET_{sample}) in order to make the calculation of the BM. The PP updated the set of data in the latest version of the PDD /14/ and the finding was closed.

ICONTEC raised CAR 4 given the GWP used for the renewal of the crediting period did not match with the one approved by UNFCCC (EB 69 annex 3, Decision 4CMP-7 and table 2.14 of the errata to the contribution of Working Group) for the second commitment period of the Kyoto Protocol. The PP updated the value of GWP with the latest one approved by UNFCCC and the finding was closed.

Conclusion on step 1

Application of Steps 1.1, 1.2, 1.3 and 1.4 confirmed that the current baseline shall be updated for the subsequent crediting period in accordance with the latest version of ACM0002 /3/.

The grid emission factor was updated based on the latest version of “Tool to calculate the emission factor for an electricity system” (Version 04.0.0) /4/.

The GWP was updated based on the EB 69 annex 3, Decision 4CMP-7 /27/ and table 2.14 of the errata to the contribution of Working Group /28/.

Step 2: Update the current baseline and the data and parameters

The PP applied directly the step 2.2, given that the baseline scenario was updated.

Step 2.2: Update the data and parameters

ICONTEC verified that the PP updated the formulae, data and parameters in accordance with the latest versions of ACM0002 /3/, tool to calculate the emission factor for an electricity system /4/ and IPCC default values in sections B.4 and B.6 of the latest version of the revised PDD /14/, Emission Reductions Spreadsheet /11/ and emission factor spreadsheet /10/. The results of this step are reported in sections 3.5 and 3.6.

ICONTEC confirms that the PP correctly assessed the current baseline and updated it in accordance with the latest version of the applied methodology and relevant tools.

3.5. MONITORING PLAN

Monitoring plan presented on revised PDD /14/ complies with requirements of approved methodology ACM0002 /3/ and all applied tools /4/. During renewal process, some findings (CL 6) were raised with regard to the completeness of the monitoring plan. This situation was corrected on the latest version of the revised PDD /14/ and the description of how each finding was closed was reported in the Annex A of this report.

Monitoring of GHG emission reductions is based on the requirements of ACM0002 /3/ and tool to calculate the emission factor /4/. ICONTEC during the documental review of the updated PDD /14/ and calculation files /10/, /11/ could verify that the monitoring has been made in a transparently way and without material misstatements.

ICONTEC verified through interviews made during the onsite to relevant personnel of maintenance and operation that the project currently is equipped with an extensive monitoring system as it was established in the monitoring plan of the registered PDD and the procedures of maintenance and operation are correctly followed in order to maintain the correct operation of the installed equipment and ensure the accuracy of the measurements and reported data.

Validation team checked all parameters presented at the monitoring plan of the latest version of the revised PDD /14/, against the requirements of the methodology and applied tool. No deviations to the project activity were found.

3.5.1. PARAMETERS FIXED EX-ANTE

Grid emission factor calculation:

The grid emission factor has been calculated by the PP by applying the “*Tool to calculate the emission factor for an electricity system*” /4/, using the data provided by the Salvadorian authorities of the electrical market (see references /15/, /16/ and /17/). ICONTEC verified each source provided both in the EF spreadsheet /10/ and section B.6.1 on the updated PDD /14/.

The emission factor (EF_y) is calculated as a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) factors.

The combined margin emission factor for the Salvadorian Electrical Grid was determined as **0.569 tCO₂/MWh**, considering weights of $EF_{grid, OM, y} = 0.25$ and $EF_{grid BM, y} = 0.75$, and is fixed ex ante for the entire second renewable crediting period of 7 years.

The OM emission factor was calculated ex-ante using the adjusted simple OM approach based on the generation-weighted average emissions per electricity unit over a three year period of 2010, 2011 and 2012. BM is calculated ex ante based on the 20% most recent capacity additions in the Salvadorian Electrical Grid based on net generation for the year 2012. The operating margin was determined as 0.711 tCO₂e/MWh and the build margin as

0.522 tCO₂e/MWh. The calculations and assumptions were verified and found as correct by ICONTEC.

ICONTEC raised CL 11 given that the PP had not followed a stepwise procedure and had not reported the justifications and assumptions used to calculate the Grid Emission Factor. The PP included in the latest version of the PDD /14/ the followed steps and the chosen options and the finding was closed.

GWP_{CH4}:

For the renewal of the crediting period was updated the GWP with the one approved for the second commitment of the Kyoto Protocol (25 tCO₂/tCH₄) in accordance with the decision made in the EB 69, annex 3, Decision 4CMP-7 and table 2.14 of the errata to the contribution of Working Group.

EG_{historical}:

For the renewal of the crediting period the value of EG_{historical} = 440,843 MWh was determined by PP as the annual average historical net electricity generation data of existing power units between 2002 and 2006. ICONTEC verified the reliability of this value by reviewing the official letter /23/ issued by UT, where is cited the beginning of commercial operation of the units 1 and 2 and the recorded of generating energy after their start.

δ_{historical}:

ICONTEC verified that the reported value of δ_{historical} = 12,904 MWh corresponds with the standard deviation of the annual average historical net electricity generation delivered to the grid by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity.

The values reported by UT and used to calculate the standard deviation were:

Annual average historical net electricity generation data of existing power units

Year	Historical data
2002	440,743.376
2003	461,930.520
2004	433,891.929
2005	427,719.411
2006	439,928.442

DATE_{BaselineRetrofit}:

ICONTEC verified that DATE_{BaselineRetrofit} = 2029 correspond with the date in which the existing equipment would need to be replaced in the absence of the project activity. The start date of the units 1 and 2 was 1999 and the expected lifetime reported in the Special Report of the Intergovernmental Panel on Climate Change /26/ for geothermal projects is 30 years.

ICONTEC raised CL 12 in order to ask about a better explanation of the source of the parameters fixed ex ante. The PP included the missing ex ante parameters and improved the explanation about them in the latest version of the PDD /14/. The finding was closed.

3.5.2. PARAMETERS EX-POST

The main monitoring parameters are reported in table 4. ICONTEC confirms that the latest revised PDD /14/ clearly states the information requested for the monitoring parameters as required by the latest version of ACM0002 /3/.

ICONTEC raised CL15 in order to ask about a better explanation of the information reported for each parameter to be monitored. The PP in the latest version of the PDD /14/ improved the description and the finding was closed.

Table 4: Data and parameters ex-post

Data / Parameter	Means of validation
$W_{\text{steam}, \text{CO}_2}$	<p>The average mass fraction of CO_2 in the produced steam in the project activity will be monitored at least every three months and recorded in electronic and paper. This parameter will be monitored by collecting non-condensable gases samples from the main steam line with glass flasks, filled with sodium hydroxide solution and additional chemicals to prevent oxidation.</p> <p>The samples will be analyzed in a gas chromatograph Mettler Toledo DL22, S/N 5126290638, TAG EQ-LAB-078 by a titration method. The calibration will be made at least once a year by the Geo-Chemical Laboratory of LaGeo, which is accredited by ISO/IEC 17025 /12/.</p>
$W_{\text{steam}, \text{CH}_4}$	<p>The average mass fraction of CH_4 in the produced steam in the project activity will be monitored at least every three months and recorded in electronic and paper. This parameter will be monitored by collecting non-condensable gases samples from the main steam line with glass flasks, filled with sodium hydroxide solution and additional chemicals to prevent oxidation. The samples will be analyzed in a gas chromatograph Hewlett Packard 6890, S/N 000022485, TAG EQ-LAB-034 in order to determine the content of the residuals including CH_4. The calibration will be made at least once a year by the Geo-Chemical Laboratory of LaGeo, which is accredited by ISO/IEC 17025 /12/.</p>
$M_{\text{steam}, y}$	<p>The quantity of steam produced during a year in the project activity will be monitored in a daily basis and recorded in electronic and paper. This parameter will be monitored by an annubar flow meter. Measures of temperature and pressure upstream of the flow meter are required to define the steam properties.</p> <p>The measures of steam quantities will be made by an annubar flow meters ROSEMOUNT, which will be calibrated twice a year by the Geo-Chemical Laboratory of LaGeo, which is accredited by ISO/IEC 17025 /12/.</p>
$EG_{\text{Facility}, y}$	<p>The quantity of net electricity generation supplied by the project plant to the grid will be monitored in a continuous base and archived at least monthly in an electronic format and remotely in the SCADA System. This parameter will be monitored by 0.2s accuracy energy meters consisting of main and backup meters. The calibration will be made at least each two years by private companies accredited by the national dispatch center (UT) and in accordance with the Annex of the Operation Norms of the Transmission System and Wholesale Market /29/. The generated power delivered by the project activity and registered by UT will be cross check with the receipt of sales.</p>

ICONTEC during the onsite visit could verify that currently in the project activity there is implemented a Quality Management System and an assignation of roles and responsibilities in order to keep the correct performing of the project activity.

The monitoring plan is supervised and executed by:

- Operation coordinator
- Measuring coordinator

- Geo-chemical laboratory coordinator
- Environmental unit coordinator

There is a general coordinator who reviews the information reported for each one of the coordinators, executes the calculations of emission reductions, completes the MR and is in charge of the storing of data and information of the CDM project.

With the above information, ICONTEC confirmed that the monitoring plan established by the PP for the renewal of the crediting period for LaGeo, S.A. de C.V., Berlin Geothermal Project, Phase Two, is feasible and that the PP has the ability and means of implementation sufficient to ensure that the emission reductions achieved as a result of the project activity, are reported ex-post and verified. It is according with paragraph 131 of VVS /1/.

3.6. CALCULATION OF GHG EMISSIONS

Baseline emissions:

According to equation 11 of the methodology ACM0002, version 14.0.0 /3/, emission reductions shall be calculated as follows:

$$ER_y = BE_y - PE_y$$

Where:

- ER_y = Emission reductions in year y (t CO₂e/yr)
- BE_y = Baseline emissions in year y (t CO₂/yr)
- PE_y = Project emissions in year y (t CO₂e/yr)

According to equation 6 of the methodology ACM0002, version 14.0.0 /3/, baseline emissions shall be calculated as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$$

Where:

- BE_y = Baseline emissions in year y (t CO₂/yr)
- $EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)
- $EF_{grid,CM,y}$ = Combined margin CO₂ emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system” (t CO₂/MWh)

During the onsite visit ICONTEC verified that the project activity consists of a new geothermal power unit installed next to an existing geothermal energy based power plant (units 1 and 2 of Berlin Geothermal Plant). For the above mentioned $EG_{PJ,y}$ was calculated by PP using the option 1 of the latest version of ACM0002 /3/ as follows:

$$EG_{PJ,y} = EG_{facility,y} - (EG_{historical} + \sigma_{historical})$$

Where $EG_{facility,y}$ = The sum of the annual average historical net electricity generation data (440,843 MWh) and the value forecasted for the project activity (44 MW x 8,760 hours x 0.85 = 327,624 MWh) in the registered PDD /14/.

Hence, the value of $EG_{facility,y} = 768,467$ MWh and:

$$\begin{aligned} EG_{PJ,y} &= EG_{facility,y} - (EG_{historical} + \sigma_{historical}) \\ &= 768,467 \text{ MWh} - (440,843 \text{ MWh} + 12,904) \\ &= 314,720 \text{ MWh} \end{aligned}$$

The baseline emissions for the renewal of the crediting period are:

$$BE_y = EG_{PJ,y} \times EF_{grid, CM, y} = 314,720 \text{ MWh} \times 0.569 = 179,075 \text{ tCO}_2/\text{MWh}$$

Project Emissions:

According to equation 1 of the methodology ACM0002, version 14.0.0 /3/, project emissions shall be calculated as follows:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y}$$

Where:

PE_y	= Project emissions in year y (t CO ₂ e/yr)
$PE_{FF,y}$	= Project emissions from fossil fuel consumption in year y (t CO ₂ /yr)
$PE_{GP,y}$	= Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year y (t CO ₂ e/yr)
$PE_{HP,y}$	= Project emissions from water reservoirs of hydro power plants in year y (t CO ₂ e/yr)

ICONTEC during the onsite visit could verify that for the renewal of the crediting period the Project activity does not have project emissions associated with water reservoirs or project emissions associated with fossil fuel consumption. Hence the only project emissions to take into account will be the emissions related to the operation of geothermal power plants.

From equation 2 of ACM0002 /3/:

$$PE_{GP,y} = (w_{steam,CO2,y} + w_{steam,CH4,y} \times GWP_{CH4}) \times M_{steam,y}$$

Where:

$W_{steam,CO_2,y}$	=	Average mass fraction of carbon dioxide in the produced steam in year y (t CO ₂ /t steam)
$W_{steam,CH_4,y}$	=	Average mass fraction of methane in the produced steam in year y (t CH ₄ /t steam)
GWP_{CH_4}	=	Global warming potential of methane valid for the relevant commitment period (t CO ₂ e/t CH ₄)
$M_{steam,y}$	=	Quantity of steam produced in year y (t steam/yr)
$PE_{GP,y}$	=	Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year y (t CO ₂ e/yr)

The abovementioned parameters requested to calculate the project emissions due to the operation of geothermal power plants were estimated by PP based on production data from 2012. ICONTEC verified these parameters by reviewing the approved MR issued for the sixth monitoring period /13/ and found them feasible and reliable.

Table 5: Monitoring parameters

Parameter	Description	Unit	Value
W steam CO ₂ ,y	Average mass fraction of carbon dioxide in the produced steam in year y	t CO ₂ /t steam	1.01E-02
W steam CH ₄ ,y	Average mass fraction of methane in the produced steam in year y	tCH ₄ /t steam	4.95E-07
GWP CH ₄	Global warming potential of methane valid for the relevant commitment period	t CO ₂ e/t CH ₄	25
M steam, y	Quantity of steam produced in year y	t steam/yr	2,858,252

Substituting values of table 5 in Equation 2 from the ACM0002 results:

$$PE_{G,y} = (1.01E-02 + (4.95E-07 \times 25)) \times 2,858,252 = 28,904 \text{ tCO}_2\text{e per year.}$$

Emission Reductions:

According to equation 11 of the methodology ACM0002, version 14.0.0 /3/, emission reductions will be:

$$ER_y = BE_y - PE_y = 179,075 \text{ tCO}_2\text{e} - 28,904 \text{ tCO}_2\text{e} = 150,171 \text{ tCO}_2\text{e per year.}$$

4. VALIDATION OPINION – CREDITING PERIOD RENEWAL

ICONTEC performed the validation opinion for the crediting period renewal of the LaGeo, S.A. de C.V., Berlin Geothermal Project, Phase Two, in El Salvador. The validation was performed on the basis of UNFCCC criteria for the Clean Development Mechanism and host country criteria, as well as criteria given to provide for consistent project operations, monitoring and reporting.

The review of the updated Project Design Documentation and the subsequent follow-up interviews provided ICONTEC with sufficient evidence to determine the fulfillment of the stated criteria.

The project activity has been proposed as unilateral project by LaGeo, S. A. de C. V. El Salvador has provided approval of voluntary participation and meets all requirements to participate in CDM. The Salvadorian's DNA confirmed that the project helps in achieving sustainable development.

The project on the renewal of the crediting period correctly applied the methodology: ACM0002 "*Consolidated methodology for grid-connected electricity generation from renewable sources*". Version 14.0.0.

The project involves the exploitation of the resource of the Berlin Geothermal Field characterized by a depth between 1,000 and 1,500 masl in the range of 280-300°C, 115 bar pressure, and good rock permeability. Reservoir dimensions and characteristics are enough to sustain a 44 MW power plant for the entire life of the project activity, with an expected field depletion of about 1% per year. 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 150,171 tCO₂e per year over the selected 7 year crediting period. The emissions reduction forecast has been checked and it is deemed likely that the stated amount is achieved because the underlying assumptions do not change.

In summary, it is ICONTEC's opinion that the "*LaGeo, S.A. de C.V., Berlin Geothermal Project, Phase Two*" in El Salvador, as described in the updated PDD version 21, meets all relevant UNFCCC requirements for the CDM and all relevant host country criteria and correctly applies the baseline and monitoring methodology "ACM0002". Version 14.0. ICONTEC thus requests the renewal of the crediting period of the project as a CDM project activity."

Bogotá D.C., January 29th 2014



Monica Vivas
Director of conformity assessment
ICONTEC

5. REFERENCES

- /1/ Clean development mechanism validation and verification standard, version 05.0.
- /2/ Methodology: ACM0002, version 04.
- /3/ Methodology: ACM0002, version 14.0.0.
- /4/ Tool to calculate the emission factor for an electricity system (version 04.0.0).
- /5/ Guidelines for completing the project design document form (version 01.0).
- /6/ Clean development mechanism project cycle procedure (version 05.0).
- /7/ Clean development mechanism project standard (version 05.0).
- /8/ List of Annex I Countries issued by UNFCCC.
http://unfccc.int/parties_and_observers/parties/annex_i/items/2774.php
- /9/ Methodological Tool “Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period”, version 03.0.1.
- /10/ Emission factor calculation file, issued by LaGeo, S. A. de C. V, dated on:
Version 1 on 25/04/2013 and version 2 on 30/08/2013. Files:
EF calculation-Berlín Geothermal Project Phase II-V1.xls
EF calculation-Berlín Geothermal Project Phase II-V2.xls
- /11/ Emission reductions calculation file, issued by LaGeo, S. A. de C. V, dated on 21/10/2013. File: “EPj & emission reductions calculation.xls”.
- /12/ Accreditation Certificate LEA-09:03 in ISO / IEC17025:2005 for Geo-Chemical Laboratory of LaGeo, issued by CONACYT, dated on 11/06/2010. File: “IMG_4435.JPG”
- /13/ Monitoring report for the sixth monitoring period, issued by LaGeo, S. A. de C. V, dated on 14/01/2013.
- /14/ CDM Project Design Document, including Baseline Methodology and the Monitoring Plan, versions 18, 19, 20 and 21 dated on 06/02/2006, 02/04/2013, 10/10/2013 and 28/01/2014 respectively. Files:
LaGeo_PDD_ver18.pdf
PDD_form05-Berlin Geothermal Project-Phase II-version 19.pdf
PDD_form05-Berlin Geothermal Project-Phase II-version 20.pdf
PDD_form05-Berlin Geothermal Project-Phase II-version 21.pdf
- /15/ Reports of Electricity generated by power plants in El Salvador, years: 2010, 2011 and 2012, issued by the official source “Unidad de Transacciones, S.A”, table 2. Files: “Boletín estadístico-2010.pdf”, “Boletín estadístico-2011.pdf”, “Boletín estadístico-2012.pdf”.
- /16/ Report of starting dates for power plants in El Salvador, issued by the official source “SIGET”, table 7. File: “SIGET_Boletín_2011.pdf”.
- /17/ Official letter with the fuel type used for power plants in El Salvador, issued by “Unidad de Transacciones, S.A”, dated on 02/04/2013. File:
Carta UT-Generación horario 2010,2011,2012.pdf.
- /18/ Email with the acceptance of the request for renewal of the crediting period for LaGeo, S.A. de C.V., Berlin Geothermal Project, Phase Two, issued by the secretariat of UNFCCC. Dated on 15/04/2013.
- /19/ Salvadorian Ministry of Environment and Natural Resources. <http://www.marn.gob.sv/>
- /20/ Email requesting renewal of crediting period for LaGeo, S. A. de C. V., Berlin Geothermal Project, Phase Two, issued by the current focal point Ruben Loy, dated on 15/04/2013.

- /21/ LaGeo web page. <http://www.lageo.com.sv/centrales.php>
- /22/ Single Line Diagram for the Salvadorian Interconnected System.
<http://www.ut.com.sv/web/guest/15>
- /23/ Project design document form (F-CDM-PDD), version 04.1.
http://cdm.unfccc.int/Reference/PDDs_Forms/PDDs/PDD_form05.pdf
- /24/ Letter N° 0759/13, informing the beginning of commercial operation for the thermal power units 1 and 2 in Berlin Geothermal Field, issued by UT, dated on 06/05/2013. National Salvadorian Energy Policy 2010-2024, issued by CNE, dated on 2009. File: "poltica_nacional_de_energia.pdf"
http://www.cne.gob.sv/index.php?option=com_content&view=article&id=153&Itemid=201
- /25/ Fiscal Incentive Law N° 462 for the promotion of renewable resources in El Salvador, issued by the Salvadorian Supreme Court of Justice, dated on 28/12/2007. File: "Ley de incentivos fiscales.pdf"
- /26/ Special Report of the Intergovernmental Panel on Climate Change, issued by IPCC, dated on 2012, page 425, section 4.7.3, "*Geothermal-electric performance parameters*". File: http://srren.ipcc-wg3.de/report/IPCC_SRREN_Ch04.pdf
- /27/ Decision 4CMP-7. <http://unfccc.int/resource/docs/2011/cmp7/eng/10a01.pdf>
- /28/ The Working Group I contribution to the IPCC Fourth Assessment Report. Table 2.14. <http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-errata.pdf>
- /29/ Operation Norms of the Transmission System and Wholesale Market in El Salvador, issued by UT, updated in May 2013. File: http://www.ut.com.sv/c/document_library/get_file?p_l_id=10254&folderId=10281&name=DLFE-8.pdf

6. ANNEX A

The audit team conducts a thorough, independent assessment of the registered project activities.

The next table contains questions that the audit team shall follow in order to determine whether the project activity complies with the requirements of paragraph 62 of the CDM modalities and procedures. The audit team ensures that only the verification activities, undertaken after the publication of the monitoring report on the UNFCCC CDM website, were used as the basis for ICONTEC to conclude the verification and submission of a request for issuance of CERs to the board.

Questions were answered on the right column using the following scores:

- Full: When the audit team had full access to the required information, the information is complete and satisfactory
- Partial: When the audit team did not have access to the information, or the information is incomplete, or not satisfactory. In this case, indicate finding type and number.
- Resolved: When a partial score is assigned, indicate the date when the finding was closed
- N/A: Shall be used when the question does not apply.

When raising a clarification request, corrective action request and forward action, it is in accordance with VVS v 05.0§ 24-29.

CHECKLIST QUESTION	REFERENCES	Final Conclusion
1. Global Stakeholder Consultation		
1.1 Has the validation team received and taken into account all comments on the PDD of the proposed project activity during the whole validation process? (not only during GSC) VVS (V 05.0) para34,35	N/A	N/A
1.2 If comments indicate that the proposed project activity does not comply with the CDM requirements, did the validation team request further clarification from the entity providing the comment? VVS (V 05.0) para.34	N/A	N/A

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CHECKLIST QUESTION	REFERENCES	Final Conclusion
2. Approval		
2.1 Has the designated national authority (DNA) of each Party indicated (as being involved in the proposed CDM project activity in the PDD) provided a written letter of approval? VVS (V 05.0) para. 38	N/A	N/A
2.2 Is the letter(s) of approval issued by the respective Party's DNA the confirmation of: (a) The Party is a Party to the Kyoto Protocol; (b) Participation is voluntary; (c) In the case of the host Party, the proposed CDM project activity contributes to the sustainable development of the country; (d) It refers to the precise proposed CDM project activity title in the PDD being submitted for registration? VVS (v 05.0) para. 39 and 50	N/A	N/A
3. Authorization		
3.1 All project participants have been listed in a consistent manner in the project documentation, and their participation in the project activity has been approved by a Party to the Kyoto Protocol. VVS (V 05.0) para. 46	N/A	N/A
3.2 Are there entities other than those authorized as project participants included in these sections of the PDD? VVS (V 05.0) para. 47	N/A	N/A
3.3 The approval of participation has been issued from the relevant DNA. VVS (V 05.0) para. 48	N/A	N/A
4. Modalities of communication		
4.1 All focal points included in the MoC, as well as the personal identities, including specimen signatures and employment status, have been validated by corporate,	See section 3.2.2	Partial See CL5 Closed 21.10.2013

CHECKLIST QUESTION	REFERENCES	Final Conclusion
personal identify and other relevant documentation like notarized documentation. VVS (V 05.0) para. 53		
4.2 Was the MoC correctly completed and duly authorized? - The last version of the form F-CDM-MOC has been used? - The information required as per the F-CDM-MOC, including its annex 1, is correctly completed. -The authorized project participants signing the F-CDM-MOC correspond to the authorized project participants included in F-CDM-MOC, annex 1. VVS (V 05.0) para. 59 - 60	See section 3.2.2	Partial See CL5 Closed 21.10.2013
5. Project design document		
5.1. The PDD was completed using the last version of the PDD form and guidance appropriate to the type of project activity. VVS (V 05.0) para. 62	See section 3.3	Full
6. Description of the project activity		
6.1 The PDD is accurate, complete, and provides an understanding of the proposed CDM project activity (by reviewing available designs and feasibility studies and conducting comparison analysis with equivalent projects). VVS (V 05.0) para. 64	See section 1.3 and 3.3	Partial See CL 1, CL 2, CL 3 and CL4 Closed.21/10/2013.
6.2 The project is correctly classified as large scale, non-bundled small-scale projects with emission reductions exceeding 15,000 tons per Year or bundled small-scale projects, each with emission reductions not exceeding 15,000 tonnes per year. VVS (V 05.0) para. 65	See section 1.3 and 3.3	Partial See CL 1, CL 2, CL 3 and CL4 Closed.21/10/2013.
6.3 For other individual proposed small-scale CDM project activities with emission reductions not exceeding 15,000 tonnes per year, the DOE should conduct a physical site visit as appropriate. If not, it shall be justified by the DOE. VVS (V 05.0) para. 66	See section 1.3 and 3.3	Partial See CL 1, CL 2, CL 3 and CL4 Closed.21/10/2013.

CHECKLIST QUESTION	REFERENCES	Final Conclusion
6.4 If applicable, was the use of any sampling approach made according to the “Standard for sampling and surveys for CDM project activities and programme of activities”? VVS (V 05.0) para. 66	N/A	N/A
7. Application of the selected Baseline and monitoring methodology		
7.1 The baseline and monitoring methodologies selected by the project participants are the valid versions of those approved by the Board. The selected version is valid at the time of submission of the proposed project activity for registration. VVS (V 05.0) para. 70 and 73	See section 3.4	Partial CAR 2 Closed. 20/08/2013.
7.2 The selected methodology applies to the project activity and was correctly applied with respect to: Project Boundary, baseline identification, algorithms and/ formulae used to determine emission reduction, additionality, monitoring methodology. VVS (V 05.0) para. 72 and 74	See section 3.4	Partial CAR 2 Closed. 20/08/2013.
7.3 Has each applicability condition listed in the approved methodology selected been confirmed? VVS (V 05.0) para. 77	See section 3.3, table 3 and section 3.4	Partial CL 7 and Closed. 20/08/2013
8. Deviation from an approved methodology		
8.1 Did the project request a deviation from an approved methodology before the publication of the PDD? VVS (V 05.0) para. 78	N/A	N/A
8.2 if there are any requests for deviation from an approved methodology, the applicability of the appendix 1 of Project standard must be applied. VVS (V 05.0) para. 79	N/A	N/A
9. Clarification on the applicability of an approved methodology		
9.1 In the cases where the DOE cannot make a determination regarding the applicability of the selected	N/A	N/A

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CHECKLIST QUESTION	REFERENCES	Final Conclusion
methodology to the proposed project activity, Was there requested any clarification on the applicability of the approved methodology? VVS (V 05.0) para. 81		
10. Project boundary		
10.1 Are all main GHG emission sources, the physical delineation of the proposed project activity and other relevant project and baseline emission sources covered in the methodology, included within the project boundary for the purpose of calculating project and baseline emissions for the proposed project activity? VVS (V 05.0) para. 82	See section 3.3	Partial CL 8 Closed.20/08/2013
10.2 Does the methodology allow project participants to choose whether a source or gas is to be included within the project boundary? -Has the project participant justified that choice? The DOE shall determine whether the justification provided is reasonable, based on an assessment of supporting documented evidence provided by the project participants and corroborated by observations if required. VVS (V 05.0) para. 84	See section 3.3	Partial CL 8 Closed.20/08/2013
10.3 For the project activities that have both A/R and non-A/R components, please confirm that the emissions associated with the A/R activity will be accounted for and documented by the A/R project activity. VVS (V 05.0) para. 85	See section 3.3	Partial CL 8 Closed.20/08/2013
11. Baseline scenario identification and description		
11.1 The Baseline identified for the proposed project activity is the scenario that reasonably represents the anthropogenic emissions by sources of GHGs that would occur in the absence of the proposed project activity. VVS (V 05.0) para. 88	See section 3.4	Partial CAR 2 Closed. 20/08/2013.

CHECKLIST QUESTION	REFERENCES	Final Conclusion
11.2 Please confirm that all tools required by the methodology have been used by the PP. VVS (V 05.0) para. 89	See section 3.4	Partial CAR 2 Closed. 20/08/2013.
11.3 Assess the baseline scenarios based on financial expertise and local and sectoral knowledge, crosscheck the information provided in the PDD with other verifiable and credible sources, such as local expert opinion, if available, relevant national and/or sectoral policies and circumstances, such as sectoral reform initiatives, local fuel availability, power sector expansion plans, and the economic situation in the project sector. VVS (V 05.0) para. 90, 91, 92	See section 3.4	Partial CAR 2 Closed. 20/08/2013.
12. Algorithms and/or formulae used to determine emission reductions		
12.1 Do the steps taken and equations applied to calculate project emissions, baseline emissions, leakage and emission reductions comply with the requirements of the selected baseline and monitoring methodology? VVS (V 05.0) para. 96	See section 3.4	Partial CL 10, CL 11, CL12 and CL 13 Closed.20/10/2013
12.2 If the methodology allows for selection between various equations or parameters, the DOE shall determine whether adequate justification has been provided and if the justification provided is reasonable, based on an assessment of supporting documented evidence provided by the project participants and corroborated by observations if required. VVS (V 05.0) para. 97	See section 3.4	Partial CL 10, CL 11, CL12 and CL 13 Closed.20/10/2013
12.3 Verify the justification given in the PDD for the choice of data and parameters used in the equations (appropriate, conservative and reasonable). Data sources must be provided for each parameter. VVS (V 05.0) para. 98	See section 3.4	Partial CL 10, CL 11, CL12 and CL 13 Closed.20/10/2013

CHECKLIST QUESTION	REFERENCES	Final Conclusion
13. Additionality of a project activity		
13.1 Assess and verify the reliability and credibility of all data and any assumptions, justifications and documentation provided by project participants to support the demonstration of additionality. Critically assess the evidence presented, using local knowledge and sectoral and financial expertise. VVS (V 05.0) para. 102	N/A	N/A
13.2 Please confirm that all tools required by the methodology have been used by the PP. VVS (V 05.0) para. 103	N/A	N/A
13.3 For small scale project activities or micro scale project activities, the project participant used the applicable Guidelines, procedures and documents issued by the EB VVS (V 05.0) para. 158 - 160	N/A	N/A
14. Assessment of prior consideration of the clean development mechanism		
14.1 has the start date of the project activity been identified in accordance with the CDM glossary of terms? VVS (V 05.0) para. 106	N/A	N/A
14.2 Prior consideration assessment must be done according to the latest version of the “guidelines on the demonstration and assessment of prior consideration of the CDM.” VVS (V 05.0) para. 106, 107, 108	N/A	N/A
14.3 Depending of the gap between the evidence documented, does the PP justify the validation opinion of the CDM status? VVS (V 05.0) para. 110, 111	N/A	N/A
15. Identification of alternatives (if apply)		
15.1 Have the alternatives in accordance with the approved methodology and/or the tool of additionality been identified? VVS (V 05.0) para. 113	N/A	N/A

CHECKLIST QUESTION	REFERENCES	Final Conclusion
<p>15.2 Does the DOE evaluate if the list of alternatives includes as one of the following options that the project activity is undertaken without being registered as a proposed project activity, contains all plausible alternatives of viable means of supplying the comparable outputs or that services are to be supplied by the proposed project activity and compliable with all applicable and enforced legislation?</p> <p>VVS (V 05.0) para. 114</p>	N/A	N/A
16. Investment analysis (if applicable)		
<p>16.1 Was it applied for the PP's the latest version of Guidelines on the assessment of investment analysis?</p> <p>VVS (V 05.0) para. 118</p>	N/A	N/A
<p>16.2 Does the DOE verify if the project activity is not the most economically or financially attractive alternative:</p> <ul style="list-style-type: none"> Does not produce financial or economic benefits other than CDM-related income, Is less economically or financially attractive than at least one other credible and realistic alternative: The financial returns of the proposed project activity would be insufficient to justify the required investment? <p>VVS (V 05.0) para. 119</p>	N/A	N/A
<p>16.3 Was verified:</p> <ul style="list-style-type: none"> suitability of the financial indicator selected, assessment of all parameters and assumptions used in calculating such financial indicators, as well as a determination of accuracy and suitability cross-check the parameters against a third-party, review, as appropriate, feasibility reports, public announcements, annual financial reports sensitivity analysis All computations, the accuracy of implementation 	N/A	N/A

CHECKLIST QUESTION	REFERENCES	Final Conclusion
and documentation by PP's VVS (V 05.0) para. 120		
<p>16.4 Was verified:</p> <ul style="list-style-type: none"> Determine whether the type of benchmark applied is suitable for the type of financial indicator presented Ensure that any risk premiums applied in determining the benchmark reflect the risks associated with the project type or activity Determine whether it is reasonable to assume that no investment would be made at a rate of return lower than the benchmark. <p>VVS (V 05.0) para. 121</p>	N/A	N/A
<p>16.5 Was verified (if apply):</p> <ul style="list-style-type: none"> The FSR is the basis for the decision to proceed with the investment in the project, i.e. that the period of time between the finalization of the FSR and the investment decision is sufficiently short that it is unlikely in the context of the underlying project activity that the input values would have materially change The values used in the PDD and associated annexes are fully consistent with the FSR, and where inconsistencies occur the DOE shall assess the appropriateness of the values The input values from the FSR are valid and applicable at the time of investment decision. The DOE shall confirm this on the basis of its specific local and sectoral expertise and by cross-checking or other appropriate means. <p>VVS (V 05.0) para. 122</p>	N/A	N/A
17. Barrier Analysis (if applicable)		

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CHECKLIST QUESTION	REFERENCES	Final Conclusion
<p>17.1 Does the DOE determine whether the proposed project activity faces barriers that:</p> <p>(a) Prevent the implementation of this type of proposed project activity (See the latest “Guidelines for objective demonstration and assessment of barriers”)</p> <p>(b) Do not prevent the implementation of at least one of the alternatives.</p> <p>VVS (V 05.0) para. 124</p>	N/A	N/A
<p>17.2 Did the DOE determine if the issues that have a direct impact on the financial returns of the project activity are not considered barriers and shall be assessed by investment analysis? This does not refer to either:</p> <p>(a) Risk related barriers, for example risk of technical failure, that could have negative effects on financial performance; or</p> <p>(b) Barriers related to the unavailability of sources of finance for the project activity.</p> <p>VVS (V 05.0) para. 125</p>	N/A	N/A
<p>17.3 Did the DOE apply the two step process to evaluate the barrier analysis performed and determine if the barriers are real and if so prevent the implementation of the project activity but not the implementation of at least one of the possible alternatives?</p> <p>VVS (V 05.0) para. 126</p>	N/A	N/A
18. Common Practice Analysis(if applicable)		
<p>18.1 For proposed large-scale project activities, unless the proposed project type is first-of-its-kind as determined in accordance with the relevant guidelines, the DOE has assessed whether the project participants have conducted a common practice analysis.</p> <p>VVS (V 05.0) para. 128</p>	N/A	N/A

CHECKLIST QUESTION	REFERENCES	Final Conclusion
<p>18.2 Did the DOE use official sources and its local and sectoral expertise to:</p> <p>(a) assess whether the geographical scope (e.g. the defined region) of the common practice analysis is appropriate for the assessment of common practice related to the project activity,</p> <p>(b) Determine to what extent similar and operational projects (e.g. using similar technology or practice), other than project activities, have been undertaken in the defined region;</p> <p>(c) Assess, if similar and operational projects, other than project activities, are already “widely observed and commonly carried out” in the defined region, and whether there are essential distinctions between the proposed project activity and the other similar activities. (See the Tool for assessing the additionality and/or the latest version of the Guidelines for assessing the common practice) VVS (V 05.0) para. 129</p>	N/A	N/A
19. Monitoring Plan		
<p>19.1 The Audit team identified the list of parameters required by the selected approved methodology including applicable tool(s), and confirmed that it includes the data management and quality assurance and quality control procedures to ensure that the proposed project activity can be reported ex post and verified.</p> <p>To assess the implementation of the plan the DOE shall, by means of review of the documented procedures, conduct interviews with relevant personnel, project plans and any physical inspections of the proposed project activity site. VVS (V 05.0) para. 132</p>	See section 3.5	Partial CAR 1 and CL 15 Closed.20/08/2013.
20. Environmental Impacts		

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CHECKLIST QUESTION	REFERENCES	Final Conclusion
20.1 Did the project participants develop an environmental impact analysis including trans boundary impacts? VVS (V 05.0) para. 134	N/A	N/A
20.2 Did the project participant conduct an environmental impact assessment, if required to do so by the host Party, in accordance with the host Party's procedures?	N/A	N/A
21. Local stakeholder consultation		
21.1. Have the project participants completed a local stakeholder consultation process and were due steps were taken to engage stakeholders and solicit comments for the proposed project activity? VVS (V 05.0) para. 138	N/A	N/A
21.2 Did the DOE determine whether: (a) Comments have been invited from local stakeholders that are relevant for the proposed project activity; (b) The summary of the comments received as provided in the PDD is complete; (c) The project participants have taken due account of all comments received and have described this process in the PDD. VVS (V 05.0) para. 139	N/A	N/A
22. Specific validation requirements		
23.1. For certain specific validation activities such as SSC, A/R, and PoA, the DOE shall comply with the general validation requirements described in the sections above as well as those that follow, including the simplified modalities and procedures for small-scale project activities, the modalities and procedures for afforestation and reforestation project activities, and Standards for PoA. VVS (V 05.0) para. 149	N/A	N/A

CHECKLIST QUESTION	REFERENCES	Final Conclusion
23. Small-scale project activities (if applicable)		
1. Project activity eligibility <ul style="list-style-type: none"> - The project activities fall within the threshold of the three possible types of small project activities. - The DOE verified that the small-scale methodologies were applied in conjunction with the general guidance to the methodologies. - The DOE verified that the project activity is not a debundled component of a large-scale project, in accordance with the rules defined in the appendix C of the simplified modalities for small-scale CDM project activities VVS (v 05.0) para.. 150-153	N/A	N/A
2. Debundling <ul style="list-style-type: none"> - The DOE shall verify that the proposed small-scale project activity is a debundled component of a large-scale project activity if there is a registered small-scale project activity or an application to register another small-scale project activity. - The DOE, where appropriate, has taken into account specific debundling requirements for Type I project activities and small-scale transport project activities. VVS (v 05.0) para. 154-157	N/A	N/A
<i>The proposed small-scale project activity is not a debundled component of a large-scale project activity in accordance with the Guidelines on assessment of debundling for SSC project activities</i> VVS (V 05.0) para. 154	N/A	N/A

CHECKLIST QUESTION	REFERENCES	Final Conclusion
<i>The proposed small-scale project activity is a debundled component of a large-scale project activity if there is a registered small-scale project activity or an application to register another small-scale project activity.</i> VVS (V 05.0) para. 155	N/A	N/A
<i>The Project participant takes into account specific debundling requirements for Type I project activities and small-scale transport project activities.</i> VVS (V 05.0) para. 156	N/A	N/A
3. Additionality <ul style="list-style-type: none"> - The DOE verified that the proposed SSC project activity is additional in accordance with CDM requirements applicable for small-scale project activities. - For the activities type I, II and III, the DOE assessed the fulfillment of the relevant criteria to establish the automatic additionality for these projects - The DOE detailed all the steps taken to make the cross-check of the information contained in the PDD VVS (v 05.0) para. 158-161	N/A	N/A
24. Afforestation or reforestation project activities		
<p>In addition to the requirements listed above, the DOE verified the specific requirements for A/R CDM project activities, which include:</p> <ul style="list-style-type: none"> - Project boundary for A/R CDM; - Selection of carbon pool; - Eligibility of land; - Approach proposed to address non permanence; - Timing of management activities, including harvesting cycles and verifications; - Socioeconomic environmental impacts, including impacts on biodiversity and natural ecosystems. 	N/A	N/A

CHECKLIST QUESTION	REFERENCES	Final Conclusion
VVS (v 05.0) para. 162		
1. Project boundary <i>The DOE described the documentation assessed and oral statements delivered by persons interviewed and approved their acceptability under the legal system of the host country.</i> <i>In case the DOE has applied a sampling approach; the validation report shall describe how many sites have been assessed and how these were selected.</i> VVS (v 05.0) para. 163-166	N/A	N/A
2. Selection of carbon pool <i>The DOE verified whether the selection of the carbon pool complied with the applied approved methodology or whether the exclusion of a certain pool is allowed for the methodology and is correctly justified.</i> VVS (v 05.0) para. 167-169	N/A	N/A
3. Eligibility of land <i>DOE verified the reliable discrimination between forest and non-forest land according to the particular threshold adopted by the host country.</i> VVS (v 05.0) para. 170-172	N/A	N/A
4. Addressing non permanence <i>DOE verified the specification of the proposed approach to address nonperformance in accordance with paragraph 38 of the modalities and procedures for A/R CDM projects activities.</i> VVS (v 05.0) para. 173-175	N/A	N/A
5. Timing of management activities <i>The DOE verified how the project participants would ensure that a systematic coincidence of verification and peaks in carbon stocks would be avoided.</i>	N/A	N/A

CHECKLIST QUESTION	REFERENCES	Final Conclusion
VVS (v 05.0) para. 176-178		
6. Socioeconomic and environmental impacts <i>The DOE verified using local official sources whether the project participants have undertaken an analysis of socio-economic and environmental impacts, including impacts on biodiversity and natural ecosystems, as well as impacts outside the project boundary.</i> VVS (v 05.0) para. 179-183	N/A	N/A
25. Small-scale A/R project activities		
<i>The DOE determined whether:</i> <i>The project activities qualify as a proposed small-scale A/R CDM project activity and comply with the threshold for the proposed small-scale A/R projects in accordance with the decision 5/CMP.1, annex paragraph 1(i).</i> <i>The project activity complies with one of the types of small-scale A/R project activities defined in appendix B of the annex to decision 6/CMP.1.</i> <i>The base line, monitoring methodology and the methodology is applied correctly.</i> <i>The proposed CDM project activity is not part of a debundled large-scale A/R project activity, in accordance with the rules defined in appendix C of the annex to decision 6/CMP.1.</i> <i>The proposed CDM project activity has been developed or implemented by low-income communities and individuals as confirmed by the host Party in accordance with the decision 5/CMP.1, annex paragraph 1(i).</i> VVS (v 05.0) para. 184.	N/A	N/A
26. Programme of activities / Component project activities		
1. Coordinating/managing entity and participants in a PoA <i>The DOE assessed the management system</i>	N/A	N/A

CHECKLIST QUESTION	REFERENCES	Final Conclusion
described in the PoA design document (CDM PoA-DD) in accordance with the Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for the programme of activities VVS (v 05.0) para. 186		
2. CPA design document The DOE assessed the proposed CPA that a coordinating/managing entity wished to include in the PoA. VVS (v 05.0) para. 187-188	N/A	N/A
3. Description of a PoA/CPAs The DOE assessed the CDM-PoA-DD and the PoA-specific CDM-CPA-DD that was submitted by the coordinating/managing entity and confirmed the framework developed for the implementation of the PoA, and defined a CPA under the PoA. VVS (v 05.0) para. 189	N/A	N/A
4. Application of multiple methodologies The DOE assessed the application of multiple methodologies in accordance with the Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities VVS (v 05.0) para. 190	N/A	N/A
5. Boundary for the PoA in terms of geographical area The DOE verified the boundary of the PoA within which all CPAs included in the PoA will be implemented and if the project participant has taken into account all the applicable national and/or sectoral policies and regulations.	N/A	N/A

CHECKLIST QUESTION	REFERENCES	Final Conclusion
VVS (v 05.0) para. 191-192		
6. Start date of CPA <i>The DOE verified that the start date of the CPA is on or after the start date of the PoA.</i> VVS (v 05.0) para. 193	N/A	N/A
7. Prior consideration of the CDM <i>The DOE shall assess prior consideration of the CDM for the PoA applying the provisions of paragraph 107 above mutatis mutandis.</i> VVS (v 05.0) para. 194	N/A	N/A
8. Demonstration of additionality of the PoA as a whole <i>The DOE verified the additionality of a PoA in accordance with the .Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities.</i> VVS (v 05.0) para. 195	N/A	N/A
9. Eligibility criteria for inclusion of a CPA in the PoA <i>The DOE assessed the eligibility criteria for inclusion of a CPA in the PoA in accordance with the .Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities.</i> VVS (v 05.0) para. 196	N/A	N/A
10. Crediting period of a PoA/CPA <i>The DOE determined that the length of a PoA does</i>	N/A	N/A

CHECKLIST QUESTION	REFERENCES	Final Conclusion
not exceed 28 years (60 years for A/R). VVS (v 05.0) para. 197		
11. Monitoring plan for a PoA/CPA <i>The DOE verified that the monitoring plan for a CPA is in accordance with the approved monitoring methodology, including applicable tool(s).</i> VVS (v 05.0) para. 198	N/A	N/A
12. Environmental Analysis of a PoA <i>The DOE determined that an analysis of the environmental impacts of the PoA in accordance with CDM-PoA-DD and the CDM-CPA-DD was undertaken.</i> VVS (v 05.0) para. 199-200	N/A	N/A
13. Local stakeholder consultation <i>The DOE verified that the local stakeholder consultation process was carried out for the whole PoA or at the CPA level?</i> <i>If comments by local stakeholders were invited with regard to the whole PoA, the DOE shall determine how these comments were invited; whether the summary of the comments received is complete and how due account was taken of all comments received.</i> VVS (v 05.0) para. 201	N/A	N/A
<i>If the local stakeholder consultation is conducted at the CPA level, the DOE shall determine whether it is in accordance with the level of consultation specified by the coordinating/managing entity and whether the local stakeholder comments were taken into account and described in the CDM-PoA-DD and the CDM-CPA-DD</i> VVS (v 05.0) para. 202	N/A	N/A

CHECKLIST QUESTION	REFERENCES	Final Conclusion
14. Determination of occurrences of debundling under a PoA <i>The DOE verified that the proposed small-scale CPA of a PoA is not a debundled component of a large-scale project activity in accordance with the Guidelines on assessment of debundling for SSC project activities.</i> VVS (v 05.0) para. 203	N/A	N/A
15. Inclusion or renewal of a crediting period of a CPA under a registered PoA <i>The DOE verified that the specific CDM-CPA-DD is in accordance with the latest version of the PoA and determined that the CPA meets the requirements of the PoA.</i> VVS (v 05.0) para. 204	N/A	N/A
27. Validation status and outcomes, opinion, and report		
1. Validation status and outcomes <i>The DOE provided an update of the status of its validation activity, unless the project activity has been submitted for registration 180 days subsequent to the end of the period for the submission of public comments.</i> <i>The updated status presented for the DOE, must contain one of the following conditions:</i> Finalization of the validation contract A negative validation opinion Summary of the issues raised with updates or reconfirmations of the validation status at three month intervals Which party/parties are involved in the absence of sending of a valid letter of approval	See section 1, 1.1 and 1.2	Full

CHECKLIST QUESTION	REFERENCES	Final Conclusion
<p><i>Explanations about the length of the validation activity and the update of the validation status if the validation activities are ongoing and the CAR or CL have not yet been sent to the project participant.</i> VVS (v 05.0) para. 141-142</p>		
<p>2. Validation opinion</p> <p><i>It was emitted an opinion of the likelihood of the project activity achieving the anticipated emission reductions stated in the PDD, where the PP has been informed of the validation outcome, whether it is a positive or negative opinion.</i> The DOE's opinion must include:</p> <ul style="list-style-type: none"> - A summary of the validation methodology and process used and the validation criteria applied - A description of project components or issues not covered by the validation process - A summary of the validation conclusions - A statement on the validation of the expected emission reductions - A statement as to whether the proposed project activity meets the stated criteria. - The validation opinion confirms whether the project meets the stated criteria and that the methods presented in the project design documentation are acceptable and have been correctly applied. <p>VVS (v 05.0) para. 143-146</p>	<p>See section 4</p>	<p>Full</p>
<p>3. Validation Report</p> <p><i>Is The validation report in line with IN-P-CC-01?</i></p> <p><i>The DOE included in the validation report a validation opinion that integrated:</i></p>	<p>See section 4</p>	<p>Full</p>

CHECKLIST QUESTION	REFERENCES	Final Conclusion
<ul style="list-style-type: none"> - Conclusions regarding the proposed project activity's conformity with applicable CDM requirements - Overview of the validation activities - Findings and conclusions - Information on the global stakeholder consultation process carried out. - A list of interviewees and documents reviewed - Details of the validation team - Information on quality control within the team and in the validation process - Appointment certificates or curricula vitae of the DOE's validation team members, technical experts and internal technical reviewers for the project activity. <p>VVS (v 05.0) para. 147-148</p>		

7. ANNEX B

Resolution of Corrective Action, Forward Action and Clarification Request

The following table explains how ICONTEC resolve or “close out” CARs and CLs describing how the project participants modify the project design, rectify the PDD or provide additional explanations or evidence that satisfy the ICONTEC’s concerns. VVS (V 05.0) paragraph 28.

This table explains the issues raised, the responses provided by the project participants, the means of validation of such responses and references to any resulting changes in the PDD or supporting annexes. VVS (V 05.0) paragraph 29.

<i>Report clarifications and corrective action requests</i>	<i>Reference</i>	<i>Summary of project owner response</i>	<i>Validation conclusion</i>
<p>CAR 1 In the PDD version 19, section B.7.1, was not included as parameter to be monitored the parameter “EG_{PJ_Add,y}”, which is necessary to calculate the emission reductions.</p>	<p>CDM Project Standard, version 05.0, paragraph 55.</p> <p>Guidelines for completing the project design document form, version 01.0, section B.7.1.</p> <p>CDM Validation and Verification Standard, version 05.0, paragraphs 25 (a) and 132 (a) (i).</p>	<p>“EGPJ_Add,y” is deleted in section B.7.1. of the PDD version 20 because the option 1 is chosen, then this parameter is calculated and not monitored.</p>	<p>Validation team response:</p> <p>Given that the PP changed the selected methodological choice, this parameter shall not be monitored.</p> <p>Validation team conclusion: Closed. 20/08/2013.</p>
<p>CAR 2 In the PDD version 19, section B.4, is not established the baseline scenario for the renewal of the crediting period neither in accordance with the latest version of ACM0002, version 14.0.0 nor with the section 7.2.5 of the CDM Project Standard.</p> <p>Also, it was not followed the stepwise procedure to assess the</p>	<p>CDM Project Standard, version 05.0, sections 7.2.5 and 12.9.1</p> <p>Guidelines for completing the project design document form, version 01.0, section B.4.</p> <p>CDM Validation and Verification Standard, version 05.0, section</p>	<p>The Baseline scenario for the renewal of the crediting period is established in section B.4 of the PDD, version 20. The Methodological Tool “Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period, Version 05.0.1” is used to demonstrate the validity of the baseline scenario.</p>	<p>Validation team response:</p> <p>The PP correctly reassessed the baseline scenario for the renewal of the crediting period by following the relevant UNFCCC procedures.</p> <p>Validation team conclusion: Closed. 20/08/2013.</p>

Report clarifications and corrective action requests	Reference	Summary of project owner response	Validation conclusion
continued validity of the baseline and to update the baseline at the renewal of a crediting period provided by the “Methodological Tool, Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period, Version 03.0.0”.	7.12.6. ACM0002, version 14.0.0, “II. Baseline Methodology Procedure”.		
CAR 3 In the calculation of the BM (step 5, paragraph 71 (c)), the PP did not choose the appropriated set of power units that comprises the larger annual electricity generation (SET_{sample}) in order to make the calculation.	Tool to calculate the emission factor for an electricity system, version 05.0.0, section 6.1.	The BM calculation was corrected as per the Tool to calculate the emission factor for an electricity system, version 03.0.0, section 6.1. The appropriate set of power plants was used, excluding power plants older than 10 years and including CDM projects.	Validation team response: In the latest version of the PDD and the latest version of EF’s calculation the PP correctly chose the appropriated set of power units that comprises the larger annual electricity generation (SET_{sample}). Validation team conclusion: Closed.20/08/2013.
CAR 4 The GWP used for the renewal of the crediting period does not match with the one approved by UNFCCC (EB 69 annex 3, Decision 4CMP-7 and table 2.14 of the errata to the contribution of Working Group) for the second commitment period of the Kyoto Protocol.	CDM Validation and Verification Standard, version 05.0, paragraph 25 (b).	The value of the GWP is changed to 25. The reference of the GWP for the given time horizon for the second commitment period is changed to: Table 2.14 of the errata to the contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change as per Decision 4/CMP.7.	Validation team response: The PP correctly updated the GWP approved by UNFCCC for the second commitment period of the Kyoto Protocol in the latest version of the PDD. Validation team conclusion: Closed. 21/10/2013.

<i>Report clarifications and corrective action requests</i>	<i>Reference</i>	<i>Summary of project owner response</i>	<i>Validation conclusion</i>
<p>CL 1</p> <p>In the PDD version 19, the title of the project activity, “Berlin Geothermal Project, Phase Two” does not match with the registered PDD version 18, “LaGeo, S. A. de C. V., Berlin Geothermal Project, Phase Two”.</p>	<p>CDM Project Standard, version 05.0, paragraph 227</p> <p>Guidelines for completing the project design document form, version 01.0, section V.</p> <p>CDM Validation and Verification Standard, version 05.0, paragraph 64.</p>	<p>The title of the project activity is changed to the correct name. See PPD version 20.</p>	<p>Validation team response:</p> <p>The PP correctly updated the title of the project in the latest version of the PDD.</p> <p>Validation team conclusion: Closed.16/08/2013</p>
<p>CL 2</p> <p>In the PDD version 19, section A.1 there is not a brief description of:</p> <ul style="list-style-type: none"> • The scenario existing prior to the implementation of the project activity including, where applicable, the type of facility where the project activity will take place or replace. • The baseline scenario. • The estimate of annual average and total GHG emission reductions for the chosen crediting period. 	<p>Guidelines for completing the project design document form, version 01.0, section A.1.</p> <p>CDM Project Standard, version 05.0, section 7.1.</p> <p>CDM Validation and Verification Standard, version 05.0, section 11.</p>	<p>In the section A.1 of the PDD version 20 is included a brief description of the scenario prior the implementation of the project, the baseline scenario and the total expected emission reductions for the second crediting period.</p> <p>The estimate of annual average and total GHG emission reductions for the chosen crediting period are updated.</p>	<p>Validation team response:</p> <p>The PP correctly included in the latest version of the PDD the requested information.</p> <p>Validation team conclusion: Closed. 16/08/2013.</p>
<p>CL 3</p> <p>In the PDD version 19, section A.2.4, the geographical coordinates reported (latitude 13.524801, longitude 88.509223.) do not match with the ones reported in the PDD version 18 (13° 30’ north latitude, 88° 32’ west longitude).</p>	<p>CDM Project Standard, version 05.0, section 7.1</p> <p>Guidelines for completing the project design document form, version 01.0, A.2.4.</p> <p>CDM Validation and Verification Standard, version 05.0, paragraph 64</p>	<p>The coordinates 13° 30’ north latitude, 88° 32’ west longitude are not correct, by this reason they are changed and are expressed in decimal form.</p>	<p>Validation team response:</p> <p>The PP correctly corrected the coordinates in accordance with the latest geographical information of the facilities’ location.</p> <p>Validation team conclusion: Closed. 16/08/2013.</p>

<i>Report clarifications and corrective action requests</i>	<i>Reference</i>	<i>Summary of project owner response</i>	<i>Validation conclusion</i>
<p>CL 4</p> <p>In the PDD version 19, section A.3 there is not a description of:</p> <ul style="list-style-type: none"> • The age and average lifetime of the equipment based on manufacturer's specifications and industry standards, and existing and forecast installed capacities, load factors and efficiencies. • The monitoring equipment and their location in the systems. • Facilities, systems and equipment in operation under the existing scenario prior to the implementation of the project activity. • Facilities, systems and equipment in the baseline scenario. 	<p>CDM Project Standard, version 05.0, section 7.1.</p> <p>Guidelines for completing the project design document form, version 01.0, A.3</p> <p>CDM Validation and Verification Standard, version 05.0, paragraph 64</p>	<p>Section A.3 was modified with the following information:</p> <ul style="list-style-type: none"> • The age and average lifetime of the equipment based on industry standards, and existing and forecast installed capacities, load factors. • The monitoring equipment and their location in the systems. • Facilities, systems and equipment in operation under the existing scenario prior to the implementation of the project activity. • Facilities, systems and equipment in the baseline scenario. 	<p>Validation team response:</p> <p>The PP correctly updated the description reported in the section A.3 with the requested information.</p> <p>Validation team conclusion: Closed. 16/08/2013.</p>
<p>CL 5</p> <p>In the PDD version 19, section A.4 are not reported all the PP's registered in UNFCCC.</p>	<p>CDM Project Standard, version 05.0, section 12.9.1</p> <p>Guidelines for completing the project design document form, version 01.0, section A.4.</p> <p>CDM Validation and Verification Standard, version 05.0, paragraph 300.</p> <p>Clean development mechanism project cycle procedure, version 03.1, paragraph 245.</p>	<p>The CDM Registry approved the F-CDM_MoC form regarding the voluntary withdrawal of CAF and the Ministry of Infrastructure and Environment as authorized participants by the Netherlands.</p>	<p>Validation team response:</p> <p>ICONTEC verified in the UNFCCC web page the approval of the withdraw of CAF on 04/10/2013.</p> <p>Validation team conclusion: Closed.21/10/2013.</p>

<i>Report clarifications and corrective action requests</i>	<i>Reference</i>	<i>Summary of project owner response</i>	<i>Validation conclusion</i>
<p>CL 6</p> <p>In the PDD version 19, section B.1 there is not a description of the tools and other methodologies to which the selected methodology refers.</p>	<p>CDM Project Standard, version 05.0, paragraph 37.</p> <p>Guidelines for completing the project design document form, version 01.0, section B.1.</p> <p>CDM Validation and Verification Standard, version 05.0, paragraph 73</p>	<p>The sections B.1 of the PDD version 20 includes a description of the tools that the ACM0002 methodology refers.</p>	<p>Validation team response:</p> <p>The PP correctly included in the latest version of the PDD a description of the tools and other methodologies to which the selected methodology refers.</p> <p>Validation team conclusion: Closed. 16/08/2013.</p>
<p>CL 7</p> <p>In the PDD version 19, section B.2 is not enough clear, the choice of the selected methodology by showing that the project activity meets each applicability condition of the methodology.</p> <p>Also, is not provided the documentation that has been used in order to demonstrate the applicability of the methodology.</p>	<p>CDM Project Standard, version 05.0, section 12.9.1</p> <p>Guidelines for completing the project design document form, version 01.0, section B.2.</p> <p>CDM Validation and Verification Standard, version 05.0, paragraph 76</p>	<p>The section B.2 of the PDD version 20 is completed to clarify the applicability of the selected methodology.</p> <p>A letter from the Transaction Unit (grid operator) states the starting date of the power units installed in Berlin Geothermal Plant, which demonstrate that the project activity is an addition capacity of an existent power plant. This letter is attached to the PDD</p>	<p>Validation team response:</p> <p>The PP in the latest version of the PDD included the requested evidences and explained the followed methodological choices.</p> <p>Validation team conclusion: Closed. 20/08/2013.</p>
<p>CL 8</p> <p>In the PDD version 19, section B.3 was not included the analysis for the GHG source “CO₂ emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants”, as is requested by</p>	<p>CDM Project Standard, version 05.0, section 12.9.1</p> <p>Guidelines for completing the project design document form, version 01.0, section B.3.</p> <p>CDM Validation and Verification</p>	<p>The section B.3 of the PDD version 20 does not include the calculation of CO₂ emissions from fossil fuel combustion by two reasons: the power unit is not equipped with a diesel backup generator and the version 14 of the ACM0002 methodology indicates that the use</p>	<p>Validation team response:</p> <p>The PP correctly included the analysis for the GHG source, as is requested by ACM0002, version 14, table 1 and included a flow diagram of the project</p>

Report clarifications and corrective action requests	Reference	Summary of project owner response	Validation conclusion
<p>ACM0002, version 14, table 1.</p> <p>Also, it was not included a flow diagram of the project boundary, physically delineating the project activity, with the equipment, systems and flows of mass and energy and the data and parameters to be monitored.</p>	<p>Standard, version 05.0, section 7.12.5.</p> <p>ACM0002, version 14.0.0, "Project Boundary".</p>	<p>of fossil fuels for the back up or emergency purposes (e.g. diesel generators) can be neglected.</p> <p>Also, it was included a flow diagram to delineate the boundaries of the project activity and the main components of the project are indicated.</p>	<p>boundary, physically delineating the project activity, with the equipment, systems and flows of mass and energy and the data and parameters to be monitored.</p> <p>Validation team conclusion: Closed. 16/08/2013.</p>
<p>CL 9</p> <p>In the PDD version 19, sections B.5 there are missing references.</p>	<p>CDM Validation and Verification Standard, version 05.0, paragraph 22 (a) (i).</p>	<p>The missing references are deleted.</p>	<p>Validation team response: The PP deleted the missed references.</p> <p>Validation team conclusion: Closed. 16/08/2013.</p>
<p>CL 10</p> <p>In the PDD version 19, section B.6.1 are not the justifications for all relevant methodological choices. Also, some used equations have wrong number's references from ACM0002, version 14.0.0.</p>	<p>ACM0002, version 14.0.0, "II. Baseline Methodology Procedure".</p> <p>Guidelines for completing the project design document form, version 01.0, section B.6.1.</p>	<p>The section B.6.1 is completed according the version 14 of the methodology ACM0002 and the numbers of equations are corrected.</p>	<p>Validation team response: In the latest version of the PDD, the PP reported the justifications for all relevant methodological choices and corrected the notation in the used equations.</p> <p>Validation team conclusion: Closed. 20/08/2013.</p>
<p>CL 11</p> <p>In the PDD version 19, section B.6.1 "Calculation of the emission factor", it was not followed a stepwise procedure and are not reported the justifications and assumptions in order to demonstrate:</p> <ul style="list-style-type: none"> The chosen project electricity system and any connected 	<p>Tool to calculate the emission factor for an electricity system, version 04.0.0, section 6.1.</p>	<p>The section B.6.1 is updated following a step by step procedure and the selected options are clarified.</p> <p>It is included a justification and an explanation in relation to:</p> <ul style="list-style-type: none"> The chosen project electricity system and any connected electricity system. 	<p>Validation team response:</p> <p>In the latest version of the PDD, the PP correctly followed a stepwise procedure in order to justify and calculate the EF.</p> <p>Validation team conclusion: Closed. 20/08/2013.</p>

Report clarifications and corrective action requests	Reference	Summary of project owner response	Validation conclusion
<p>electricity system.</p> <ul style="list-style-type: none"> The not existence of significant transmission constraints. The choice of the Simple adjusted OM as method to calculate the project's OM. The chosen alternative (1 or 2) to calculate the BM. The option chosen to calculate the $EF_{grid, CM, y}$. The default values chosen for w_{OM} and w_{BM}. <p>Also, in the PDD version 19, the step 5 is not reported as it was established in the version 04.0.0 of the tool.</p>		<ul style="list-style-type: none"> The not existence of significant transmission constraints. The choice of the Simple adjusted OM as method to calculate the project's OM. The chosen alternative 1 to calculate the BM. The option chosen to calculate the $EF_{grid, CM, y}$. The default values chosen for w_{OM} and w_{BM}. The step 5 is reported as it was established in the version 05.0.0 of the tool. 	
<p>CL 12</p> <p>In the PDD version 19, section B.6.2; it is not clear the source of data reported for the parameter "EF".</p> <p>Also, they should be include next ex ante parameters:</p> <ul style="list-style-type: none"> GWP_{CH4} $EG_{historical}$ $\sigma_{historical}$ $DATE_{BaselineRetrofit}$ $DATE_{hist}$ 	<p>CDM Project Standard, version 05.0, paragraph 52.</p> <p>Guidelines for completing the project design document form, version 01.0, section B.6.2.</p> <p>CDM Validation and Verification Standard, version 05.0, paragraph 94 (a).</p>	<p>Section B.6.2 is completed and ex-ante parameters are included.</p> <p>The parameter $DATE_{hist}$ is not included because the five last calendar years prior to the implementation of the project activity was chose as the time span to calculate $EG_{historical}$.</p>	<p>Validation team response:</p> <p>The PP properly justified the source of data for EF and included the missed parameters.</p> <p>Validation team conclusion: Closed.20/08/2013.</p>
<p>CL 13</p> <p>In the PDD version 19, section B.6.3,"Ex ante calculation of emission reductions", it was not</p>	<p>CDM Project Standard, version 05.0, paragraph 50.</p>	<p>Section B.6.3 of the PDD is completed to enable the reader to reproduce the calculation and a stepwise procedure was followed.</p>	<p>Validation team response:</p> <p>The PP correctly resolved the raised issues in the</p>

<i>Report clarifications and corrective action requests</i>	<i>Reference</i>	<i>Summary of project owner response</i>	<i>Validation conclusion</i>
<p>followed a stepwise procedure and are not reported the justifications and assumptions used in order to calculate the emission reductions. The above mentioned does not enable the reader to reproduce the calculation</p> <p>Also, there are equations from ACM0002, version 14.0.0 reported with wrong numbers.</p>	<p>Guidelines for completing the project design document form, version 01.0, section B.6.3.</p> <p>CDM Validation and Verification Standard, version 05.0, paragraph 96.</p>	<p>The value of GWP is corrected and the equations with wrong numbers are corrected.</p>	<p>latest version of the PDD.</p> <p>Validation team conclusion: Closed.21/10/2013.</p>
<p>CL 14</p> <p>In the PDD version 19, section B.6.4, the project emissions reported in the table 5 for the period (2014-2020) are not using the format for presentation of values (comma for thousands and dot for decimal point).</p>	<p>Guidelines for completing the project design document form, version 01.0, paragraph 18.</p>	<p>The number format and values are corrected in table of section B.6.4.</p>	<p>Validation team response:</p> <p>In the latest version of the PDD the PP correctly used the format for presentation of values requested by UNFCCC.</p> <p>Validation team conclusion: Closed. 21/10/2013.</p>
<p>CL 15</p> <p>In the PDD version 19, section B.7.1, the information reported for each parameter to be monitored should be supplemented for:</p> <ul style="list-style-type: none"> • Description • Source of data • Measurement methods and procedures • QA/QC procedures • Purpose of data 	<p>Guidelines for completing the project design document form, version 01.0, section B.7.1.</p> <p>CDM Project Standard, version 05.0, paragraph 56.</p> <p>CDM Validation and Verification Standard, version 05.0, paragraph 132.</p>	<p>The information regarding monitoring parameters is completed in section B.7.1 of the version 20 of the PDD, including:</p> <ul style="list-style-type: none"> • Description • Source of data • Measurement methods and procedures • QA/QC procedures • Purpose of data 	<p>Validation team response:</p> <p>The PP properly completed the information requested in the latest version of the PDD.</p> <p>Validation team conclusion: Closed. 20/08/2013.</p>

<i>Report clarifications and corrective action requests</i>	<i>Reference</i>	<i>Summary of project owner response</i>	<i>Validation conclusion</i>
CL 16 In the PDD version 19, the section B.7.3 has not been filled.	Guidelines for completing the project design document form, version 01.0, section B.7.3. CDM Validation and Verification Standard, version 05.0, paragraph 22 (a) (i).	The section B.7.3 has been filled in the PDD with a chart that describes the operational and management structures to implement the monitoring plan.	Validation team response: In the latest version of the PDD the section B.7.3 was filled. Validation team conclusion: Closed. 21/10/2013.
CL 17 In the PDD version 19, section C, it should be clarified: <ul style="list-style-type: none"> In the section C.1.1, the start date of the project activity is not reported in the format DD/MM/YYYY. Also, is missing the evidence to support how this date has been determined. In the section C.2.1, is missing the indication about the number of the crediting period (first, second, third). 	Guidelines for completing the project design document form, version 01.0, section C.1.1.	The starting date is corrected according to the format DD/MM/YY and the evidence is attached (letter from UT). In the section C.2.1 is indicated the type and number of crediting period.	Validation team response: In the latest version of the PDD the requested clarifications were made. Validation team conclusion: Closed. 21/10/2013.
CL 18 In the PDD version 19, appendix 1 is missing the Mandatory Information "Postcode".	Guidelines for completing the project design document form, version 01.0, appendix 1.	El Salvador does not have "PostCodes", hence no one information is included.	Validation team response: The PP properly explained why it was not included post code in the latest version of the PDD. Validation team conclusion: Closed.20/08/2013.

8. AUDIT TEAM EXPERIENCE AND KNOWLEDGE

ANGELA DUQUE CDM LEAD AUDITOR

Forestry Engineer, Universidad Distrital Francisco José de Caldas (1992)
Specialist in Evaluation of Social Projects. University of Los Andes (1998)
M.Sc. Environmental Economics and Natural Resources. Universidad de los Andes - University of Maryland. (2003)

International Course : “Climatic Change and CDM Projects Design in Forestry and Bio-energy Sectors” Research and Teaching Tropical Agronomic Center – CATIE –Turrialba, Costa Rica, October 2004.

Workshop of Climate Change protocols and procedures 2007 09

PROFESSIONAL EXPERIENCE

- CORPORACIÓN ANDINA DE FOMENTO – CAF, August 2009 (currently)

Consultant.

Rapid assessments of eligibility of afforestation or reforestation projects which are potentially eligibles for the Clean Development Mechanism - CDM. (Projects evaluated in Ecuador and Mexico).

- PIZANO S.A. October 2005 (currently)

Assessor.

Consultancy specialized in the design, development and negotiation of projects with the potential sale of emission reductions in the carbon market (Clean Development Mechanism of the Kyoto Protocol and voluntary markets). In particular, the following project activities:

- Proposed strategic forest ecological areas in the Colombian Caribbean plains Establishment Ceiba 18,600 hectares, Gmelina, teak, Eucalyptus and Acacia - CDM Project
- Forestation and the production of long lived wood products in the Caribbean Coastal Pains of Colombia - Draft Voluntary Carbon Market (CCX).
- Reforestation Project Maderas del Darién - Community Councils Afro-descendant communities of the Lower Atrato, Riosucio municipality, department of Choco, Colombia (CDM project)
- Installation of a steam boiler in the plant production of plywood (Triplex), Flake (TableX), doors and laminated melamine (Madercor) in Barranquilla, Colombia (CDM project)

- FONDO DE INVERSIÓN FORESTAL – LAFM (August 2009)

Assessor.

Preparation of Project Idea Note (PIN) Project MADEFLEX 1 of 3 000 hectares of Eucalyptus, located in the municipalities of San Juan Nepomuceno and San Jacinto (Bolívar).

- FEDERACIÓN NACIONAL DE CAFETEROS DE COLOMBIA (May 2009)
Assessor
 - Develop a proposal for estimating opportunity costs for preservation or conversion coffee production in the landscape and analyzing national and international market potential for carbon sequestration.
 - Assessing the impact of forest program phase I, II and III, in order to extend the multi-temporal analysis through the inclusion of perimeter surveys of the intervened sites of the program to determine into the GIS the usefulness as an instrument to measure the environmental impact on the Forestry Program KfW through the change of use and land cover.
- ASOCIACIÓN AGRÍCOLA LOCAL DE PRODUCTORES DE NUEZ DEL NOROESTE DEL ESTADO DE CHIHUAHUA (AALPRONN) April 2009
Assessor.
Preparation of the Project Idea Note (PIN) of the “Nogal Pecanero Production (*Carya illinoensis*) project” in the State of Chihuahua, Mexico.
- CORPORACIÓN ECOVERSA / JAVIER BLANCO FREJA. February to July 2008
Assessor.
Reformulation of the "SAN NICOLAS CDM Reforestation Project" according to the methodology approved "AR-AM0009 - Afforestation or reforestation on degraded land allowing for silvopastoral activities”.
- INSTITUTO COLOMBIANO DE NORMAS TÉCNICAS – ICONTEC October 2008
External Professional.
 - Review of procedures defined by ICONTEC for validation and verification of CDM projects for identifying inconsistencies with the modalities and procedures of CDM.
 - Technical expert for validation and verification forestation and reforestation projects
- FUNDACIÓN NATURA Noviembre 2007 a July 2008
Assessor.
Formulation of the CDM project “Corridor of Conservation “Guantiva – La Rusia – Iguaque” in the framework of the program "*ROBLES CONSERVATION CORRIDOR: A STRATEGY FOR THE FOREST CONSERVATION AND FORESTRY DEVELOPMENT IN COLOMBIA*"
- UNIVERSIDAD DE LOS ANDES May to July 2008
Researcher.
University of Los Andes. "*COLOMBIA: DIAGNOSIS, PROSPECTS AND POSSIBLE GUIDELINES FOR DEFINING STRATEGIES TO CLIMATE CHANGE*". Research developed in the framework of the EMGESA contract. Include the following activities: a) Review of abstracts of national plans for mitigation and adaptation, b) international benchmarking proposal c) Document on vulnerability analysis d) Comments on the proposed mitigation options; e) Development of a proposal of guidelines for a Strategic National Plan for Climate Change.
- MINISTRY OF ENVIRONMENT, HOUSING AND TERRITORIAL DEVELOPMENT. 2002 - 2005
Expert in charge of Land use, land use change and forestry projects of Colombian Office of Climate Change Mitigation .

- ALCARAVÁN FOUNDATION – ARAUQUITA, ARAUCA. August to September 2003.

Assessor.

Prefeasibility Study of “Arracacho (*Montrichardia arborescens*) Commercial Farming in Low Atrato, Choco and Antioquia Departments, as input for flesh-pulp to make paper”. Ecopulp E.U.

- ZIO-A’I FOUNDATION UNIÓN DE SABIDURÍA. February to June 2003

Principal Investigator and Study Coordinator.

Feasibility Study to produce, process and commercialize medicinal plants in 16 Indian communities associated to a Cofan Life Plan in the Municipalities of Valle del Guamuez, San Miguel and Orito located in Putumayo Department.

- ORGANIZATION OF AMERICAN STATES – INTER- AMERICAN AGENCY FOR COOPERATION AND DEVELOPMENT. JANUARY 2002 TO MAY 2003.

Joint Reserch.

Marketing Basic Study of eight Latinamerican plants in Colombia, Costa Rica, Guatemala, Honduras, Nicaragua and Panamá. Development of Technology for the cultivation of Medicinal Plants and Phytotherapy Production.

- MAJOR’S OFFICE. ARAUQUITA, ARAUCA. November 2002 to March 2003. Assessor.

Marketing Basic Studio of achiote (*Bixa orellana L.*) and its by-products.

- ALEXANDER VON HUMBOLDT BIOLOGIC RESEARCH INSTITUTE. SUSTAINABLE BIOTRADE. July to September 2002.

Assessor.

- Evaluation of nationwide medicinal plants producers focused on the needs of the enterprises supported by the CBI-PROEXPORT-IAVH program.
- Marketing of three Colombian Medicinal Species Characterization. *Petiveria alliacea L.*, *Lippia alba* (Mill.) y *Croton lechleri* Muell. Arg Alexander von Humboldt Biologic Research Institute. Sustainable Biotrade. March to October 2002.
- Consultant. Medicinal and Aromatic Plants National Survey, definition of criteria to select species with priority and Marketing of three Colombian Medicinal species Characterization. (*Sambucus nigra L.*, *Crescentia cujete L.* and *Taraxacum officinale W.*). May 2001 to January 2002

- UNIVERSIDAD DE LOS ANDES. POWER AND ENERGY RESEARCH CENTER – CIPE. ELECTRICAL AND ELECTRONIC ENGINEERING DEPARTMENT. April to December 2002

Joint Research.

Analysis of implications of Greenhouse Gasess GHGs emission reduction in Colombia and Marginal Cost of CO₂ Sequestration in Colombia.

- COLOMBIAN ASSOCIATION FOR THE PROMOTION OF PUBLIC AND ENVIRONMENTAL ADMINISTRATION – ACAPI June 1999 – January 2001

Forest Adviser. Environmental Projects Coordinator.

- COLOMBIAN ASSOCIATION OF REFORESTATION AND TIMBER INDUSTRIALIZATION – ACOFORE. March de 1996 - January de 1999

Forest Department Manager.

“Technical and Statistical System of Industrial Forest Plantations in Colombia” Project Coordinator. Natural Resources Handling Program BIRF – Environmental Research.

- URBAN DEVELOPMENT INSTITUTE. January 1996 - May 1996
Consultant.
“Environmental and Social Management Plan to design 12 pedestrian bridges in Bogotá”. IDU Contractor through Mrs. Esperanza Sicard Abad.

EXPERIENCE IN CDM ACTIVITIES

- Validation process of Restoration of Degraded Lands of Small and Medium Farmers through Afforestation and Reforestation in Central Chile.
- Validation process of Reforestation of degraded/degrading land in the Caribbean Savannah of Colombia
- Validation process of Reforestación de áreas de pastura en la Sociedad Agrícola de Interés Social “José Carlos Mariátegui” – Proyecto Joven Forestal.
- Validation of Estancia NINA Afforestation Project
- Validation of San Nicolas CDM Reforestation Project

CRISTIAN DARIO GRISALES BERNAL **CDM SPECIALIST Technical Area 1.2**

EDUCATION:

Master Executive in Renewable Energies (On Line)
EOI-Madrid, Spain
At present

Certified ISO 14001
ICONTEC
May 2012

Certified ISO 9001
ICONTEC
August 2012

Electrical Engineer
National University of Colombia
Bogotá - Colombia
July 2009

PROFESSIONAL BACKGROUND

Professional of Climate Change
ICONTEC
May 2012 – Today
Professional on developing validation and verification on CDM projects as lead auditor and as technical expert in the energy sector.

Electrical Maintenance Engineer
EMGESA S.A ESP. Colombia
November 2009 – May 2012

Electrical maintenance engineer in the Bogotá River Hydroelectric plants. Executing preventive, predictive and corrective maintenance of the generators, auxiliary services, power transformers and electrical substation. Developed the investment projects' inventory in accordance with the annual operating budget. Implementation of RCM maintenance programs. Monthly service availability in the plant, and full-time availability in failure care. Electrical testing of generators, transformers, motors and substation equipment.

Engineering Intern

INGENIERIA ESPECIALIZADA

Commercial visits to different industries, sales, design and assembly of shielding systems, grounding grids, power quality studies, calculation of electrical installations, RETIE inspections, diagnostic grounding systems, implementation, supervision and maintenance of the developed projects.

EXPERIENCE IN CDM ACTIVITIES:

Auditor and Specialist:

- Validation of Biogas project, Olmeca I, Santa Rosa, Guatemala
- Validation of CGR Catanduva Landfill Gas Project, Brazil
- Validation of Macaubas Landfill Gas Project, Brazil
- Validation of Taurichuco Hydropower Project, Perú
- Validation of Teresina Landfill Gas Project, Brazil
- Validation of Maceio Landfill Gas Project, Brazil
- Validation of Doña Teresa Hydroelectric Power Plant, Colombia
- Validation of SHPs Poço Fundo and Providência CDM Project (JUN1133), Brazil
- Validation of SHPs Tambaú, das Pedras and Rio do Sapo CDM Project (JUN1132), Brazil
- Verification of Amaime Minor Hydroelectric Power Plant, Colombia
- Verification of Ciudad Juarez Landfill Gas to Energy Project, Mexico
- Verification of Santa Ana Hydroelectric Plant, Colombia
- Verification of Biogas Project, Olmeca III, Tecún Uman, Guatemala
- Verification of Berlin Geothermal Project, Phase Two, San Salvador

Technical Reviewer:

- Validation of Thuan Nhien Phong Wind Farm, Viet Nam
- Validation of Phuong Mai 3 Wind Power Project, Viet Nam
- Validation of Chamelecón 280 Hydroelectric project, Honduras
- Validation of Providencia I: 1.8MW Small Hydro Power Generation Plant, Colombia
- Validation of Providencia III: 9.11MW Small Hydro Power Generation Plant, Colombia
- Validation of SHP Itaguacu CDM Project (JUN 1146), Brazil, Brazil
- Renewal of Aguafresca Multipurpose and Environmental Service Project, Colombia
- Validation of Feira de Santana Landfill Gas Project, Brazil
- Validation of SHP Morro Azul CDM Project (JUN1164), Colombia
- Verification of Santa Ana Hydroelectric Plant, Colombia
- Verification of Methane recovery and effective use of power generation project Norte III-B Landfill, Argentina

FRANCY MILENA RAMÍREZ TORRES
CDM and Technical Reviewer

Electrical Engineer. Universidad Los Andes, 2001

Postgrade: Assessment of Social Projects. Universidad Los Andes, 2005

University of Oxford. Course: Applying Knowledge Management, Principle and Practices (December 1 de 2009).

University of Oxford. Course: Successful Change Management for Engineers, Scientists and Staff in Hi-tech Companies (December 2, 2009).

University of Oxford. Course: Essentials of Project Management for Engineers, Scientists and Staff in Hi-tech Companies (December 3 de 2009).

University of Oxford. Course: Advanced Project Management for Engineers, Scientists and Staff in Hi-tech Companies (December 4 de 2009).

Climate Change, Trade and Standardization - in a development perspective". Stockholm, Sweden (23 and 25 of November de 2009)

ISO global workshop on Greenhouse Gas Schemes Addressing Climate Change – How ISO Standards Help, Stockholm, Sweden. (20 and 21 Of November de 2009)

Conference on Climate Change – Deforestation and Standardization. Bali, Indonesia (31 de mayo y 1 de junio de 2010)

PROFESSIONAL EXPERIENCE

- ICONTEC. (2005 – Actually)

Professional of Standardization

Planning, coordinate, implement and ensure compliance with the program of national standardization in technical committees among which are electrical installations, electrical power quality, electrical transformers, substations and equipment for medium and high voltage, lighting, appliances and electrical accessories, protection against lightning strikes and electrical equipment. Develop technical standards. Develop and manage special projects assigned. Participate in programs of regional and international standardization.

- CODENSA (2002 – 2005)

Inspections and electrical works coordinator

Supervise field work and download the results in the central information system, evaluate the inspections performed, reconciled with contractors, addressing the results of inspections to different areas of the company, charging inspections and electrical work to clients of the firm, coordination and support group field sales engineers, technical training for technical staff, administrative support to department business processes and lost control, maintenance of the database for internal management inspections. Project Leader for the Optimization of Technical Processes and Regional Trade in Cundinamarca.

EXPERIENCE IN CDM ACTIVITIES:

Lead Auditor

- Validation of Guanaquitas 9.74 MW hydroelectric project, Colombia
- Validation of Fuel Switching through change of furnaces at Imusa S.A., Colombia
- Validation of Installation of a high-pressure/high-efficiency bagasse boiler to cogenerate heat and power, Argentina
- Validation of Cueva Maria Hydroelectric Expansion Project, Guatemala
- Validation of Paysandú Clean Energy, Uruguay
- Validation of La Vegona Hydroelectric project, Honduras
- Validation of Chamelecón 280 Hydroelectric project, Honduras
- Validation of Pardos SHPs and LOGICarbon CDM Project, Brazil
- Validation of Pequi and Sucupira SHPs and LOGICarbon CDM Project, Brazil
- Validation of Cambará and Embaúba SHPs and LOGICarbon CDM Project, Brazil
- Validation of Bonyic hydroelectric project, Panamá
- Validation of METALDOM Fossil fuel switch from reheat furnace, República Dominicana
- Validation of Toachi – Pilaton Hydroelectric Project, Ecuador
- Validation of EMGEA Small Hydropower (SHP) Run-of-the-River CDM Project Bundle, Colombia
- Validation of Energy efficiency at Malvinas Gas Plant, Perú
- Validation of Marañón Hydroelectric Project, Perú
- Validation of Santa Rita Hydroelectric Plant, Guatemala
- Validation of Ventana, Suba and Usaquén Hydroelectric CDM Bundled, Colombia
- Verification of Los Algarrobos hydroelectric project, Panamá
- Verification of Bio energy in General Deheza –Electric power generation from peanut hull and sunflower husk-, Argentina
- Validation of Taurichuco Hydropower Project, Perú
- Validation of Agua fresca Multipurpose and Environmental Service Project, Colombia
- Verification of Agua Fresca Multipurpose and Environmental Service Project, Colombia
- Verification of La Joya Hidroelectric project, Costa Rica
- Verification of Amaime Minor Hydroelectric Power Plant, Colombia

Specialist

- Validation of Rio Bonito and Baitaca SHPs and LOGICarbon CDM Project, Brazil
- Validation VCS of Pequi and Sucupira SHPs and LOGICarbon CDM Project, Brazil
- Verification of three crediting periods of La Vuelta and la Herradura hydroelectric project, Colombia

CDM Technical Reviewer

- Validation of improving energy efficiency in a new Gas Plant in Gibraltar - Colombia
- Validation of Tres Valles Cogeneration Project, Honduras
- Validation of Tunjita Diversion Hydroelectric Project, Colombia
- Validation of Ferreira Gomes Hydro Power Plant CDM Project, Brazil
- Verification of two crediting periods of La Venta II, México
- Verification of two crediting periods of La Joya Hidroelectric Project, Costa Rica
- Verification of Bio energy in General Deheza –Electric power generation from peanut hull and sunflower husk-, Argentina
- Verification of Tres Valles Cogeneration Project, Honduras

- Verification of Agua Fresca Multipurpose and Environmental Services, Colombia
- Verification of La Venta II, México
- Verification of two crediting periods of Fertinal Nitrous Oxide Abatement Project, México
- Verification of Co-composting of EFB and POME project, Guatemala
- Verification of Biogas Project, Olmeca III, Tecun Uman, Guatemala
- Verification of Jeparachi Wind Power Project, Colombia
- Verification of Biogas energy plant from palm oil mill effluent, Guatemala
- Verification of Santa Ana Hydroelectric Project, Colombia
- Validation of SHP Morro Azul CDM Project (JUN1164), Colombia
- Verification of Biogas Project, Olmeca III, Tecun Uman, Guatemala

Specialist Technical Reviewer

- Validation of Biogas project, Olmeca I, Santa Rosa, Guatemala
- Validation of CGR Catanduva Landfill Gas Project, Brazil
- Validation of Macaubas Landfill Gas Project, Brazil

