VALIDATION REPORT

Amatitlan Geothermal Project in Guatemala

REPORT NO. 2007-1945

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DET NORSKE VERITAS

VALIDATION REPORT

DET NORSKE VERITAS
CERTIFICATION AS

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Approved by: Michael Lehmann	Organisational unit: Climate Change Services
Client: EcoSecurities Group plc	Client ref.: Joaquin Pereyra

Project Name: Amatitlan Geothermal Project
Country: Guatemala
Methodology: ACM0002
Version:6
GHG reducing Measure/Technology: Ormat Combined Cycle Unit (OCCU) to generate power from geothermal resources.
ER estimate: 82 978 tCO_2e (Annual average)
Size
☒ Large Scale
☐ Small Scale
Validation Phases:
☒ Desk Review
☒ Follow up interviews
☒ Resolution of outstanding issues
Validation Status
☐ Corrective Actions Requested
☐ Clarifications Requested
☒ Full Approval and submission for registration
☐ Rejected

In summary, it is DNV's opinion that the Amatitlan Geothermal Project in Guatemala, as described in the PDD version 7 dated 25 April 2008, meets all relevant UNFCCC requirements for the CDM and all relevant host Party criteria and correctly applies the baseline and monitoring methodology ACM0002, version 6. DNV thus requests the registration of the project as a CDM project activity.

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Amatitlan Geothermal Project in Guatemala

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Abbreviations

AMM	Adminstrador del Mercado Mayorista
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction
CH_4	Methane
CL	Clarification request
COCODE	Community Councils on Sustainable Development
CONAP	National Council of Protected Areas
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
DGE	Dirección General de Energía
DNV	Det Norske Veritas
DNA	Designated National Authority
ECLAC	Economic Commission for Latin America and the Caribbean
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
INDE	Instituto Nacional de Electrificación
IPCC	Intergovernmental Panel on Climate Change
MARN	Ministry of the Environment and Natural Resources
MP	Monitoring Plan
N_2O	Nitrous oxide
NGO	Non-governmental Organisation
OCCU	Ormat Combined Cycle Unit
ODA	Official Development Assistance
OEC	Ormat Energy Converter
PDD	Project Design Document
UNFCCC	United Nations Framework Convention on Climate Change

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1 EXECUTIVE SUMMARY – VALIDATION OPINION

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

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

The host Party is Guatemala and the Annex I Party is United Kingdom of Great Britain and Northern Ireland. Both countries fulfil the participation criteria and have approved the project and authorized the project participants. The DNA from Guatemala has confirmed that the project assists in achieving sustainable development.

The project correctly applies ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources", version 06.

By constructing a new geothermal power plant with a net capacity of 20.5MW that is connected to the local grid, the project results in reductions of GHG emissions that are real, measurable and give long-term benefits to the mitigation of climate change. It is demonstrated that the project is not a likely baseline scenario. Emission reductions attributable to the project are hence additional to any that would occur in the absence of the project activity.

The total emission reductions from the project are estimated to be on average 82 978 tCO_2e per year during the selected first 7 year crediting period. The emission reduction forecast has been checked and it is deemed likely that the stated amount is achieved given that the underlying assumptions do not change.

Adequate training and monitoring procedures have been implemented.

In summary, it is DNV's opinion that the "Amatitlan Geothermal Project" in Guatemala, as described in the PDD Version 7 dated 25 April 2008, meets all relevant UNFCCC requirements for the CDM and all relevant host Party criteria and correctly applies the baseline and monitoring methodology ACM0002, version 06. DNV thus requests the registration of the project as a CDM project activity.

2 INTRODUCTION

Ecosecurities Group Plc has commissioned Det Norske Veritas Certification AS (DNV) to perform a validation of the "Amatitlan Geothermal Project" in Guatemala (hereafter called "the project"). This report summarises the findings of the validation of the project, performed on the basis of UNFCCC criteria for the CDM, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to Article 12 of the Kyoto Protocol, the CDM modalities and procedures, and the subsequent decisions by the CDM Executive Board.

2.1 Objective

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

2.2 Scope

The validation scope is defined as an independent and objective review of the project design document (PDD). The PDD is reviewed against the criteria stated in Article 12 of the Kyoto Protocol, the CDM modalities and procedures as agreed in the Marrakech Accords and the relevant decisions by the CDM Executive Board, including the approved baseline and monitoring methodology ACM0002. The validation team has, based on the recommendations in the Validation and Verification Manual employed a risk-based approach, focusing on the identification of significant risks for project implementation and the generation of CERs.

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

3 METHODOLOGY

The validation consisted of the following three phases:

I a desk review of the project design documents

II follow-up interviews with project stakeholders

III the resolution of outstanding issues and the issuance of the final validation report and opinion.

The following sections outline each step in more detail.

3.1 Desk Review of the Project Design Documentation

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

/1/ EcoSecurities Ltd. *Project design document for the* "Amatitlan Geothermal Project", Version 1 of 15 March 2006; Version 2 of 03 August, 2006; Version 3 of 03 August, 2006; version 4 of 16 January 2007, Version 5; version 4 of 16 January 2007 and Version 7 dated 25 April 2008.

/2/ DNV of Guatemala: Approval letter, dated 22 November 2007

/3/ United Kingdom of Great Britain and Northern Ireland: Approval letter ESG/04/2008 Dated 25 January, 2008.

/4/ International Emission Trading Association (IETA) & the World Bank's Prototype Carbon Fund (PCF): *Validation and Verification Manual*. http://www.vvmanual.info

/5/ CDM Executive Board: *ACM0002 – "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"*. Version 06

/6/ Instituto Nacional de Electrificación and Ortitlan Limitada *Power Purchase Agreement* 17 April, 2003

/7/ Energy and Mines Ministry *Ortitlan's Geothermal Resources authorization* 15 July, 2003

/8/ Environmental Impact Assessment Study For The Project: *Installation And Operation Of The Ortitlan Geothermal Plant Located At The Amatitlan Geothermal Field, Municipality Of Amatitlan, Department Of Guatemala*, July 2003

/9/ National Council of Protected Areas: *Project Authorization*, 11 May, 2005

/10/ MARN *Environmental Impact Assessment Acceptance* Resolution 942 from 2005.

/11/ Ecosecurities Ltd. *Project emission spreadsheet* Version 1 dated 25 September, 2006; Version 2 dated December, 2006; Version 3 20 April, 2007

/12/ CDM Executive Board: *Tool for the demonstration and assessment of additionality*, version 04

/13/ Goverment of Guatemala *Ley General de Electricidad* – Decreto Nº 93-96

/14/ ECLAC- *Centroamerican Itsmo Electricity subsector statistics for years 2004-2006*

/15/ Comisión Federal de Electricidad- Gerencia de proyectos Geotérmicos: *Amatitlan Project Technical Report*, November 2001

/16/ International Energy Agency- *Guatemalan 2003 electricity statistics.*

/17/ Ecosecurities Ltd. *Guatemala CEF calculation* December 2006 and 18 April, 2007 information provided by AMM and DGE.

/18/ Wold Bank Environmental, *health and safety guidelines for geothermic projects* July, 1998

/19/ Ortitlan *stakeholders meetings newspaper invitation, poll results and meeting minutes* provided December 2006

/20/ ORMAT *electrical single line diagram* 14 December, 2003

/21/ American Society for testing and Materials *Standard Practice for sampling two-phase Geothermal fluid for purposes of chemical analysis* E 1675 – 95a

/22/ Werner Witting Loarca *Environmental Compliance report during construction phase* 20 April, 2006

/23/ EcoSecurities, Ecosecurities - *Amatitlan a proposal to ORMAT,* 12 January, 2005

/24/ Guatemalan Ministry of environmental and Natural Resources http://www.marn.gob.gt/

/25/ Guatemalan Ministry of energy and mines http://www.mem.gob.gt/Portal/Intro.htm).

/26/ Lawrence, Stephen. "Geothermal Energy". Leeds School of Business; Boulder, Colorado. 21 February, 2006. http://leeds-faculty.colorado.edu/lawrence/syst6820/Lectures/Geothermal%20Energy.ppt

/27/ European Commission, Geothermal Energy: Market Barriers. http://ec.europa.eu/energy/atlas/html/geomark.html

/28/ International Institute for Sustainable Development. "Summary of Proceeding of the International Conference for Renewable Energies #3". Volume 95, Number 03. Thursday, 3 June 2004. Geothermal Power Side Event. http://www.iisd.ca/download/asc/sd/sdvol95num3e.txt

/29/ Geothermal Energy Association (GEA). "Statement of the GEA to the Committee on Ways and Means, US House of Representatives". Washington DC: May 42, 2005. http://www.geothermal-biz.com/Docs/Statement%20of%20the%20Geothermal%20Energy%20Association%20Submitted%20May%2024%202005.doc

/30/ Lobato, Enrique M. et al. "Geothermal Guatemala," June, 2003. *GRC Bulletin.* Geothermal Resources Council. Available online at www.geothermal.org/articles/guatemala.pdf

/31/ World Energy Resources Council. "Survey of Energy Resources: Geothermal Energy". 2001. http://www.worldenergy.org/wec-geis/publications/reports/ser/geo/geo.asp

/32/ Decree 52-2003, Decree 20-86 Government of Guatemala, 28 October 2003 and 08 January 1986 respectively.

/33/ ORMAT Technologies Inc., Annual Report for the fiscal year 2005,

/34/ ORMAT International, proposal to INDE to establish the PPA, 20 February 2002.

/35/ Local press reports, Prensa Libre, El Informador Rural, Peace link, Social Conflicts for Amatitlan, 2003-2006

/36/ Ortitlan Limitada, Short Term Loan Portfolio, 2004 – 2008.

The main changes between the PDD version published for the 30 days stakeholder commenting period and the final version of the PDD submitted for registration are as follows:

- A.2. Description of the project activity

Detailed project location and better description of the project's contribution to sustainable development of the Host Country

- A.4.3. Technology to be employed by the project activity:

Better description of the Ormat Combined Cycle Unit and related training programs to employees.

- B.1. Title and reference of the approved baseline methodology applied to the project activity

Reference to the tool for demonstration and assessment of additionality used

- B.2 Justification of the choice of the methodology and why it is applicable to the project activity

Description and explanation of the choice of methodology and related justification

- B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario

Identification and assessment of a third alternative to the project scenario.

- B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality)

Broader explanation of Sub-step 1b. Consistency with mandatory laws and regulations; step 3. Barrier Analysis; Sub-step 4b Discuss any similar options that are occurring and final conclusion.

- B.6.1. Explanation of methodological choices:

Broader description about project boundary, review to the baseline emission factor

- B.7.1 Data and parameters monitored:

Better description of data / parameter as required by the new methodology version.

- B.7.2 Description of the monitoring plan:

Broader explanation and new information like the description of the monitoring procedures

- D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party

New description of the mitigation actions

- E.2. Summary of the comments received

Description of further presentation to the communities.

- E.3. Report on how due account was taken of any comments received:

Further description of explanations to communities' presentations and description of the net capacity of the plant

- Annex 4 Further details of the Monitoring Plan.
Table 1: CDM Monitoring System Procedures
Table 2: Operational procedures and responsibilities for monitoring and quality assurance of emissions reductions from the project activity

3.2 Follow-up Interviews with Project Stakeholders

	Date	Name	Organization	Topic
/37/	05 December, 2006	Raúl Castañeda	DNA of Guatemala	- - Environmental and operational permits - - National environmental legislation - - LoA status - - National stakeholders comments process - - Stakeholders consultation process information
/38/	05-06 December, 2006	Isaac Nachman Aaron Choresh	Ortitlán Limitada	- - Environmental impact assessment report - - Applied project technology - - Physical conditions - - Local permits and local environmental requirements.
/39/	05-06 December, 2006	Jenna Goodward	EcoSecurities Ltd	- Baseline and monitoring methodologies - Additionality evaluation - Calculation of emission reductions

3.3 Resolution of Outstanding Issues

The objective of this phase of the validation was to resolve any outstanding issues which needed to be clarified for DNV's positive conclusion on the project design.

In order to ensure transparency a validation protocol was customised for the project. The protocol shows in a transparent manner the criteria (requirements), means of verification and the

results from validating the identified criteria. The validation protocol serves the following purposes:

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

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

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

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

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

The initial validation of the project identified 3 Corrective Action request and 13 Clarification request.

These initial findings were presented to the project participants in the form of a draft validation report dated 10 November 2007 (rev. 0).

To guarantee the transparency of the validation process, the concerns raised by DNV and the response provided by the project participants is documented in Table 3 of the Validation Protocol in Appendix A to this report.

Since modifications to the project design was necessary to resolve DNV's concerns, Ecosecurities Group Plc. decided to revise the PDD and resubmitted the PDD of Version 7 dated 25 April 2008. After reviewing the revised PDD, DNV issued this final validation report and opinion.

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

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

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

Figure 1 Validation protocol tables

3.4 Internal Quality Control

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

3.5 Validation Team

Role/Qualification	Last Name	First Name	Country
Team Leader / CDM Validator	Capuchino	Alfonso	Mexico
GHG Auditor	Lara	Barbara	Mexico
GHG Auditor	Praveen	Nagaraje Urs	India
Sector Expert	Lehmann	Michael	Norway
Technical Reviewer	Sharma	Anjana	India

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

4 VALIDATION FINDINGS

The findings of the validation are stated in the following sections. The validation criteria (requirements), the means of verification and the results from validating the identified criteria are documented in more detail in the validation protocol in Appendix A.
The final validation findings relate to the project design as documented and described in the revised and resubmitted project design documentation.

4.1 Participation Requirements

The project participants are Ortitlán Limitada from Gauatemala; and EcoSecurities Group PLC and EcoSecurities Carbon I Ltd from United Kingdom of Great Britain and Northern Ireland. The host Party is Guatemala and the Annex I Party is the United Kingdom of Great Britain and Northern Ireland. Both Parties meet the requirements for participating in a CDM project activity and have approved the proposed project and provided authorization to the project participants. The DNA of Guatemala has also confirmed the proposed project's contribution to the sustainable development.
The validation did not reveal any information that indicates that the project can be seen as a diversion of official development assistance funding towards Guatemala.

4.2 Project Design

The project is located in the departments of Esquintla and Guatemala in the municipalities of San Vicente Pacaya, Amatitlan and Villa Caneles. The total installed capacity of the proposed project is 25.2 MW and the actual net capacity is 20.5 MW.
The proposed project involves the installation of 3 turbines (two with installed capacities of 12 MW each, and one at 1.2 MW) and is expected to generate about 162 GWh annually.
The project uses the Ormat combined cycle unit (OCCU) technology that is manufactured by Ormat Industries Ltd, a subsidiary of the U.S.-based Ormat Technologies Inc. The technology reflects current good practices.
The steam and brine are extracted from 5 wells, AMF-1, AMF2, AMF-5, AMF-6 and AMJ-7. Wells AMF-3 and AMF-4 are to be used for steam and brine re-injection
The Ormat combined cycle unit comprises of two types of modules:
Module I (also called topping module): This module consists of a 1.2 MW back-pressure steam turbine. A portion of produced steam (at a pressure of 9 bars) at the initial inlet will be utilized to run the turbine and the generator. The expanded steam from the Module 1 will enter Module II.
Module II: This module consists of two Ormat energy converter (OEC) units, which use an organic rankine cycle to convert the heat of the brine, the heat of the steam bypassing module I, and the heat rejected from the topping module into power. The electricity is generated by the synchronous type brush generator connected to the two OECs. The heat is recovered from the above mentioned sources through an organic motive cycle fluid. The steam and hot brine flow to the vaporizer and the preheater of the unit where they heat and boil the organic fluid. The geothermal steam is condensed while flowing in the vaporizer and exits the vaporizer as condensate and mixes with the brine. The waste geothermal fluid exits the OEC at a temperature of approximately 75°C, and the entire amount of steam and brine extracted from the production wells is re-injected into the injection wells (AMF-3 and AMF-4).

DNV was able to confirm that the proposed project is in line with relevant legislation in Guatemala and the technology is approved by different authorities and verified that the relevant licenses and permits are in place.

Project start date has been considered as the date of signing the Power Purchase agreement (PPA) between Ortitlan Limitada and the INDE on 25 April 2003. The initial start of the construction of 01 May 2005 was verified from the Ormnat's Annual Report of 2005 /33/. The expected operational lifetime of the proposed project is 25 years which has been verified from the viability analysis done by ORMAT International /6/.

The project developer has selected a renewable crediting period starting from 01 November 2008 or the date of registration of the CDM project activity, whichever occurs later..

4.3 Baseline Determination

The project applies the approved consolidated baseline methodology ACM0002: "Consolidated baseline methodology for grid connected electricity generation from renewable sources" /5/. The methodology is applicable to the project activity since:

The project is a renewable electricity generation plant, in the form of a geothermal power plant which is connected to a national power grid, the Guatemalan National Interconnected System (Sistema Nacional Interconectada). This grid is clearly identified and information on its characteristics is available to the public, and the proposed project is not an activity that involves switching from fossil fuels to renewable energy at the site of the project activity.

The project developer has discussed the following alternatives to the proposed project:

- Alternative 1: The proposed project without CDM – This alternative has not been selected as the baseline scenario as it faces barriers (refer to the additionality discussion)
- Alternative 2: Continuation of the current situation i.e generation of same amount of electricity by the power plants connected to the grid – This scenario has been selected as the baseline scenario as it does not face any barrier and also is in compliance with the national laws and regulations.
- Alternative 3: The construction of thermal (fossil fuel based) power plant with the same annual power output or with the same installed capacity – This scenario has not been selected as the baseline scenario as the project developer does not have experience in the operation of thermal power plant. It has been confirmed that the main business area of the project developer is the development and operation of the geothermal power plants. DNV was able to verify that the project developer is in this business since at least 50 years ago, as per the recognition of the Italian Geothermal Union delivered to ORMAT on 10 December 2005.

As specified in ACM0002 for projects which do not modify or retrofit existing electricity generation facilities, the baseline is that the electricity delivered to the grid by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations.

According to ACM0002, the Sistema Nacional Interconectada (the Guatemalan National grid system) is selected as the project boundary. This choice is justified because:

- It is the default grid definition in countries which do not have layered dispatch systems, which Guatemala does not;

- It is the grid to which the electricity generated by the project will be sold; and it is the grid which serves the whole country, with the exception of a small area in the rural northern region of Petén.

The application, discussion and determination of the chosen baseline methodology is transparent. The application follows exactly each of the steps outlined in the methodology and answers the corresponding sections in a proper manner.

The baseline emissions were calculated as prescribed by the methodology. The baseline emissions factor (EFy) is calculated as the weighted average of the operating margin emission factor and the build margin emission factor. The data used to calculate the grid emissions factor is sourced from the General Office of Energy, a division of the Ministry of Mines and Energy (Dirección General de Energia, or DGE) and the grid administration authority (Aministrador del Mercado Mayorista, or AMM) /17/.

The operating margin has been calculated as simple operating margin because the low-cost must run resources constitute less than 50% of total grid generation.

The build margin emission factor $EF_{BM,y}$ is calculated ex-ante based on the most recent accurate and complete information available (2003-2005) on plants already built for sample group at the time of PDD submission for validation in year 2006. For the proposed project, the project developer has chosen the sample group *m* which consists of power plant capacity additions that represent 20% of total system generation.

Electricity supplied annually by the project to the grid (*GEN*) is predicted at 162 000 MWh.

The system boundaries are defined as follow:

	GHGs involved	*Description*
Baseline emissions	CO_2	According to ACM0002 only CO_2 emissions from electricity generation should be accounted for.
Project emissions	CO_2	According to ACM0002 CO_2 emissions in non-condensable gases that are released to the atmosphere must be accounted for.
	CH_4	According to ACM0002 CH_4 emissions in non-condensable gases that are released to the atmosphere must be accounted for.
Leakage	According to ACM0002, leakage is not considered and no leakage is expected.	

4.4 Additionality

The additionality of the project activity has been established using the "Tool for the demonstration and assessment of additionality, Version 4" /12/.

DNV was able to verify that the benefits of CDM revenues were seriously considered for the proposed project since its initial stages i.e. year 2001. Viability analysis of the proposed project was done by ORMAT International (project developer) in year 2001 and the CER income was included into the proposal presented to INDE (power purchaser) on 20 February 2002. Based on this proposal (including the CDM revenues), the project developer signed the final Power Purchase Agreement (PPA) with INDE on 25 April 2003 for the sale of electricity (considered as the starting date of the project activity).
Though the PPA for the proposed project was signed in year 2003 but due to the social conflicts between the project developer and the local communities (mainly related to implementation of the project), there was no progress on developing this project for about two years. DNV was able to confirm the same from the several published reports that mention about the conflict of the project developer with the communities /36/. These conflicts were finally treated through a negotiation table integrated by the Civil Forces of Guatemala, the Municipalities and Ortitlan Ltda. DNV was able to confirm this from several press reports and direct interviews with the authorities /36/. DNV was also able to verify that these social conflicts also hindered the process of getting the construction permit for the proposed project /36/.
Furthermore, the project developers signed the contract with the CDM consulting company, EcoSecurities Ltd. on 15 February 2005 to develop the proposed project as a CDM project. The main scope of work for the contracted company was to analyze and commercialize the project's carbon mitigation potential. The final construction of the project started on 01 May 2005 which has been verified from the annual report of ORMAT for the fiscal year 2005 /33/. Eventually, the proposed project was submitted for validation in June 2006.

Step 1. Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a. Define alternatives to the project activity:

Three alternatives to the project scenario are considered:

Alternative 1: The proposed project activity without CDM: construction of a new renewable generation plant with a net capacity of 20.5MW connected to the local grid, implemented without considering CDM support and revenues.

This alternative faces a number of barriers as identified in the assessment and demonstration of additionality, and therefore is unlikely to be implemented in the absence of the CDM (i.e. is not the baseline scenario).

Alternative 2: Continuation of the current situation. Electricity will continue to be generated by the existing generation mix operating in the grid and future expansions.

Continuation of the current situation would require no investments on the part of the project developer, and would not face any technological or other barriers. Electricity would continue to be generated by the existing mix of (predominantly fossil fuel) power plants in the grid and would be expanded along the lines of the build margin. This alternative does not face any barriers and is therefore identified as the baseline scenario.

Alternative 3: Construction of a thermal (fossil-fuel) power plant with the same installed capacity or the same annual power output.

This is not a plausible alternative for this specific project developer, given that Ortitlan Limitada is a company dedicated to development and management of geothermal power plants and has no experience in thermal (fossil-fuel) power plants.

Sub-step 1b. Consistency with mandatory laws and regulations:

The law governing the electricity sector in Guatemala is the "Ley General de Electricidad – Decreto Nº 93-96". It was enacted in 1996 and mandated the de-bundling and privatization of the Guatemalan electricity sector. There are no laws or government incentives that are compelling the project developer to develop this type of renewable energy plant, thus alternatives 1 and 2 identified are in line with all applicable laws and regulations. Both alternatives are in compliance with all applicable legal and regulatory requirements of Guatemala.

During the site visit, DNV visited the Guatemalan DNA authority with the aim of cross checking PDD statements related to baseline and legislation compliance. DNV was also able to confirm that in Guatemala, laws keep on changing very frequently. Due to this, the project might get affected as it has to comply with the new amendments. However, these amendments are publicly available[1] when approved by the authorities so as to get the project participants to be in absolute compliance with laws and regulations. By the time of the validation process, the project was in compliance with the laws and regulation established by the authorities in Guatemala.

Step 3. Barrier Analysis

Sub-step 3a. Identify the barriers that would prevent the implementation of type of the project activity.

Technical Barriers

Resource uncertainty: Predicting reservoir size and the long-term fluid and heat flow that reservoirs can sustain is the major concern. The uncertainty of the resources (as stated in the PDD) has been verified from the external studies /26/. The evidence provided sufficiently demonstrates that under such situation the proposed project faces risks in terms of:

- Performance
- Increase in operation costs (which mainly depends on actual situation at the time of emergency).
- Additional resources necessary for the exploration of extra wells.
- Other unseen risks which can affect project operation.

Operational and Maintenance Requirements: DNV was also able to confirm that in such type of projects (geothermal), it is quite difficult to estimate the operation and maintenance requirements at the project development stages. Hence, even the O&M costs cannot be estimated resulting in uncertainty of future costs and operational consistency.

The project developers for such type of projects maintain a well reserve fund (WRF) for emergencies. Considering that the flow from the wells might decline from time to time due to

[1] http://www.marn.gob.gt/; http://www.mem.gob.gt/Portal/Intro.htm

well clogging or other damage, the well reserves fund (WRF), which is basically a "saving" reserve account, provides a shield for such type of emergencies.
Studies by the European Commission /27/ and US Government Accountability office /29/ confirm that the extent to which corrosion of moving parts and scale deposition, caused by the presence of silica in water is an upfront pushing to establish and regularly pay into a well maintenance fund to reduce the risk that unexpected costs could cause volatile income.

Technology Barriers: Guatemala's extensive geothermal reserves are estimated between 800 and 4,000 MW as stated as part of the 2005 World Geothermal Congress /30/. Despite this, only 33.4 MW of capacity has ever been installed, and the technology for geothermal power plants is not available locally. Instead, equipments are imported from countries outside Central America.
In the proposed project's case, in response to the INDE's international tender for a developer of the geothermal field, Ormat Industries Ltd. was the only bidder, which clearly indicates limited interest due to the significant challenges and risks associated with such a project in Guatemala. The risks outlined above are primarily a result of the fact that the technology is state-of-the-art, not available locally, and not common practice.

Commercial Barriers
Investment barriers a) Financing availability: It has been stated that the unavailability of funds for geothermal power plants is the major barrier for the implementation of such type of projects. International and commercial banks are reluctant to finance geothermal projects in large part due to the risks associated with resource uncertainty. This was verified as part of the document research from the International Institute for Sustainable Development web page articles /28/. r
DNV was able to verify that even the proposed project faced this barrier. Initially, the project was supposed to be financed by Inter-American Development Bank (IADB). However, the project developer did not get any response from IADB. The same was verified from the communications between the project developer and IADB (dated 2003).
The project developer decided to approach other lenders. A local bank was contacted in year 2004 - 2005 to syndicate financing but due to inability to reach agreement on loan documents terms, the same could not get finalized. The investment barrier faced by the project is further evident from the fact that the project developer has still not been able to arrive at the financial closure for the project.
DNV was able to confirm that the construction of the project is financed by short term temporary loans /36/, and the project participant is needed to get long term external financing that will optimize the financial structure by replacing the short terms loans.
The project participant demonstrated that CDM revenues are needed to provide potential lenders the customary debt coverage ratios. Also it was confirmed that CDM revenues will provide resources to construct two additional wells that are needed to achieve project's contractual obligations for 20.50 MW under the PPA /6/. As per the technical report /8/ in order to sustain the flow of fluids to the plant, it is projected that a new well (or major overhaul to existing wells) will have to be carried out every 3-4 years.
Besides, DNV was able to confirm that it is agreed that the CDM revenues shall belong to the project developer and therefore lower tariffs could be offered to INDE by the PP.

b) Country risk It has also been verified that Guatemala has been placed under the category D for the legal and regulatory risk and under category C in the overall political risk assessment as

per The Economist – 2006. Under such conditions, investing in any type of project in such a country is risky for any investor. The above mentioned ratings increase the insurance premiums resulting in an additional financial burden on the project developer.

Institutional and infrastructure barriers: DNV was able to verify through direct interviews /31/ that the context of the project such as the sector re organization and the privatization of the electricity (1996) places the project in a situation of less attractiveness for investment environment for geothermal and renewables in general due the private sector is more risk averse and seeks short-term profit in its investments.
It was confirmed through direct interviews /31/ that the independent power producers still rely on INDE for such crucial project components as Power Purchase Agreements and the installation of grid interconnections, both of which are under its mandate in the current power sector structure, arrangement which makes generators dependent on INDE and vulnerable to any delays within its operations as well as their own.

Regulatory Risk:
The project developer has argued that the proposed project faces risk due to frequent changes in the Guatemalan regulations. There is a lack of clarity related to the complete privatization process. The main affect of the changes in the regulation is on the prevailing tariff regime. DNV was able to confirm that recently, the regulatory agencies (which oversee the power market) like National Commission on Electrical Energy (Comisión Nacional de Energía Eléctrica, or CNEE) and the Administrador del Mercado Mayorista agencies announced plans to change the tariff structure for electricity which will decrease some capacity payments and increase transaction costs for independent generators. Such type of changes greatly affects the financial viability of projects already under construction including the proposed project. Though the Power Purchase agreement of the proposed project has already been signed but the risk due these type of changes always exists for this type of project as well. Both situations were assessed with environmental authority /33/ and had been periodically verified as part of the local news paper (www.elperiodico.com) continual news.
DNV was able to verify that these changes have been protested loudly by the Association of Renewable Energy Generators (Asociación de Generadores con Energía Renovable, or AGER) and the National Association of Generators (Asociación Nacional de Generadores),
Furthermore, DNV was also able to verify that the proposed project faced barriers in getting the permission to start the construction. The main reason behind the same was the lack of coordination between the state government and national government laws. DNV was able to confirm that due to the lack of clarity on the type of permission/consent to be taken for the implementation of the proposed project, there was actual delay in starting the project. Up to the validation process the compliance was demonstrated by the project participant and cross checked with the involved authorities.
DNV also confirmed that due to changes in the environment laws, the project had to face the loss in terms of tax credits. As per the current Law for Incentives for Development of Renewable Energy Projects (Decree 52-2003) issued on 28 October 2003, the proposed project will receive less tax credits compared to the old environmental law decree 30-86 issued on 08 January 1986. The old and the new revised environmental laws have been verified by DNV. /32/.

Barrier analysis evidence: During validation process, evidences of all identified barriers were requested which were discussed with the local authorities /37/ and verified during site visit and

document review. References to this support documents were included in the PDD /1/ in the form of footnote which also were assessed to verify sources veracity.

Sub-step 3b: The barriers detailed above are specific to the development of a geothermal power plant in Guatemala without CDM support (Alternative 1). They do not apply to or in any way prevent Alternative 2 and therefore it is demonstrated that the baseline scenario is not the project activity.

Step 4. Common Practice Analysis

Sub-step 4a. Analyse other activities similar to the proposed activity

The project developer has provided a list of geothermal plants in Guatemala. DNV was able to confirm the completeness of data from the authorities in Guatemala MARN and INDE). It has been observed that Orzunil power plant (Quetzaltenango) with an installed capacity of 28 MW is the only large-scale power plant operating to date. The plant was installed in 1999.

Based on above statistics, DNV is of the opinion that the small amount of capacity installed relative to potential that exists indicate that the development of this type of project is not a common practice in Guatemala.

Sub-step 4b Discuss any similar options that are occurring

As stated above, the only other large commercial geothermal power plant in Guatemala is located at the Zunil geothermal field near the town of Zunil in Quetzaltenango. There are, however, essential distinctions between the proposed CDM project and the already operating Orzunil project:

- Orzunil project was planned in 1993, before the privatisation of the electricity sector. Although it is not state-owned, INDE provides risk mitigation support in its PPA with Orzunil, as per the "Plan de Acción Económica" of the Government of Guatemala 2002 - 2004, which it does not in the PPA for Amatitlan. These measures include INDE taking full responsibility for the resource risk. Although INDE did not have geothermal experience, it took on this "high risk" and even offered Orzunil a take-or-pay PPA.
- For Orzunil, INDE guaranteed the production of hot water and steam supply, well-field operations, and adequate injection capacity, as per the "Plan de Acción Económica" of the Government of Guatemala 2002 - 2004, all of which removes all resource risk to the developer. Furthermore, the Orzunil project was able to source both equity and debt funding from the IFC, which wanted to fund the project as a demonstration project and the "first of its kind" in the country.
- Orzunil was financed before the renewable support law was changed, and so enjoys a locked-in tax structure which allows for 100% tax credits for capital expenditures.

The common practice analysis therefore reveals that there are essential differences in the regulatory and investment environment under which similar activities were implemented, and that the project activity is not common practice.

Conclusion:

Project barriers were verified by different means including interview with Environmental authorities /37/; site visit and interview with project participants /38/ and /39/; Internet research and verification of data sources mentioned in the PDD /1/. Based on the evaluated it is DNV's opinion that the project faces significant barriers to implementation. The amount of geothermal

projects implemented in the area and also within the country demonstrates that is not common practice and that alternative 2 does not have any barriers to prevent it in the short or medium term.

4.5 Monitoring

The project has correctly applied the approved consolidated methodology ACM0002, "*Consolidated monitoring methodology for zero emissions grid-connected electricity generation from renewable sources*". The application of methodology is justified based on the fact that the proposed project activity is a renewable energy based (geothermal sources) power generation project connected to the grid.

For geothermal projects, monitoring methodology requires the monitoring of following parameters:

- Electricity generation from the proposed project activity
- Data needed to calculate fugitive carbon dioxide and methane emissions and carbon dioxide emissions from combustion of fossil fuels required to operate the geothermal power plant.

In the proposed project activity, the grid emission factor has been fixed *ex ante* and hence, does not require to be monitored during the crediting period.

4.5.1 Parameters determined ex-ante

- Simple operating margin (0.778 tCO_2e / MWh) and build margin (0.514 tCO_2e / MWh). Both were calculated applying data from 2003-2005 provided by DGE and AMM and default power plant fuel efficienc(ies) were used to calculate fuel consumption at plants where no specific consumption data was available from DGE or AMM based on EB Response to the Request for guidance on the Application of AM0015 (and AMS-I.D) in Brazil, dated October 7, 2005: Open cycle gas turbines: 32% and Oil based power plant sub-critical oil boiler: 33%.
- Calculated Baseline emission factor (0.646 tCO_2e / MWh) which will be applied during the 7 years crediting period.
- Net Calorific Values (NCV); Fuel Oil = 0.0404; Diesel = 0.0430; Coal = 0.0267 and Orimulsion = 0.0275 which were obtained from IPCC 2006.
- CO_2Emission factor: Fuel Oil = 77.36; Diesel = 74.06; Coal = 98.26 and Orimulsion = 77 which were obtained from IPCC 2006.
- Oxidation factor of fuel: 100% which are from the latest version of the IPCC national inventory guidelines and correspond specifically to the types of fuels used in Guatemala.

4.5.2 Parameters monitored ex-post

Parameters to be monitored include the ones required by the ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" Version 6 /5/, which are as follow:

- Electricity quantity (EG_y)
- Electricity consumption from grid quantity (ECG_y)
- Mass quantity of steam ($M_{s,y}$)
- Mass fraction of carbon dioxide in steam ($\omega_{Main,CO2}$)
- Mass fraction of methane in steam ($\omega_{Main,CH4}$)
- Mass quantity of steam ($M_{t,y}$) generated during well testing
- Mass fraction of carbon dioxide in steam ($\omega_{t,CO2}$) generated during well testing

- Mass fraction of methane in steam ($\omega_{t,CH4}$) generated during well testing
- Fuel quantities (F_{iy})
- Emission factors coefficient ($COEF_i$)

The monitoring plan was assessed and it can be concluded that it meets methodology requirements.

4.5.3 Management system and quality assurance

The site visit demonstrated that ORMAT, responsible for the technology and project implementation, is ISO 9000 and ISO 14000 certified and even that Amatitlan project is not certified past experiences and general management system requirements will be implemented for the day to day operations and EcoSecurities will assist to ensure that monitoring plan be completely fulfilled.
PDD includes a description of overall global responsibilities, monitoring, measurement and reporting procedures and activities.

4.6 Estimate of GHG Emissions

Emission reductions resulting from the proposed project activity have been calculated as follows:

Emission reductions (ERs) = Baseline emissions (BEs) – Project emissions (PE) –Leakage (L)

Baseline emissions

The baseline emissions factor (EFy) has been calculated as the weighted average of the operating margin emissions factor and the build margin emissions factor. The data used to calculate the grid emissions factor comes from General Office of Energy, a division of the Ministry of Mines and Energy (Dirección General de Energia, or DGE) and the grid administration authority (Aministrador del Mercado Mayorista, or AMM).

Simple operating margin (Option (a) from the Consolidated Methodology for Grid Connected Projects) were applied based on the following conditions: a) low-cost must run resources constitute less than 50% of total grid generation, b) The rest of the options are not able to complete based on the updated, accurate and complete information available which was verified during site visit and document review as well as part of the corroboration of official updated available generation data in the country.

Baseline emissions will be calculated as the result of electricity supplied by the project to the grid (MWh) multiplied by the baseline emission factor (0.646 tCO_2e / MWh).

Baseline emissions have been estimated to be 104 649 tCO_2 per year.

Project Emissions:

According to ACM0002 Geothermal project activities shall account the following emission sources:

- Fugitive emissions of carbon dioxide and methane due to release of non-condensable gases from produced steam which were estimated based on operational projects and taking into

account the fraction of CO_2 in gas composition of NCG resulting for a test performed by Comision Federal de Electricidad from Mexico /15/.
- Carbon dioxide emissions resulting from combustion of fossil fuels related to the operation of the geothermal power plant. Considering a back-up diesel generator that is expected to run approximately 15 hours per year.

Final project emissions estimations are 21 670 tCO_2e per year, which will be monitored during project life.

Leakage:

According to ACM0002, the leakage of the proposed project is not considered. No leakage is expected.

Emission reductions: have been estimated to be 82 978 tCO_2e per year during the first crediting period.

4.7 Environmental Impacts

Environmental impacts created by the project are clearly described in the Environment Impact Assessment /8/.

Environmental impacts have been identified for the different phases of the project: Pre-Operation Phase (Site Preparation, Earthworks and Construction), Operation Phase (the Operation itself and Tests) and the Site Abandonment Phase, during the actual stage, the environmental element considered as critical are noise. The noise mitigation shall be achieved by the installation of silencers inside the plant; thus, this impact has influenced the project design. Environmental Ministry grants permit to the project /10/ and have been demonstrated that environmental mitigation activities are carry on required by the authorities and verified by a third party /22/. Authorization and permits from the ministry of Energy and Mines (MEM) /7/, Ministry of Environment and Natural Resources (MARN) /10/, and the Commission on National Protected Areas (CONAP) /9/ have been granted. When National standards do not address a critical environmental requirement Project Participants applies World Bank standards /18/.

4.8 Comments by Local Stakeholders

A formal consultation process with local stakeholders has taken place and corresponding information has been submitted to the audit team. The process has taken place as part of the EIA and hereby announcement in “La Hora” a national newspaper in 28 July 2003 respect to comments into the Environmental Impact Assessment and an opinion poll that surveyed stakeholders in the surrounding communities of San Vicente Pacaya, El Cedro, El Bejucal, San Francisco de Sales, and Calderas, and covered demographic, social, economic and environmental aspects of the Project.

Negative comments were received with respect to sulfurized water from the project overflowing into the lake and concerns regarding the level of noise pollution that the plant would produce have been received. In both cases, explanation and actions implemented were clearly described.

Further meetings with the COCODE were hold in the following dates: 28 May 2005; 05 August, 2005; 16 December, 2005; 02 April, 2006; 17February, 2006; 23 June, 2006; 22 September 2006

and 22 December 2006. Evidence of the meetings, polls and comments were assessed stating that PDD states clearly the received comments and how actions were taken.

4.9 Comments by Parties, Stakeholders and NGOs

The PDD of 15 March 2006 version 1.0 was made publicly available on DNV's climate change website (http://www.dnv.com/focus/climate_change/projects/projectlist.asp?) and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 07 June 2006 to 06 July 2006.

Following the revision of ACM0002, the PDD of 16 January, 2007 Version 4.0, was also made publicly available on DNV's climate change website and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 28 June 2007 to 27 July 2007.

In both consultation periods, no comments were received.

APPENDIX A

CDM VALIDATION PROTOCOL

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

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

Requirement	Reference	Conclusion
absence of the project activity, i.e. a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity.	CDM Modalities and Procedures §43	
About forecast emission reductions and environmental impacts		
11. The emission reductions shall be real, measurable and give long-term benefits related to the mitigation of climate change.	Kyoto Protocol Art. 12.5b	OK
For large-scale projects only		
12. Documentation on the analysis of the environmental impacts of the project activity, including transboundary impacts, shall be submitted, and, if those impacts are considered significant by the project participants or the Host Party, an environmental impact assessment in accordance with procedures as required by the Host Party shall be carried out.	CDM Modalities and Procedures §37c	OK
About stakeholder involvement		
13. Comments by local stakeholders shall be invited, a summary of these provided and how due account was taken of any comments received.	CDM Modalities and Procedures §37b	OK
14. Parties, stakeholders and UNFCCC accredited NGOs shall have been invited to comment on the validation requirements for minimum 30 days, and the project design document and comments have been made publicly available.	CDM Modalities and Procedures §40	OK
Other		
15. The baseline and monitoring methodology shall be previously approved by the CDM Executive Board.	CDM Modalities and Procedures §37e	OK
16. A baseline shall be established on a project-specific basis, in a transparent manner and taking into account relevant national and/or sectoral policies and circumstances.	CDM Modalities and Procedures §45c,d	OK
17. The baseline methodology shall exclude to earn CERs for decreases in activity levels outside the project activity or due to force majeure.	CDM Modalities and Procedures §47	OK

Requirement	Reference	Conclusion
18. The project design document shall be in conformance with the UNFCCC CDM-PDD format.	CDM Modalities and Procedures Appendix B, EB Decision	~~CL 1~~ OK
19. Provisions for monitoring, verification and reporting shall be in accordance with the modalities described in the Marrakech Accords and relevant decisions of the COP/MOP.	CDM Modalities and Procedures §37f	OK

Table 2 Requirements Checklist

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
A. General Description of Project Activity *The project design is assessed.*					
A.1. Project Boundaries *Project Boundaries are the limits and borders defining the GHG emission reduction project.*					
A.1.1. Are the project's spatial boundaries (geographical) clearly defined?	/1/	DR	The project is located 28km southeast of Guatemala city in the Pacaya Volcano National Park region. The project is situated 2000 meters above sea level. To the north lies the Hoja de Queso hill and El Pepinal: to the east, San Franciso de Sales, El Cedro and the Municipality of San Vicente Pacaya; to the west, Mesillas Altas. The Sistema Nacional Interconectada grid is determined as the project boundary		OK
A.1.2. Are the project's system boundaries (components and facilities used to mitigate GHGs) clearly defined?	/1/	DR I	Physically were verified that project generation capacity involves 3 generators 2x12 000 KVA) and one 1200 KW; PDD (version 1) defines a capacity of 28 MW. This need to be commented. Version 4 of the PDD demonstrates net capacity of equipment is 20.79 MW considering gross Capacity less auxiliaries, such as internal unit loads of pumps, electrical losses, fans, etc.	~~CL 2~~	OK
A.2. Participation Requirements *Referring to Part A, Annex 1 and 2 of the PDD as well as the CDM glossary with respect to the terms Party, Letter of Approval, Authorization and Project Participant.*					
A.2.1. Which Parties and project participants are participating in the project?	/1/	DR	Ortitlan Limitada from Guatemala as host country and EcoSecurities Group PLCfrom		OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			United Kingdom of Great Britain and Northern Ireland as Annex I.		
A.2.2. Have all involved Parties provided a valid and complete letter of approval and have all private/public project participants been authorized by an involved Party?	/1/	DR	Not Yet Provided	~~CAR 1~~	OK
A.2.3. Do all participating Parties fulfil the participation requirements as follows: - Ratification of the Kyoto Protocol - Voluntary participation - Designated a National Authority	/1/	DR	No LoA provided Host Party: Government of Guatemala has designated MARN (Ministerio de Ambiente y Recursos Naturales) to act as DNA. Date of ratification 05 October, 1999 Annex I: UK has appointed Department of Environmental, Food and Rural Affairs as the DNA and ratifies 31 May, 2002	~~CAR 1~~	OK
A.2.4. Potential public funding for the project from Parties in Annex I shall not be a diversion of official development assistance.	/1/	DR I	The validation did not reveal any information that indicates that the project can be seen as a diversion of official development assistance funding towards Guatemala.		OK
A.3. Technology to be employed *Validation of project technology focuses on the project engineering, choice of technology and competence/ maintenance needs. The validator should ensure that environmentally safe and sound technology and know-how is used.*					
A.3.1. Does the project design engineering reflect current good practices?	/1/	DR I	Yes engineering considered current good practice gained with PP experience in other countries and different conditions.		OK
A.3.2. Does the project use state of the art technology or	/1/	DR	There is a technological transfer to the country by	~~CL 3~~	OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
would the technology result in a significantly better performance than any commonly used technologies in the host country?		I	ORMAT – but it is not clear from which country the technological transfer is happening. Primarily from Israel and from US.		
A.3.3. Does the project make provisions for meeting training and maintenance needs?	/1/	DR I	Yes project participants included project training both for equipment operation and CDM requirements and maintenance needs as part of suppliers contracts and project developer will include it as part of commissioning also.		OK
A.4. Contribution to Sustainable Development *The project's contribution to sustainable development is assessed.*					
A.4.1. Has the host country confirmed that the project assists it in achieving sustainable development?	/1/	DR	No. LoA has not been issued yet.	~~CAR 1~~	OK
A.4.2. Will the project create other environmental or social benefits than GHG emission reductions?	/1/	DR I	Yes. - The project activity results in the displacement of electricity generated by fossil fuel sources. - Diversification of the electricity portfolio of Guatemala will provide greater stability to consumers and to the national economy. - The project will directly generate approximately 500 temporary jobs during the construction phase and 20 permanent jobs during the operation phase. - The operation phase will also create indirect service jobs and economic development in the surrounding community.		OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
B. Project Baseline *The validation of the project baseline establishes whether the selected baseline methodology is appropriate and whether the selected baseline represents a likely baseline scenario.*					
B.1. Baseline Methodology *It is assessed whether the project applies an appropriate baseline methodology.*					
B.1.1. Does the project apply an approved methodology and the correct version thereof?	/1/	DR	Version 01 of the PDD applies for ACM0002 version 05 which is not valid any longer. Need to be updated. Version 02 and subsequent of the PDD applies approved baseline methodology, ACM0002, Version 06	~~CAR 2~~	OK
B.1.2. Are the applicability criteria in the baseline methodology all fulfilled?	/1/	DR	Yes. The project is a renewable electricity generation plant, in the form of a geothermal power plant which is connected to a national power grid. The proposed project is not an activity that involves switching from fossil fuels to renewable energy at the site of the project activity.		OK
B.2. Baseline Scenario Determination *The choice of the baseline scenario will be validated with focus on whether the baseline is a likely scenario, and whether the methodology to define the baseline scenario has been followed in a complete and transparent manner.*					
B.2.1. What is the baseline scenario?	/1/	DR I	Electricity will continue to be generated by the existing generation mix operating in the grid and future expansions.		OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
B.2.2. What other alternative scenarios have been considered and why is the selected scenario the most likely one?	/1/	DR I	- The proposed project activity without CDM. - Construction of a thermal (fossil-fuel) power plant with the same installed capacity or the same annual power output.		OK
B.2.3. Has the baseline scenario been determined according to the methodology?	/1/	DR	Yes. For project activities that do not modify or retrofit an existing electricity generation facility, the baseline scenario is the Electricity delivered to the grid by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources		OK
B.2.4. Has the baseline scenario been determined using conservative assumptions where possible?	/1/	DR	Yes and as required as by the methodology		OK
B.2.5. Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies, macro-economic trends and political aspirations?	/1/	DR I	Yes as informed by National DNA.		OK
B.2.6. Is the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?	/1/	DR I	Yes.		OK
B.2.7. Have the major risks to the baseline been identified?	/1/	DR I	Changes in renewable generation national policies.		OK
B.3. Additionality Determination *The assessment of additionality will be validated with focus on whether the project itself is not a likely baseline*					

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
scenario.					
B.3.1. Is the project additionality assessed according to the methodology?	/1/	DR	Tool for the demonstration and assessment of additionality Version 2 was applied in PDD's version 01 to 03 please apply updated version 03. PDD Version 04 dated 16 January, 2007 applies additionality Tool version 03	~~CL 4~~	OK
B.3.2. Are all assumptions stated in a transparent and conservative manner?	/1/	DR I	Investment barrier: It has been argued that due to lack of financial aid from banks have made very unattractive and risky developing the project. – What is the fund availability for the project development? PP describes the following barriers: ***Technical Barriers*** **Resource uncertainty:** Geothermal energy development involves high risks due to the uncertainty inherent in predicting reservoir size and the long-term fluid and heat flow that reservoirs can sustain. **Operational and Maintenance Requirements:** Exact operation and maintenance requirements of a geothermal power station are difficult to determine in the development stages of the project, which results in uncertainty of future costs and operational consistency. **Technology Barriers:** Equipment for the Project must be imported from countries	~~CL 5~~	OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			outside Central America. In INDE's international tender for a developer of the geothermal field, Ormat Industries Ltd. was the only bidder, which indicates limited interest due to the significant challenges and risks associated with such a project in Guatemala. ***<u>Commercial Barriers</u>*** **Investment barriers a) Financing availability** there is a lack of commercial financing available for geothermal power plants which present a large barrier to project implementation. International and commercial banks are reluctant to finance geothermal projects in large part due to the risks associated with resource uncertainty. **b) Country risk** General contractual risk is a concern in the context of the Project because Guatemala receives a "D" rating in Legal and Regulatory Risk from The Economist in 2006. These concerns and Guatemala's overall political risk rating of "C" presents challenges when trying to arrange financing of a geothermal power plant there. Furthermore, investors would not be interested in the Project without political risk insurance (PRI), which the Project has had to secure privately at a significant cost.		

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			Institutional and infrastructure barriers: There are institutional barriers to the development of a geothermal power plant in Guatemala which result primarily from sectoral policy and reorganization of the power sector. **Regulatory Risk:** Changes in electricity sector regulation, renewable support policies, and local regulation can all affect financial performance of the Project and are outside of its control. Geothermal technology is becoming more mature, but still requires governmental support for commercial success; if this support is not dependable it presents a barrier to success and decreases attractiveness to investors.		
B.3.3. Is sufficient evidence provided to support the relevance of the arguments made?	/1/	DR I	Yes. Support documentation were assessed an interview with local authorities corroborate it.		OK
B.3.4. If the starting date of the project activity is before the date of validation, has sufficient evidence been provided that the incentive from the CDM was seriously considered in the decision to proceed with the project activity?	/1/ /23/	DR I	Yes. A contract between ORMAT and EcoSecurities were signed in February 2005 which is 3 months before project construction start.		OK
B.4. Calculation of GHG Emission Reductions – Project emissions *It is assessed whether the project emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values*					

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
– where applicable – is justified.					
B.4.1. Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/ /15/	DR I	In the project emission calculation, the mass fraction of carbon dioxide is considered as 1.8% - how is this calculated- calculation sheet need to be evidenced The diesel generator is approximately estimated to run for 15 hours per year and 180 kg of diesel is used – needs to be checked how this was accounted. CFE test demonstrates carbon dioxide is 1.8% and diesel consumption explained.	~~CL 6~~ ~~CL 7~~	OK
B.4.2. Have conservative assumptions been used when calculating the project emissions?	/1/	DR	All NCGs entering the power plant are discharged to atmosphere via the cooling tower		OK
B.4.3. Are uncertainties in the project emission estimates properly addressed?	/1/	DR	Yes as applicable and as determined by the methodology.		OK
B.5. Calculation of GHG Emission Reductions – Baseline emissions *It is assessed whether the baseline emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.*					
B.5.1. Are the calculations documented according to the	/1/	DR	Guatemala CEF is calculated with vintage	~~CAR 3~~	OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
approved methodology and in a complete and transparent manner?		I	data from years 2001-2003. In 09 April, 2007 ECLAC publish Electricity statistics of the Central American region which includes Guatemala, In order to calculate Grid CEF needs to be used latest official available information. Please update CER calculation. Was verified that above data would not be possible to apply as it does not include fuel consumption, so was verified that PDD was wrote with the most accurate and complete data available		
B.5.2. Have conservative assumptions been used when calculating the baseline emissions?	/1/	DR	Wherever possible, plant specific fuel consumption data was used where supplied by the DGE or AMM. However, for the few plants without such data available, fuel consumption was calculated using conservative default fuel efficiencies for the relevant technologies, as specified in EB Guidance		OK
B.5.3. Are uncertainties in the baseline emission estimates properly addressed?	/1/	DR	Yes		OK
B.6. Calculation of GHG Emission Reductions – Leakage *It is assessed whether leakage emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.*					
B.6.1. Are the leakage calculations documented	/1/	DR	According to ACM0002, the leakage of the		OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
according to the approved methodology and in a complete and transparent manner?			proposed project is not considered. No leakage is expected.		
B.7. Emission Reductions *The emission reductions shall be real, measurable and give long-term benefits related to the mitigation of climate change.*					
B.7.1. Are the emission reductions real, measurable and give long-term benefits related to the mitigation of climate change.	/1/ /11/	DR	Yes. The implementation of proposed project as stated will result in reduction of approximately 83,140 emissions per year. DNV was able to verify the spreadsheet provided by the project developer.		OK
B.8. Monitoring Methodology *It is assessed whether the project applies an appropriate monitoring methodology.*					
B.8.1. Is the monitoring plan documented according to the approved methodology and in a complete and transparent manner?	/1/	DR	After change in methodology version the provided PDD includes all parameters required.		OK
B.8.2. Will all monitored data required for verification and issuance be kept for two years after the end of the crediting period or the last issuance of CERs, for this project activity, whichever occurs later?	/1/	DR	Yes clearly stated in B.7.2		OK
B.9. Monitoring of Project Emissions *It is established whether the monitoring plan provides for reliable and complete project emission data over time.*					
B.9.1. Does the monitoring plan provide for the collection and archiving of all relevant data	/1/	DR	Yes clearly stated.		OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
necessary for estimation or measuring the greenhouse gas emissions within the project boundary during the crediting period?					
B.9.2. Are the choices of project GHG indicators reasonable and conservative?	/1/	DR	Yes and they comply fully with the ones stated by the methodology.		OK
B.9.3. Is the measurement method clearly stated for each GHG value to be monitored and deemed appropriate?	/1/ /21/	DR	Measurement methods are adequate and also applies international standards were required as ASTM		OK
B.9.4. Is the measurement equipment described and deemed appropriate?	/1/	DR	Yes and well described in the PDD.		OK
B.9.5. Is the measurement accuracy addressed and deemed appropriate? Are procedures in place on how to deal with erroneous measurements?	/1/	DR	Yes.		OK
B.9.6. Is the measurement *interval* identified and deemed appropriate?	/1/	DR	Yes		OK
B.9.7. Is the *registration, monitoring, measurement* and *reporting* procedure defined?	/1/	DR	Yes		OK
B.9.8. Are procedures identified for *maintenance* of monitoring equipment and installations? Are the calibration intervals being observed?	/1/	DR	Yes		OK
B.9.9. Are procedures identified for day-to-day records handling (including what records to keep, storage	/1/	DR	Yes		OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
area of records and how to process performance documentation)					
B.10. Monitoring of Baseline Emissions *It is established whether the monitoring plan provides for reliable and complete baseline emission data over time.*					
B.10.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining baseline emissions during the crediting period?	/1/	DR	Yes, the monitoring plan has been developed in accordance with the approved monitoring methodology ACM0002, version 06.		OK
B.10.2. Are the choices of baseline GHG indicators reasonable and conservative?	/1/	DR	Yes and considered reasonable and conservatives.		OK
B.10.3. Is the measurement method clearly stated for each baseline indicator to be monitored and also deemed appropriate?	/1/	DR	Yes		OK
B.10.4. Is the measurement *equipment* described and deemed appropriate?	/1/ /21/	DR	Yes and when required international methods applied.		OK
B.10.5. Is the measurement *accuracy* addressed and deemed appropriate? Are procedures in place on how to deal with erroneous measurements?	/1/	DR	Yes.		OK
B.10.6. Is the measurement *interval* for baseline data identified and deemed appropriate?	/1/	DR	Yes		OK
B.10.7. Is the registration, *monitoring, measurement* and *reporting* procedure defined?	/1/	DR	Yes and clearly stated in the monitoring plan		OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
B.10.8. Are procedures identified for *maintenance* of monitoring equipment and installations? Are the calibration intervals being observed?	/1/	DR	Yes and clearly stated in the monitoring plan		OK
B.10.9. Are procedures identified for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation)	/1/	DR	Yes and clearly stated in the monitoring plan		OK
B.11. Monitoring of Leakage *It is assessed whether the monitoring plan provides for reliable and complete leakage data over time.*					
B.11.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining leakage?	/1/	DR	According to ACM0002, the leakage of the proposed project is not considered. No leakage is expected.		OK
B.12. Monitoring of Sustainable Development Indicators/ Environmental Impacts *It is assessed whether choices of indicators are reasonable and complete to monitor sustainable performance over time.*					
B.12.1. Is the monitoring of sustainable development indicators/ environmental impacts warranted by legislation in the host country?	/1/	DR I	Guatemalan DNA requests it to issue the LoA but is informed that is not necessary to be included in PDD or during verifications. Guatemalan Agencies will be responsible to verify it.		OK
B.13. Project Management Planning *It is checked that project implementation is properly*					

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
prepared for and that critical arrangements are addressed.					
B.13.1. Is the authority and responsibility of overall project management clearly described?	/1/	DR	Table 4c in the PDD does not address the responsibilities for the following • internal audit of GHG project compliance with operational requirements where applicable • project performance reviews • corrective actions in order to provide for more accurate future monitoring and reporting Version 4 of the PDD includes a description of project management. During the site visits, it was also verified that Ormat Technologies Inc. have ISO 9000 and ISO 14000 management systems implemented and will be implemented management system requirements in the project in order to increase process control.	~~CL 8~~	OK
B.13.2. Are procedures identified for training of monitoring personnel?	/1/	DR I	During site visit, DNV was able to verify the training manual and verified the existence of information to provide the required maintenance.		OK
B.13.3. Are procedures identified for emergency preparedness for cases where emergencies can cause unintended emissions?	/1/	DR I	No clearly described or explained. PDD Version 3 describes why unintended emissions will be avoided.	~~CL 9~~	OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
B.13.4. Are procedures identified for review of reported results/data?	/1/	DR I	Item B.13.1	~~CL 8~~	OK
B.13.5. Are procedures identified for corrective actions in order to provide for more accurate future monitoring and reporting?	/1/	DR I	Item B.13.1	~~CL 8~~	OK
C. Duration of the Project/ Crediting Period *It is assessed whether the temporary boundaries of the project are clearly defined.*					
C.1.1. Are the project's starting date and operational lifetime clearly defined and evidenced?	/1/	DR I	Yes, the starting date of the project activity has been stated as per the EB33 Point 76, 25 April 2003 (signature of the contract of PPA with INDE, the project construction started on 01 May, 2005 and a 25 years operational lifetime is predicted based on other existing projects from the same PP.		OK
C.1.2. Is the start of the crediting period clearly defined and reasonable?	/1/	DR I	Crediting period is defined as 01 September 2008, or the date of registration, whichever occurs later. This was stated as 01 September 2007, which seemed unrealistic based on the lack of LoA's at December 2007 this will need to be updated. PDD version 5 defines date as 01 May, 2008	~~**CL 10**~~	OK
D. Environmental Impacts *Documentation on the analysis of the environmental impacts will be assessed, and if deemed significant, an EIA should be provided to the validator.*					

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
D.1.1. Has an analysis of the environmental impacts of the project activity been sufficiently described?	/1/ /10/	DR I	The project developers demonstrate the existence of an Environmental Impact Assessment for a capacity of 22 MW, but PDD (version 1) describes a total capacity of 28 MW. PDD Version 4 clearly indicates project capacity and demonstrates that net capacity is less than 22 MW.	~~CL 11~~	OK
D.1.2. Are there any Host Party requirements for an Environmental Impact Assessment (EIA), and if yes, is an EIA approved?	/1/ /10/	DR I	Yes. An EIA study were assessed and also approved by the environmental authorities (MARN)		OK
D.1.3. Will the project create any adverse environmental effects?	/1/ /8/	DR I	According to the EIA, the project is not expected to have adverse impacts on the local environment beyond the current level of human intervention.		OK
D.1.4. Are transboundary environmental impacts considered in the analysis?	/1/ /8/	DR I	Yes as stated in the EIA		OK
D.1.5. Have identified environmental impacts been addressed in the project design?	/1/ /8/	DR	Yes.		OK
D.1.6. Does the project comply with environmental legislation in the host country?	/1/ /7/ /9/ /10/ /22/	DR I	No permit is required by the local municipality. Authorization and permits from the ministry of Energy and Mines (MEM), Ministry of Environment and Natural Resources (MARN), and the Commission on National Protected Areas (CONAP) have been granted.	~~CL 12~~	OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			There is no evidence that project developers meet the mitigation actions identified in the Environmental Management Plan. A letter from a third part approved by environmental ministry provides evidence that project comply with the mitigation activities determined in the EIA.		
E. Stakeholder Comments *The validator should ensure that stakeholder comments have been invited with appropriate media and that due account has been taken of any comments received.*					
E.1.1. Have relevant stakeholders been consulted?	/1/ /19/	DR I	PDD does not address when was the stakeholders meeting and poll survey held; As well, Project Developers delivers information about stakeholders comments process but there are not evidence of people involved during site visit informs that meeting with COCODES (Consejos Comunitarios de Desarrollo) were done but no evidence were presented. Project participants delivers copy of minutes were states persons consulted including Community Councils on Sustainable Development (COCODEs, by the Spanish acronym) of the nearby villages. PDD does not address (the date)-when was	~~CL 13~~	OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			the stakeholders meeting and poll survey held? Dates included as part of the clarification requests.		
E.1.2. Have appropriate media been used to invite comments by local stakeholders?	/1/ /19/	DR I	Yes by different means including Stakeholders have been consulted in four distinct ways during the development of this project, including: a broadly circulated newspaper		OK
E.1.3. If a stakeholder consultation process is required by regulations/laws in the host country, has the stakeholder consultation process been carried out in accordance with such regulations/laws?	/1/ /19/	DR I	Yes and other means were carry out: 1) Formal survey of opinions in surrounding communities, an open commenting period held in conjunction with the MARN. 2) Periodic presentations to the local communities, and quarterly meetings with the Community Councils on Sustainable Development (COCODEs, by the Spanish acronym) of the nearby villages. 3) The stakeholders' comments and opinions during the EIA phase 4) Public commenting period through a 20-day public discussion administered by the Ministry of Environment and Natural Resources. The public discussion was made open to all and publicized through a broadly circulated newspaper.		OK
E.1.4. Is a summary of the stakeholder comments received provided?	/1/ /19/	DR I	Yes. And mayor concerns included in the PDD. Also copy of periodic meetings with		OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			the COCODEs was these concerns are wider explained.		
E.1.5. Has due account been taken of any stakeholder comments received?	/1/ /19/	DR I	Yes and clearly included in the PDD and also verified during site visit some of the actions taken like noise reduction equipments.		OK

Table 3 Resolution of Corrective Action and Clarification Requests

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
CAR 1 There are no evidence of the LoA from Host and Annex I Countries.	A.3.1 A.3.2. A.4.1	LoA in progress of been issued by both DNA.	Both LoA had been delivered and verified that meet CDM requirements. Corrective Action Request closed.
CAR 2Version 01 of the PDD applies for ACM0002 version 05 which is not valid any longer. Need to be updated.	B.1.1	Version 6 of ACM0002 will be applied in a revised version of the PDD.	PDD Version 3 includes ACM0002 Version 6. Corrective action request closed.
CAR 3 PDD Version 3 includes vintage data to calculate Guatemala Grid CEF. Also, on 09 April 2007 ECLAC publishes Electricity statistics of the Central American region which includes Guatemala, In order to calculate Grid CEF. Please update CEF calculation.	B.5.1	PDD and baseline calculation will be modified including updated existing data. CEPAL report for year 2006 does not include fuel consumption data. Power generation data alone will not allow us to use the preferred method of calculating the grid according to the options presented in footnote 4 on page 5 of ACM0002v6.	PDD Version 4 and baseline calculation were modified reflecting new CEF for years 2003-2005. Based on the existence data were verified that PDD version 4 includes Guatemala grid CEF using 2003-2005 years data which were verified and found to be the most complete and accurate available. Corrective action request closed.
CL 1 Based on the existence of a new PDD format, project participants must deliver project design document in new template.	Table 1 Req. 18	New version of PDD will be issued considering this template	Project participants delivers PDD version 4 with actual PDD template. Completeness checklist demonstrates that fulfill all requirements.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
			Clarification closed.
CL 2 Physically were verified that project generation capacity involves 3 generators 2x12 000 KVA) and one 1200 KW; while the PDD (version 1) defines a capacity of 28 MW.	A.1.2	Explanation of installed and net capacity of equipment will be included in the PDD demonstrating that net capacity is less than 22 MW	The revised PDD clearly describe capacities of the equipments and also during site visit were verified nameplate of generation units. Clarification closed.
CL 3 There is a technological transfer to the country by ORMAT – but it is not clear from which country the technological transfer is happening	A.3.2	The origin of the technology for main generating equipment is from an Israeli affiliate of Ormat Technologies, Inc., which is a U.S. company. Some components of the power plant will be procured in Europe and/or other origins.	PDD clearly indicates that technologies will be transferred. Clarification is considered close.
CL 4 Tool for the demonstration and assessment of additionality Version 2 was applied in PDD's version 01 to 03 please apply updated version 04.	B.3.1	Included in a revised PDD.	PDD includes application of tool version 04. Clarification closed
CL 5 Investment barrier: It has been argued that due to lack of financial aid from banks have made very unattractive and risky developing the project. – What is the fund availability for the project development?	B.3.2	Financial closure has still has not been achieved, 3-4 years after signature of the PPA and of the first contract with lenders. The project sought debt financing from IADB but hurdles in that process prohibited closure. In countries like Guatemala, developers must usually pay an interest rate premium for	Explanation provided by the project participants and checked during site visit are considered valid based on current country conditions and provided data support included in the PDD. Clarification closed

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
		country risk. The project developer sought political risk insurance (PRI) in order to obtain better financing terms. It approached MIGA for assistance with PRI but was not able to reach attractive terms, so had to seek PRI in the private sector. Some progress has been made with a local Guatemalan bank for debt financing, but financial closure has not been accomplished as of yet.	
CL 6 In the project emission calculation, the mass fraction of carbon dioxide is considered as 1.8% - how is this calculated- calculation sheet need to be evidenced	B.4.1	The mass fractions of CO_2 and CH_4 are based on testing done for the EIA on the % of NCG's in the steam, and on gas composition data from well testing done by CFE of Mexico. Please see baseline calculations spreadsheet for detailed calculations.	CFE tests provided by PP and verified that applied considerations are accurate and real. Clarification closed
CL 7 The diesel generator is approximately estimated to run for 15 hours per year and 180 kg of diesel is used – needs to be checked how was this accounted.	B.4.1	The 100 KW emergency generator is used only when the grid is not available or during servicing. Ormat engineer estimated hours running based on previous experience with other projects. Assuming typical 120g/kWh fuel consumption, these results in annual consumption of 180 kg/yr. Calculations included in baseline worksheet.	Baseline spreadsheet assessed and verified. Values correctly considered. Clarification closed.
CL 8 Table 4c in the PDD Version 01 does	B.13.1	Revision in PDD (Table 4C). All of	PDD version 3 includes a description of

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
not address the responsibilities for the following - internal audit of GHG project compliance with operational requirements where applicable - project performance reviews - corrective actions in order to provide for more accurate future monitoring and reporting	B.13.4 B.13.5	these responsibilities will belong to the Ortitlan Plant Manager; the position has been defined, but an individual has not yet been hired because the project is still in the construction phases. The plant manager will be responsible for of daily record keeping, and will send data to EcoSecurities on a monthly schedule. The Plant manager is also responsible for project performance data reviews and corrective actions, reporting to Ormat headquarters as needed.	the procedures required and determines responsible of each one. Clarification closed.
CL 9 No Procedures is identified for emergency preparedness for cases where emergencies can cause unintended emissions	B.13.3	Geothermal plants occasionally experience emergencies, which can result in unintended emissions of steam (and NCGs) if steam is released from rock mufflers or steam traps instead of being processed in the plant. However, at the Amatitlan plant, the technical design is such that in excess steam is not released in emergencies, thus emergency emissions are negligible. Unlike other types of plants, Amatitlan is equipped with automatic control valves on the well heads. Therefore, when there are operational issues at the plant, steam and NCGs are not flowing to mufflers and are only lost for a very	Explanation had been included in the PDD version 3 and also was assessed with Site Managers during site visit. Clarification closed.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
		short time until the control valves close (either partially to compensate for a partial upset or completely if the plant is shut down).	
CL 10 Crediting period is defined as 01 September 2007, which seems unrealistic based on the lack of LoA's at December 2007. This will need to be updated	C.1.2	Clarification period will be updated based on date of LoA issued.	PDD Version 7 dated 25 April 2008 includes a new date starting 01 November 2008 or the date of registration whichever occurs later. This clarification is closed
CL 11 The project developers demonstrate the existence of an Environmental Impact Assessment for a capacity of 22 MW, but PDD (version 1) describes a total capacity of 28 MW.	D.1.1	Explanation of installed and net capacity of equipment will be included in the PDD demonstrating that net capacity is less than 22 MW	The revised PDD clearly describe capacities of the equipments and also during site visit were verified nameplate of generation units. Clarification closed.
CL 12 There is no evidence that project developers meet the mitigation actions identified in the Environmental Management Plan.	D.1.6	Based on Guatemala environmental law a third party approved by MARN needs to assess project mitigation activities. A inform from this party will be requested to demonstrate compliance.	Inform from Werner Wittig Loarca approved by MARN as verified during site visit with the DNA were delivered and assessed. These demonstrate actions taken in relation to construction mitigation actions. Clarification closed.
CL 13 PDD does not address when was the stakeholders meeting and poll survey held; As well, Project Developers delivers information about stakeholders comments process but	E.1.1	Stakeholders were invited to comment directly to the MARN during the 20 business-day comment period through newspaper and published 28 July, 2003.	Information provided and included in the PDD Version 4. Clarification closed.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
there are not evidence of people involved during site visit informs that meeting with COCODES (Consejos Comunitarios de Desarrollo) were done but no evidence were presented.		During this period the local governments and public were free to request public hearing, but no request was made. Poll was conducted during the month of June, 2003. Copy of recurrent meetings with the COCODES was delivered including list of attendance during first stakeholders meeting required as for EIA.	

APPENDIX B

CERTIFICATES OF COMPETENCE

CERTIFICATE OF COMPETENCE

Praveen Nagaraje Urs

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

GHG Auditor:	Yes		
CDM Validator:	Yes	***JI Validator:***	--
CDM Verifier:	Yes	***JI Verifier:***	--
Industry Sector Expert for Sectoral Scope(s):	--		

Høvik, 30 October 2007

Michael Lehmann
Techncal Director, International Climate Change Services

CERTIFICATE OF COMPETENCE

Alfonso Capuchino

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

GHG Auditor:	Yes		
CDM Validator:	Yes	***JI Validator:***	--
CDM Verifier:	Yes	***JI Verifier:***	--
Industry Sector Expert for Sectoral Scope(s):	--		

Høvik, 30 October 2007

Michael Lehmann
Technical Director, International Climate Change Services

CERTIFICATE OF COMPETENCE

Barbara Lara

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

GHG Auditor:	Yes		
CDM Validator:		***JI Validator:***	--
CDM Verifier:	--	***JI Verifier:***	--
Industry Sector Expert for Sectoral Scope(s):	--		

Høvik, 2 May 2008

Michael Lehmann
Technical Director, Climate Change Services

CERTIFICATE OF COMPETENCE

Michael Lehmann

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

GHG Auditor:	Yes		
CDM Validator:	Yes	***JI Validator:***	Yes
CDM Verifier:	Yes	***JI Verifier:***	Yes
Industry Sector Expert for Sectoral Scope(s):	Sectoral scope 1, 2, 3		
Technical Reviewer for (group of) methodologies:			
ACM0001, AM0002, AM0003, AM0010, AM0011, AM0012, AMS-III.G	Yes	*AM0027*	Yes
ACM002, AMS-I.A-D, AM0019, AM0026, AM0029, AM0045	Yes	*AM0030*	Yes
ACM003, ACM0005, AM0033, AM0040	Yes	*AM0031*	Yes
ACM0004, ACM0012	Yes	*AM0032*	Yes
ACM0006, AM0007, AM0015, AM0036, AM0042	Yes	*AM0035*	Yes
ACM0007	Yes	*AM0038*	Yes
ACM0008	Yes	*AM0041*	Yes
ACM0009, AM0008, AMS-III.B	Yes	*AM0034*	Yes
AM0006, AM0016, AMS-III.D, ACM0010	Yes	*AM0043*	
AM0009, AM0037	Yes	*AM0046*	
AM0013, AM0022, AM0025, AM0039, AMS-III.H, AMS-III.I	Yes	*AM0047*	
AM0014	Yes	*AMS-II.A-F, AM0044*	Yes
AM0017	Yes	*AMS-III.A*	Yes
AM0018	Yes	*AMS-III.E, AMS-III.F*	Yes
AM0020	Yes		
AM0021, AM0028, AM0034, AM0051	Yes		
AM0023	Yes		
AM0024	Yes		

Høvik, 5 February 2007

Einar Telnes
Director, International Climate Change Services

Michael Lehmann
Technical Director

CERTIFICATE OF COMPETENCE

Anjana Sharma

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

GHG Auditor:	Yes		
CDM Validator:	Yes	***JI Validator:***	--
CDM Verifier:	--	***JI Verifier:***	--
Industry Sector Expert for Sectoral Scope(s):			
Technical Reviewer for (group of) methodologies:			
ACM002, AMS-I.A-D, AM0019, AM0026, AM0029, AM0045	Yes		

Høvik, 1 June 2008

Michael Lehmann
Technical Director, Climate Change Services