



VALIDATION REPORT

CANDELARIA HYDROELECTRIC PROJECT IN GUATEMALA

REPORT No. 2003-0510

REVISION No. 03

DET NORSKE VERITAS



VALIDATION REPORT

Date of first issue: 2003-05-28	Project No.: 28624543
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Summary:

Det Norske Veritas Certification Ltd. has performed the validation of the “Candelaria Hydroelectric Project” in Guatemala. This report summarises the findings of the validation, performed on the basis of UNFCCC criteria for small-scale CDM project activities, as well as criteria given to provide for consistent project operations, monitoring and reporting.

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

In summary, it is DNV's opinion that the project, as described in the project design document of 07 September 2006, meets all relevant UNFCCC requirements for the CDM, is eligible as type I small-scale CDM project activity and correctly applies the approved simplified baseline and monitoring methodology AMS-I.D, version 8. Hence, DNV requests the registration of the “Candelaria Hydroelectric Project” as a CDM project activity.

Report No.: 2003-0510		Subject Group: Environment	
Report title: Candelaria Hydroelectric Project in Guatemala			
Work carried out by: Gustavo Godinez, Einar Telnes			
Work verified by: Michael Lehmann			
Date of this revision: 2006-09-16	Rev. No.: 03	Number of pages: 9	

Indexing terms	
Key words Climate Change Validation Clean Development Mechanism	Service Area Verification
	Market Sector
	Process Industry
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***Abbreviations***

AMM	Administrador de Mercado Mayorista
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor(s)
CER	Certified Emission Reductions
DNV	Det Norske Veritas
DNA	Designated National Authority
INDE	Instituto Nacional de Electrificación
MGM	MGM International Inc.
MP	Monitoring plan
ODA	Official development assistance
OGIC	Guatemalan Office for Activities Implemented Jointly
PDD	Project Design Document
UNFCCC	United Nations Framework Convention on Climate Change



1 INTRODUCTION

MGM International Inc. (MGM) has commissioned Det Norske Veritas Certification Ltd to perform a validation of the “Candelaria Hydroelectric Project” (the project) in Guatemala. This report summarises the findings of the validation of the project, performed on the basis of UNFCCC criteria for small-scale CDM projects, as well as criteria given to provide for consistent project operations, monitoring and reporting from such projects.

The validation team consists of the following personnel:

Mr Einar Telnes	DNV Oslo	Team leader, GHG auditor
Mr Gustavo Godinez	DNV Mexico	GHG auditor
Mr Michael Lehmann	DNV Oslo	Internal verifier

1.1 Validation 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).

1.2 Scope

The validation scope is defined as an independent and objective review of the project design document (PDD). The PDD is reviewed against the criteria stated in Article 12 of the Kyoto Protocol, the CDM modalities and procedures as agreed in the Marrakech Accords, the simplified modalities and procedures for small-scale CDM project activities and the relevant decisions by the CDM Executive Board, including the approved simplified baseline and monitoring methodology AMS-I.D. The validation team has, based on the recommendations in the Validation and Verification Manual [7], 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.



1.3 GHG Project Description

The objective of the proposed project activity is to generate renewable electricity using hydroelectric resources and to sell the generated output to the national grid. The project has the capacity to reduce CO₂ emissions by avoiding electricity generation by the fossil fuel-fired power plants connected to the grid.

The project activity involves the installation of a run-of-river hydropower plant with an installed capacity of 4.3 MW that will utilize the water of the Trece Aguas River. Currently, this watercourse is used for electricity generation in an existing 16 MW hydropower plant (Secacao) located upstream of Candelaria. The Secacao plant was developed in 1998 and is owned and operated by Candelaria's sponsors.

The 4.3 MW plant will provide peak-load capacity. Total altitude differential (head) between the headpond and the turbine/generator is approximately 130 meters. The project will require a 400 meter long tunnel, and a 700 meter long penstock, and one 4.3 MW Francis type turbine will be installed. The water used, once having gone through both plants, will be returned to the original river basin downstream.

The plant will deliver electricity to the Guatemalan National Electric Grid and will be connected to it through a 69 kilovolt transmission line (that was built to connect the existing 16 MW plant), but could also sell part of its output locally through an existing 13.8 kilovolt distribution line, thus giving access to electricity to several communities that are located nearby.

The project will use the option of a three times seven year crediting period under the CDM. Estimated average annual emission reductions are 18 922 ton CO₂.

2 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.

In order to ensure transparency, a validation protocol was customised for the project, according to the Validation and Verification Manual /7/. The protocol shows in transparent manner 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 Figure 1.

The completed validation protocol of the "Paramount Integrated Corporation Methane Recovery and Electricity Generation" project is enclosed in Appendix A to this report.



Validation Protocol Table 1: Mandatory Requirements for CDM Project Activities			
Requirement	Reference	Conclusion	Cross reference
<i>The requirements the project must meet.</i>	<i>Gives reference to the legislation or agreement where the requirement is found.</i>	<i>This is either acceptable based on evidence provided (OK), a Corrective Action Request (CAR) of risk or non-compliance with stated requirements or a request for Clarification (CL) where further clarifications are needed.</i>	<i>Used to refer to the relevant checklist questions in Table 2 to show how the specific requirement is validated. This is to ensure a transparent Validation process.</i>

Validation Protocol Table 2: Requirement Checklist				
Checklist Question	Reference	Means of verification (MoV)	Comment	Draft and/or Final Conclusion
<i>The various requirements in Table 1 are linked to checklist questions the project should meet. The checklist is organised in seven different sections. Each section is then further sub-divided. The lowest level constitutes a checklist question.</i>	<i>Gives reference to documents where the answer to the checklist question or item is found.</i>	<i>Explains how conformance with the checklist question is investigated. Examples of means of verification are document review (DR) or interview (I). N/A means not applicable.</i>	<i>The section is used to elaborate and discuss the checklist question and/or the conformance to the question. It is further used to explain the conclusions reached.</i>	<i>This is either acceptable based on evidence provided (OK), or a Corrective Action Request (CAR) due to non-compliance with the checklist question (See below). A request for Clarification (CL) is used when the validation team has identified a need for further clarification.</i>

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

Figure 1 Validation protocol tables



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

- a) mistakes have been made with a direct influence on project results;
- b) validation protocol requirements have not been met; or
- c) there is a risk that the project would not be accepted as a CDM project or that emission reductions will not be certified.

The term Clarification may be used where additional information is needed to fully clarify an issue.

2.1 Review of Documents

The PDD /1/ for the “Candelaria Hydroelectric Project” (version of 17 March 2003 and final version 7 of 7 September 2006) submitted by MGM International and additional background documents /2/-/6/ related to the project design and baseline as well as the emission reduction calculations were reviewed as a part of the validation.

2.2 Follow-up Interviews

On 12-13 May 2003 the validation team member Gustavo Godinez interviewed representatives of Hidroeléctrica Secacao, the Guatemalan Ministry of Environment and the Ministry of Energy. The main topics of the interviews were the current status of the project EIA, national sustainable development priorities, stakeholder consultations and the project developer’s ability to monitor the GHG emission indicators.

2.3 Resolution of Clarification and Corrective Action Requests

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.

The initial validation of the project identified some corrective action requests and requests for clarification which were presented to the project participants in the form of a draft validation report (rev 1 of 28 May 2003 and rev 2 of 16 January 2004).

The project participants’ response to DNV’s initial findings, which also included the submission of the final PDD of 7 September 2006, addressed the raised requests to DNV’s satisfaction.

To guarantee the transparency of the validation process, the concerns raised and responses given are documented in more detail in the validation protocol in Appendix A.



3 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 final project design documentation of 7 September 2006.

3.1 Participation Requirements

The project participant is Hidroeléctrica Candelaria S.A. The host Party Guatemala meets the requirements to participate in the CDM. Written approval of voluntary participation from the DNAs of Guatemala has been obtained /4/. No participating Annex I Party is yet identified.

3.2 Project Design

The project is a hydropower project which has minimal impact on the natural environment. No large dam is required for the project; hence little or no emission leakage from decaying vegetation can be expected. The project will make use of an already existing dam upstream to Hidroeléctrica Candelaria which has been in operations for the past 16 years. The technology intended to be deployed is well tested and should pose no significant risk to the project.

Being a renewable energy project activity with an output capacity of less than 15 MW, the project qualifies as a small-scale CDM project activity according to category I-D. of the modalities and procedures for small-scale projects under the CDM.

The project has not received and is not seeking public funding. The validation did not reveal any information that indicates that the project can be seen as a diversion of official development assistance (ODA) funding towards Guatemala.

The project lifetime is expected to be 30 years. A renewable crediting period of 7 years starting on 1 January 2007 has been selected.

The project is likely to contribute to sustainable development by providing employment opportunities during the construction period and also subsequent to commissioning. In addition, the plant will likely create opportunities for replication of the project to other rural regions of Guatemala for this technology. The rural generation of electricity may also displace some local diesel generators, thus contributing to reduction in local pollutants. The DNA of Guatemala has confirmed that the project assists in achieving sustainable development /4/.

3.3 Baseline Determination and Additionality

The project employs the simplified baseline methodologies for category I.D small-scale CDM project activities, i.e. grid-connected renewable energy projects (AMS-I.D, version 08). i.e. the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient calculated in a transparent and conservative manner as the average of the approximate operating margin (OM) and the build margin (BM). The application of the methodology is correct, and underlying data used are verified. Calculations and use of data sources are also



correctly applied. The project boundaries are well defined and appropriate for the project activity.

It is demonstrated from two angles that the project faces barriers: Firstly, the PDD refers to the fact that no hydropower projects have been built in Guatemala since the deregulation of the electricity sector. This is sustained by another fact, namely that the electricity expansion plan of Guatemala presently does not include any hydropower projects with capacities of less than 50 MW. Secondly, it is demonstrated that a small-scale hydropower project like Candelaria is at least 20% more expensive in investment costs per MW than the least cost option. It is therefore reasonable to conclude that the project does not represent its own baseline. Emission reductions attributable to the project are thus additional to those that would have occurred in the absence of the proposed CDM project activity.

3.4 Monitoring Plan

As a renewable energy project, the project has zero emissions and will only need to monitor its own electricity generation to calculate the baseline emissions. The baseline emission factor used for determining emission reductions, i.e. the average of the build margin and the operating margin, has been determined ex-ante based on data provided by the Guatemala wholesale market administrator Administrador de Mercado Mayorista (AMM).

Management system requirements for defining necessary activities that relate to a consistent and reliable measurement, monitoring and reporting system are developed. However, this system needs to be finalised prior to the crediting period commencement with regard to calibration of monitoring equipment, review of records and project performance.

3.5 Calculation of GHG Emissions

The calculation of GHG emissions and emission reductions are straight forward, based on the simplified small-scale methodology AMS-I.D applied by the project. If implemented as planned, the project is likely to achieve the emission reductions stated in the PDD.

Data provided by the Guatemala wholesale market administrator AMM for the years 2001-2003 which were the most recent statistics available at the time of PDD submission, have been used to determine the operating margin (OM). The power plant capacity additions in the electricity system that comprise 20% of the system generation in 2003 and that have been built most recently have been used to determine the build margin (BM).

The build margin (BM) emission factor of 0.88tCO₂/MWh and the operating margin (OM) emission factor of 0.767tCO₂/MWh results in a combined margin emission factor of 0.824tCO₂/MWh. This emission factor will be multiplied with the verified electricity generation exported to the grid to determine CERs.

Since the renewable energy technology does not represent equipment transfer from another activity, leakage calculations are not required for category I.D project activities.

3.6 Environmental Impacts

The project will not have any significant impact on local bio systems or water supply to residents in the region. It has been confirmed during the validation that the Guatemalan authorities require an EIA for a project of "Candelaria Hydroelectric Project's" size. An EIA was performed for the



project in connection with the EIA of an upstream power plant, and the EIA has been approved by the relevant Guatemalan authorities.

3.7 Comments by Local Stakeholders

The PDD did originally not mention the local stakeholder consultation process carried out by the project developers. However, the follow-up interviews confirmed that a stakeholder consultation has taken place through interviews with local stakeholders. Comments to the project were also invited through newspaper publications. Moreover, following concerns raised by Amnesty International about human rights violations, the project developers extended the stakeholder consultations. These and comprehensive further investigations from DNV's side showed that the claims from Amnesty's side were unrelated to the construction of the power plant.

The extended stakeholder consultation process is thoroughly described in the final version of the PDD which provides a summary of the comments received and how due account was taken of the comments received.

4 COMMENTS BY PARTIES, STAKEHOLDERS AND NGOS

The PDD (version of 17 March 2003) was on 12 December 2003 published on DNV's climate change website www.dnv.com/certification/ClimateChange and Parties, stakeholders and UNFCCC accredited NGOs were through the UNFCCC website invited to provide comments within 30 days until 13 January 2004. One comment was received from a stakeholder.

In addition, three comments were received during a previous unofficial stakeholder consultation process carried out in March-April 2003.

All stakeholder comments (in unedited form) are shown in Appendix B of this report. The comments received were mainly related to the potential impacts the power plant would have on the surrounding environment. As the EIA of the project has concluded that the environmental impacts of the project are insignificant, it is DNV's opinion that the environmental impacts of the project are sufficiently addressed and mitigated. Two comments were also questioning the project additionality as well as the use of data from the national electricity regulator. Since DNV has verified that the data for determining the baseline emission factor was correctly applied using official data sources and since DNV is not in the position to challenge official data, we have accepted the baseline emission factor determined by the project proponents. With regard to the comment made on the investment calculations, DNV is of the opinion that the additionality of the project is sufficiently justified through the data used in the presented investment barriers.



5 VALIDATION OPINION

Det Norske Veritas Certification Ltd (DNV) has in the period of March 2003 to September 2006 performed a validation of the “Candelaria Hydroelectric Project” – a small-scale hydropower project in Guatemala. The validation is performed on the basis of UNFCCC criteria for small-scale CDM project activities, as well as criteria given to provide for consistent project operations, monitoring and reporting.

The project consists of a small grid connected hydropower dam with generation capacity of maximum 4.3 MW. As the generation capacity is significantly less than 15 MW the project qualifies as a type I small scale CDM project activity.

The project participant is Hidroeléctrica Candelaria S.A. The host Party Guatemala meets the requirements to participate in the CDM. Written approval of voluntary participation from the DNAs of Guatemala has been obtained. No participating Annex I Party is yet identified.

The project will contribute to sustainable development by displacing fossil fuel-based electricity generation with renewable energy. The Guatemalan DNA has confirmed that the project assists in achieving sustainable development.

The validation did not reveal any information that indicates that the project can be seen as a diversion of ODA funding towards Guatemala.

An analysis of the investment barriers demonstrates that the proposed project activity 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. Investment calculations show that the investment barrier per MW generation capacity is significantly higher for this project than for the least cost option for electricity generation. The determination of the baseline is transparent. The project applies the simplified baseline methodologies proposed for category I.D project activities (AMS-I.D, version 08), i.e. the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient calculated as the average of the approximate operating margin (OM) and the build margin (BM).

The monitoring plan provides for the monitoring of electricity generated by the project.

By displacing fossil-based electricity with hydropower electricity, the project results in reductions of CO₂ emissions that are real, measurable and give long-term benefits to the mitigation of climate change. Project emissions are zero and the baseline emissions are determined using reasonable assumptions. Estimated annual emission reductions are 18 922 t CO₂e.

Local stakeholders were consulted and a local stakeholder consultation process was carried out. The PDD has been published on DNV's climate change website for comments by Parties, stakeholders and NGOs and due account was taken of the comments received.

In summary, it is DNV's opinion that the project, as described in the project design document of 07 September 2006, meets all relevant UNFCCC requirements for the CDM, is eligible as type I small-scale CDM project activity and correctly applies the approved simplified baseline and monitoring methodology AMS-I.D, version 8. Hence, DNV requests the registration of the “Candelaria Hydroelectric Project” as a CDM project activity.



6 REFERENCES

Documents provided by the project proponent that relate directly to the project:

- /1/ MGM International: *CDM-SSC-PDD for the “Candelaria Hydroelectric Project”*, version of 17 March 2003 and version 7 of 7 September 2006.
- /2/ MGM International: *Baseline emission calculations*, 7 September 2006
- /3/ MGM International: *IRR and NPV calculations*, 7 September 2006
- /4/ DNA of Guatemala: *Letter of Approval*, 23 August 2006

Background documents related to the design and/or methodologies employed in the design or other reference documents:

- /5/ Mercado Mayorista de Electricidad de Guatemala: *Informe Estadístico 2002-2004..* www.amm.org.gt
- /6/ DOE: *Energy background of Guatemala.* www.eia.doe.gov/meu/cabs/gutemal/html
- /7/ International Emission Trading Association (IETA) & the World Bank’s Prototype Carbon Fund (PCF): *Validation and Verification Manual.* <http://www.vvmanual.info>

Persons interviewed during the validation, or persons contributed with other information that are not included in the documents listed above:

OGIC:	Eduardo Alvarez
Hidroeléctrica Secacao SA	Rudolf Jacobs/Rodrigo Tormo
Ministry of Environment	Ervin Gomez/Ruth Portillo
Ministry of Energy	Marco Davila
AMM	Yuri Omar Urbina
MGM (PDD Consultants)	Marco Monroy/Fabián Gaioli/Gautam Dutt

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APPENDIX

A

VALIDATION PROTOCOL

Table 1 Mandatory Requirements for Small Scale Clean Development Mechanism Project Activities

Requirement	Ref	Conclusion	Reference / Comment
1. <i>Assist Parties included in Annex I in achieving compliance with part of their emission reduction commitment under Art. 3</i>	Kyoto Protocol Art. 12.2	OK	Table 2, Section E.4.1 Annex I Party not yet identified
2. <i>Assist non-Annex I Parties in achieving sustainable development</i>	Kyoto Protocol Art. 12.2	OK	Table 2, Section A.3
3. <i>Assist non-Annex I Parties in contributing to the ultimate objective of the UNFCCC?</i>	Kyoto Protocol Art. 12.2.	OK	Table 2, Section E.4.1
4. <i>The project shall have the written approval of voluntary participation from the designated national authority of each party involved</i>	Kyoto Protocol Art. 12.5a	OK	The project has Received a Letter of Approval by the DNA of Guatemala.
5. <i>The emission reductions should be real, measurable and give long-term benefits related to the mitigation of climate change</i>	Kyoto Protocol Art. 12.5b	OK	Table 2, Section E.1 to E.4
6. <i>Reduction in GHG emissions must be additional to any that would occur in absence of the project activity</i>	Kyoto Protocol Art. 12.5.c	OK	Table 2, Section B.2.1
7. <i>Potential public funding for the project from Parties in Annex I is not a diversion of official development assistance</i>	Marrakech Accords	OK	No funding from public sources.
8. <i>Parties participating in the CDM shall designate a national authority for the CDM</i>	Marrakesh Accords (CDM modalities § 29)	OK	The DNA of Guatemala is the Ministerio de Ambiente y Recursos Naturales
9. <i>The host country shall be a Party to the Kyoto Protocol</i>	Marrakech Accords, CDM Modalities §30	OK	Guatemala ratified the Kyoto Protocol on 5 October 1999.

Requirement	Ref	Conclusion	Reference / Comment
<i>10. The proposed project activity shall meet the eligibility criteria for small scale CDM project activities set out in § 6 (c) of the Marrakesh Accords and shall not be a debundled component of a larger project activity</i>	Simplified Modalities and Procedures for Small Scale CDM Project Activities	OK	Table 2, Section A.1
<i>11. The project design document shall conform with the Small Scale CDM Project Design Document format</i>	Simplified Modalities and Procedures for Small Scale CDM Project Activities	OK	
<i>12. The proposed project activity shall confirm to one of the project categories defined for small scale CDM project activities and uses the simplified baseline and monitoring methodology for that project category</i>	Simplified Modalities and Procedures for Small Scale CDM Project Activities	OK	Table 2, Section A.1.3 and B.1
<i>13. Comments by local stakeholders are invited, and a summary of these provided</i>	Simplified Modalities and Procedures for Small Scale CDM Project Activities	OK	Table 2, Section G
<i>14. If required by the host country, an analysis of the environmental impacts of the project activity is carried out and documented</i>	Simplified Modalities and Procedures for Small Scale CDM Project Activities	OK	Table 2, Section F

Requirement	Ref	Conclusion	Reference / Comment
<i>15. Parties, stakeholders and UNFCCC accredited NGOs have been invited to comment on the validation requirements and comments have been made publicly available</i>	Simplified Modalities and Procedures for Small Scale CDM Project Activities	OK	<p>The PDD was on 12 December 2003 published on DNV's climate change website www.dnv.com/certification/ClimateChange and Parties, stakeholders and UNFCCC accredited NGOs were through the UNFCCC website invited to provide comments within 30 days until 13 January 2004. One comment was received.</p> <p>In addition, the PDD has been published on DNV's climate change website on 24 March 2003 and Parties, stakeholders and NGOs have been invited through the Climate-L mailing list to provide comments on the validation requirement during a period of 30 days until 24 April 2003. Three comments were received during this unofficial stakeholder consultation process.</p>

Table 2 Requirements Checklist

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
A. Project Description			<i>The project description is reviewed to ensure that all aspects related to direct and indirect emissions are captured in the project design and are considered in projecting emission reductions.</i>		
A.1. Small scale project activity			<i>Simplified modalities and procedures apply to small scale project activities.</i>		
<i>A.1.1. Does the project qualify as a small scale CDM project activity as defined in paragraph 6 (c) of decision 17/CP.7 on the modalities and procedures for the CDM?</i>	/1/	DR	Yes. The project is a renewable energy project with a maximum capacity of less than 15 MW.		OK
<i>A.1.2. The small scale project activity is not a debundled component of a larger project activity?</i>	/1/	DR	The discussions provided demonstrate that the project is not a part of a de-bundled CDM project activity. It is made clear that the other hydropower activity in Trece Aguas, Secacao, cannot claim CDM credits, since it was constructed prior to 2000.		OK
<i>A.1.3. Does the proposed project activity confirms to one of the project categories defined for small scale CDM project activities?</i>	/1/	DR	The project qualifies under Type I, D, Renewable energy projects - Renewable electricity generation for a grid.		OK
A.2. Project Design			<i>Validation of project design focuses on the choice of technology, environmental impact and the design documentation of the project.</i>		
<i>A.2.1. Are the project's spatial (geographical) boundaries clearly defined?</i>	/1/	DR	Yes. This is defined by descriptions and figures in the PDD.		OK
<i>A.2.2. Are the project's system (components and facilities used to mitigate GHG's) boundaries clearly defined?</i>	/1/	DR	Yes. Hydropower project based on renewable energy.		OK

* MoV = Means of Verification, DR= Document Review, I= Interview

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
<i>A.2.3. Does the project require extensive initial training and maintenance efforts in order to work as presumed during the project period? Does the project make provisions for meeting training and maintenance needs?</i>	/1/	DR	The project will not require extensive training, neither for operations nor for maintenance. Maintenance costs are considered in the financial calculations.		OK
A.3. Contribution to Sustainable Development			<i>The project's contribution to sustainable development is assessed</i>		
<i>A.3.1. Will the project create other environmental or social benefits than GHG emission reductions?</i>	/1/	DR	Yes. The project is likely to provide electricity to rural areas of Guatemala, and also reduce pollution from fossil-based electricity generation.		OK
<i>A.3.2. Will the project create any adverse environmental or social effects?</i>	/1/	DR	Not likely. The Trece Aguas is already regulated, and water for Candelaria will be fed back to the water stream after going through the turbine.		OK
<i>A.3.3. Have identified social and environmental impacts been addressed in the project design?</i>	/1/	DR	Social and environmental impacts are discussed in the PDD, but are not likely to have any adverse impact.		OK
<i>A.3.4. Is the project in line with relevant legislation and plans in the host country?</i>	/1/	DR I	The project is in line with the current Government intentions of expanding the renewable energy portfolio in the national grid.		OK
<i>A.3.5. Is the project in line with host-country specific CDM requirements?</i>	/1/	DR I	At present, no specific CDM requirements are established in Guatemala. However, the DNA of Guatemala has approved the project.		OK
<i>A.3.6. Is the project in line with sustainable development policies of the host country?</i>	/1/	DR I	The project is in line with the present Guatemalan sustainable development priorities..		OK
B. Project Baseline			<i>The validation of the project baseline has sought to establish whether the selected baseline is relevant and represents the most likely scenario of all possible baselines.</i>		
B.1. Baseline Methodology			<i>It is assessed whether the project applies an appropriate baseline methodology.</i>		
<i>B.1.1. Is the selected baseline methodology in line with the baseline methodologies provided for</i>	/1/, /2/	DR	Yes. The selected baseline methodology is version 8 of AMS-I.D. The baseline is the kWh produced by the renewable		OK

* MoV = Means of Verification, DR= Document Review, I= Interview

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
<i>the relevant project category?</i>			generating unit multiplied by an emission coefficient calculated as the average of the approximate operating margin (OM) and the build margin (BM).. This is well elaborated and calculations provided to arrive at an appropriate baseline emission factors. Data have been verified towards AMM statistics for 2001-2003, which were the most recent at the time of PDD submission.		
<i>B.1.2. Is the baseline methodology applicable to the project being considered?</i>	/1/ /2/	DR	Yes.		OK
B.2. Baseline Determination			<i>It is assessed whether the project activity itself is not a likely baseline scenario and whether the selected baseline represents a likely baseline scenario.</i>		
<i>B.2.1. Is it demonstrated that the project activity itself is not a likely baseline scenario due to the existence of one or more of the following barriers: investment barriers, technology barriers, barriers due to prevailing practice and other barriers?</i>	/1/ /3/ /4/	DR	It is demonstrated that there are investment barriers for the project activity. The project's economics are less favourable than for fossil-based fuel projects. In addition, no hydropower projects have been established in Guatemala after the electricity privatisation without also taken into account the CDM incentives. These facts thus sustains that fossil-based generation is the preferred option in financial terms.		OK
<i>B.2.2. Is the application of the baseline methodology and the discussion and determination of the chosen baseline transparent?</i>	/1/ /3/ /5/	DR	The baseline methodology is correctly applied, and the discussion that leads to the determination of the baseline is transparent.		OK
<i>B.2.3. Are relevant national and/or sectoral policies and circumstances taken into account?</i>	/1/ /3/	DR	Yes. Guatemala has a need for more power. The PDD has considered the potential impact of SIEPAC establishment will have on the project.		OK
<i>B.2.4. Is the baseline selection compatible with the available data?</i>	/1/	DR	Yes. Power plant data are available via www.amm.org.gt .		OK
C. Duration of the Project / Crediting Period					
<i>C.1.1. Are the project's starting date and operational lifetime clearly defined?</i>	/1/	DR	Yes. The construction began in January 2005 and power generation began on July 1, 2006.		OK

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Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
<i>C.1.2. Is the crediting period clearly defined (seven years with two possible renewals or 10 years with no renewal)?</i>	/1/	DR	Seven years with two optional seven year periods are selected starting on 1 January 2007..		OK
D. Monitoring Plan			<i>The monitoring plan review aims to establish whether all relevant project aspects deemed necessary to monitor and report reliable emission reductions are properly addressed.</i>		
D.1. Monitoring Methodology			<i>It is assessed whether the project applies an appropriate monitoring methodology.</i>		
<i>D.1.1. Is the selected monitoring methodology in line with the monitoring methodologies provided for the relevant project category?</i>	/1/	DR	Yes. Electricity generation of the project will be monitored.		OK
<i>D.1.2. Is the monitoring methodology applicable to the project being considered?</i>	/1/	DR	Yes. The monitoring methodology is in general a mirroring of the baseline estimation methodology with added electricity generation from the project to be provided. Responsibility for monitoring , frequency and source of data are defined.		OK
<i>D.1.3. Is the application of the monitoring methodology transparent?</i>	/1/	DR	Partly, as links to data sources and worksheets for exact calculations and algorithms are not provided.		OK
<i>D.1.4. Will the monitoring methodology give opportunity for real measurements of achieved emission reductions?</i>	/1/	DR	Yes.		OK
D.2. Monitoring of Project Emissions			<i>It is established whether the monitoring plan provides for reliable and complete project emission data over time.</i>		
<i>D.2.1. Are the choices of project emission indicators reasonable?</i>			NA. There are no project emissions		OK
D.3. Monitoring of Leakage			<i>It is assessed whether leakage effects have been properly assessed and whether the monitoring plan provides for reliable and complete leakage data over time.</i>		
<i>D.3.1. Are leakage calculation required for the selected project category and if yes, are the relevant leakage effects assessed?</i>	/1/	DR	Since the renewable energy technology does not represent equipment transfer from another activity, no leakage calculations are required by AMS-I.D.		OK

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Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
<i>D.3.2. If applicable, are the choices of leakage indicators reasonable?</i>			NA		OK
D.4. Monitoring of Baseline Emissions			<i>It is established whether the monitoring plan provides for reliable and complete project emission data over time.</i>		
<i>D.4.1. Is the choice of baseline indicators, in particular for baseline emissions, reasonable?</i>	/1/	DR	Yes. This is in line with the small-scale methodology AMS-I.D, version 8, as approved by the CDM EB.		OK
<i>D.4.2. Will it be possible to monitor / measure the specified baseline emission indicators?</i>	/1/	DR	Yes, through www.amm.org.gt		OK
<i>D.4.3. Do the measuring technique and frequency comply with good monitoring practices?</i>	/1/	DR	Definitely. Daily measurements are considered best practice.		OK
<i>D.4.4. Are the provisions made for archiving baseline emission data sufficient to enable later verification?</i>	/1/	DR	Yes. Data will be kept for 10 years, and www.amm.org.gt has recent data available.		OK
D.5. Project Management Planning			<i>It is checked that project implementation is properly prepared for and that critical arrangements are addressed.</i>		
<i>D.5.1. Is the authority and responsibility of project management clearly described?</i>	/1/	DR	Hidroeléctrica Secacao will have the project management.		OK
<i>D.5.2. Is the authority and responsibility for recording, monitoring measurement and reporting clearly described?</i>	/1/	DR	In general terms, yes. .		OK
<i>D.5.3. Are procedures identified for training of monitoring personnel?</i>	/1/	DR	No. Limited monitoring necessary, although the responsibility for monitoring and reporting of baseline data to be fed into CER calculations need to be defined. Hence, training may be required to provide for consistent reporting.	CAR-1	OK
<i>D.5.4. Are procedures identified for emergency preparedness?</i>	/1/	DR	NA		-
<i>D.5.5. Are procedures identified for calibration of equipment?</i>	/1/	DR	No	CAR-2	OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
<i>D.5.6. Are procedures identified for maintenance of equipment and installations?</i>	/1/	DR	No procedures for maintenance of equipment are described, but the project only requires limited maintenance which is part of normal operations.		OK
<i>D.5.7. Are procedures identified for monitoring,, measurement and reporting?</i>	/1/	DR	Not in detail, although data requested by the small-scale PDD template are provided in full.		OK
<i>D.5.8. Are procedures identified for day-to-day records handling including what records to keep, storage of records and how to process performance documentation and possible data sensitivities?</i>	/1/	DR	Only in general terms.	CAR-3	OK
<i>D.5.9. Are procedures identified for review of reported results/data?</i>	/1/	DR	No.	CAR-4	OK
<i>D.5.10. Are procedures identified for internal audits of GHG project compliance with operational requirements?</i>	/1/	DR	No, but internal audits are assumed not to be relevant for this project category.		OK
<i>D.5.11. Are procedures identified for project performance reviews?</i>	/1/	DR	No, but project performance reviews are assumed not to be relevant for this project category.		OK
<i>D.5.12. Are procedures identified for corrective actions?</i>	/1/	DR	No	CAR-5	OK
E. Calculation of GHG emission					
<i>E.1. Project GHG Emissions</i>			<i>The validation of predicted project GHG emissions focuses on methodology transparency and completeness in predictions</i>		
<i>E.1.1. Are all aspects related to direct and indirect project emissions captured in the project design?</i>	/1/	DR	There are no project emissions.		OK
<i>E.2. Leakage</i>			<i>It is assessed whether there is leakage, i.e. change of emissions which occurs outside the project boundary and which are measurable and attributable to the project.</i>		
<i>E.2.1. Are potential leakage effects identified and</i>	/1/	DR	NA.		OK

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Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
<i>are they properly accounted for in the calculations (if applicable)?</i>					
E.3. Baseline GHG Emissions			<i>Validation of baseline GHG emissions will focus on methodology transparency and completeness in emission estimations.</i>		
<i>E.3.1. Are the baseline emissions boundaries clearly defined and do they sufficiently cover sources for baseline emissions?</i>	/1/	DR	The baseline emission boundaries are defined in accordance with the project category I.D baseline methodology.		OK
<i>E.3.2. Are all aspects related to direct and indirect baseline emissions captured in the project design?</i>	/1/	DR	Yes. Transparently described and concluded.		OK
<i>E.3.3. Do the methodologies for calculating baseline emissions comply with existing good practice?</i>	/1/	DR	Yes. Daily data will be used.		OK
<i>E.3.4. Are the baseline calculations documented in a complete and transparent manner?</i>	/1/	DR	Yes. Calculations are transparent and complete.		OK
<i>E.3.5. Have conservative assumptions been used?</i>	/1/	DR	Conservative assumptions are used where applicable.		OK
E.4. Emission Reductions			<i>Validation of baseline GHG emissions will focus on methodology transparency and completeness in emission estimations.</i>		
<i>E.4.1. Will the project result in fewer GHG emissions than the baseline case?</i>	/1/	DR	Yes.		OK
F. Environmental Impacts					
<i>F.1.1. Does host country legislation require an analysis of the environmental impacts of the project activity?</i>	/1/	DR	Yes. Two EIAs are performed for the project and the reservoir.		OK
<i>F.1.2. Will the project create any adverse environmental effects?</i>	/1/	DR	No. The EIA confirms this.		OK

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Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
<i>F.1.3. Have environmental impacts been identified and addressed in the PDD?</i>	/1/	DR	Yes.		OK
G. Comments by Local Stakeholders					
<i>G.1.1. Have all relevant stakeholders been consulted?</i>	/1/	DR I	The follow-up interviews confirmed that a local stakeholder consultation had been performed (with people who live around the area of the project) by personal interviews. Comments to the project were also invited through newspaper publications. Moreover, following concerns raised by Amnesty International about human rights violations, the project developers extended the stakeholder consultations.		OK
<i>G.1.2. Is a summary of the comments received provided?</i>	/1/	DR I	Comments from local stakeholders have been reported in version 7 of PDD.		OK
<i>G.1.3. Has due account been taken of any comments received?</i>	/1/	DR I	The comments received have been sufficiently addressed. The second stakeholder consultation process and comprehensive further investigations from DNV's side showed that the claims from Amnesty's side were unrelated to the construction of the power plant.		OK

Table 3 Resolution of Corrective Action and Clarification Requests

Draft report clarifications and corrective action requests by validation team	Ref. to Table 2	Summary of response by project proponents	Validation team conclusion
Corrective Action Requests (1-5): Detailed responsibilities and authorities for project management, monitoring and reporting and QA/QC procedures and are not yet described, but will need to be developed prior to project start.	D.5.3 D.5.5 D.5.8 D.5.9 D.5.12	The project proponents plan to implement the necessary procedures prior to project start.	The corrective action requests are resolved in the latest version of the PDD. Responsibilities and authorities for project management, monitoring and reporting and QA/QC procedures are now described, but may need to be developed even more detailed prior to start of the crediting period. CARs closed.

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APPENDIX

B

STAKEHOLDER COMMENTS

Comment by: [Axel Michaelowa, Hamburg Institute of International Economics \(HWWA\)](#)

Inserted On: 2003-12-30

Subject: Additionality test and baseline data problems (Axel Michaelowa, Hamburg Institute)

Comment:

1. Several assumptions of the cash flow/NPV additionality test on pp 14 and 15 of the PDD are biased:

- The technical and economic lifetime of a hydropower station is much longer than 30 years. This biases the NPV downwards
- A discount rate of 12% for long-life projects like Candelaria is relatively high

The proponent should do a sensitivity analysis with a lifetime of 60 years and a discount rate of 10%. If this still gives an IRR which is lower than the IRR of competing alternatives (which has not been calculated by the proponents), the barrier is credible.

2. The efficiencies of thermal power plants for calculation of the operating margin (OM) (Table 7 on p. 31) are just estimates and seem extremely low, especially for gas and cogen plants. Neither fuel types nor efficiencies for the build margin (BM) (p. 30) are quoted and they seem to be extremely high, given that only one plant is coal-fired, one geothermal, one hydro and two bunker. Geothermal plants (Orzunil) have CO₂ emissions, thus should not get the emission factor 0 .

In principle only measured/reported efficiencies should be used for calculation of the OM/BM. As a last resort, I would accept estimates if they are really conservative, i.e. efficiencies of recently installed plants in the region are taken that have a high probability of being at least as high as the actual efficiencies of the plants serving the grid.

Summary: I would recommend validation only if these two points are rectified.

Axel Michaelowa, Dec. 30, 2003

Comment by: [Diana Shand, Environment Canterbury](#)

Inserted On: 2003-04-15

Subject: Have these factors been considered?

Comment:

What is involved in the HEP generation?
Will a natural ecosystem be lost?
What is the sustainability of the capacity (e.g. will sedimentation mean the generation will only be maintained a few decades?) or will it pose hazard risk for downstream habitat and habitation?
Will flooded vegetation produce methane emissions that should be costed as a climate change debit?

Comment by: [Andrew Keck, IRG](#)

Inserted On: 2003-03-25

Subject: Guatemala Hydroelectrical Candelaria PDD

Comment: The PDD provides ample information on many fronts but the contents are not yet complete and a few areas merit clarification. Specifically,

1. The explanation of investment additionality is unclear. The project is expected to have an IRR, before carbon credits of around 12.2%. It is not stated if the other investment options to the project (i.e., the baseline) have a higher or lower estimated IRR. One would presume they should have a higher IRR, thus demonstrating that they would occur before the proposed project. The PDD neither confirms or rejects such a concept.

The baseline section also mentions the expected future price required for the project but it is unclear whether the project can negotiate the target price with the central grid operator or not, and whether such negotiations will influence the project's implementation.

2. The baseline calculation is based on the Small-scale guidelines, which is reasonable. However, there are a few gaps in information. In particular, the PDD does not state the technology/fuel/performance of the five plants included in the average of the "build margin". This seems odd given that those specifications are provided for the other existing power plants in Guatemala. Approval of the PDD should require that the developer provide specific information on the plants included in the build margin calculation.

I am also not convinced that all diesel power plants in Guatemala operate on identical efficiency factors (25%). Newer diesel plants can have considerably higher efficiency factors and this would drive down the weighted average which I find unnaturally high given the low presence of coal.

For greater transparency in calculations, it is advisable that the developer present the CO₂ emissions/kWh of each power plant (by adding an additional column to Table 7).

At issue here is whether the estimates represent "conservative" calculations or not and I would argue that not enough information is presented to determine if the GHG emissions factors are sufficiently conservative to avoid unduly awarding excess carbon credits.

3. The Environmental assessment section is unnecessarily weak on information. Does the government have an impact assessment process? Does the company have governmental environmental approval?

4. The Stakeholder Assessment has NOT YET been completed. I can't see why DNV would accept launching review of the project if the stakeholder assessment is not completed.

5. The Small-scale PDD guidelines for calculating ERs for a project like this one (generating electricity for a grid) are notably weak in one area, the estimation of the baseline. The use of a weighted average of plants on the grid is certainly simple as far as a calculation, but there is no requirement that the change in generation mix over time be taken into account. As of 2004, the forecast expansion plan includes construction of only combined cycle and turbo gas power plants. Combined cycle plants have very high energy conversion rates so emissions will be much lower than for the older diesel plants.

The validator should review this issue and render an opinion as to the permanence of the baseline against which the project is expected to be judged for a renewable seven year period.

Comment by: [Patrick Karani, BEA International](#)

Inserted On: 2003-04-16

Subject: A few remarks on the Guatemala CDM project

Comment: First, the capacity of 4.3 MW of electricity is minimal to sacrifice or compromise the use of water by local communities downstream.

Second, this project should be subject to critical social, environmental and sustainable development assessments. I suppose, this river no matter how small its but supports numerous lifeforms, ecosystems and biodiversity if well documented and quantified will outweigh the CDM merits in this context. For practical purposes of CDM, the project may qualify.

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