

ASSESSMENT OPINION  
POST REGISTRATION CHANGES

International Bank for Reconstruction and Development  
(IBRD) as

Trustee of the Netherlands CDM Facility (NCDMF)

**Chile: Quilleco Hydroelectric Project**

UNFCCC REFERENCE NUMBER: "1265"

AENOR Reference No: 2009/018/CDM/04

## Assessment opinion on Post registration changes

"Chile: Quilleco Hydroelectric Project"

<b>Validation opinion:</b>	AENOR Reference No.:		Version of this document:	Date of this rev.:	
	2009/018/CDM/04		1	29/10/2012	
<b>Project:</b>	Title:		Registration date:	UNFCCC Reference	
	Chile: Quilleco Hydroelectric Project		09/07/2008	1265	
<b>Project Participant(s):</b>	Host Party:		Other involved Parties:		
	Chile		The Netherlands and United Kingdom of Great Britain and Northern Ireland		
<b>Applied methodology/ies:</b>	Title:		Code:	No revision	Scope:
	Methodology for zero-emissions grid-connected electricity generation from renewable sources in Chile or in countries with merit order based dispatch grid		AM0026	2	1
	Consolidated baseline methodology for grid-connected electricity generation from renewable sources		ACM0002	6	1
<b>PDD:</b>		Registered PDD	Revised PDD:		
	Version	2.1	2.2		
	Date	27/06/2008	05/10/2012		
	Estimated emission reductions	172,176 tCO <sub>2</sub> /year	172,176 tCO <sub>2</sub> /year		
<b>Previous versions of this document:</b>			Version:	Date:	
<b>Validation of the changes was conducted</b>	<input type="checkbox"/> Prior to the commencement of a verification of the project activity <input checked="" type="checkbox"/> When performing a verification of the project activity				
<b>Summary of Post registration changes:</b>	<b>TYPE OF POST REGISTRATION CHANGE</b>			<b>Is prior approval by CDM EB required?</b> (According to appendix 1 of PS)	
	<b>Temporary deviations</b>	<b>From</b>	<b>To</b>	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Not applicable	
	<b>Corrections</b>			<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Not applicable	
	<ul style="list-style-type: none"> <li>Include more details on the effective installed capacity of the project activity, and the nameplate installed capacity of the turbines.</li> <li>Update the project participants.</li> </ul>				
	<b>Changes to the start date of the crediting period</b>			<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Not applicable	
	<b>Permanent changes from the registered monitoring plan or applied methodology</b>			<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Not applicable	
	<b>Changes to the project design of a registered project activity</b>			<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Not applicable	
<p>The Spanish Association for Standardisation and Certification (AENOR) has performed the assessment opinion on the post registration changes of the project "Chile: Quilleco Hydroelectric Project" (Registration Ref. No. 1265) to submit the changes as part of the request for issuance of the monitoring period from 09/07/2008 to 08/07/2009, in accordance with requirements of CDM Project Cycle Procedure (Version 02.0).</p> <p>AENOR was contracted to perform the verification for this first monitoring period, and during the on site visit, the proposed changes were identified by the audit team.</p>					
<b>Report prepared by:</b>	Climate Change Unit. AENOR				

## Abbreviations

AENOR	Spanish Association for Standardisation and Certification
ACM0002	Consolidated baseline methodology for grid-connected electricity generation from renewable sources (version 6)
AM0026	Methodology for zero-emissions grid-connected electricity generation from renewable sources in Chile or in countries with merit order based dispatch grid (version 2)
CAR	Corrective action request
CDM	Clean development mechanism
CDM-EB	CDM Executive Board
CER	Certified emission reduction
CL	Clarification request
CMP	Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol
CO <sub>2</sub>	Carbon dioxide
CO <sub>2</sub> e	Carbon dioxide equivalent
DNA	Designated national authority
DOE	Designated operational entity
ER	Emission reduction
FAR	Forward action request
GHG	Greenhouse gas(es)
IPCC	Intergovernmental Panel on Climate Change
MP	Monitoring Plan
MR	Monitoring report
PCP	Clean Development Mechanism Project Cycle Procedure (Version 02.0)
PS	Clean Development Mechanism Project Standard (Version 01.0)
PDD	Project Design Document
PP	Project Participant
tC	Carbon tonnes
tCO <sub>2</sub> eq	Carbon dioxide equivalent tonnes
UNFCCC	United Nations Framework Convention on Climate Change
VVS	CDM Validation and Verification Standard (version 02.0)

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## 1 INTRODUCTION

International Bank for Reconstruction and Development (IBRD) as Trustee of the Netherlands Clean Development Mechanism Facility (NCDMF) commissioned AENOR to carry out the verification and certification of the emission reductions generated by "Chile: Quilleco Hydroelectric Project" in Chile (the project) for the period 09/07/2008 – 08/07/2009, and during the on site visit, the need of the proposed changes was identified by the audit team.

### 1.1 Objective

According to the modalities and procedures for the CDM (paragraph 57), project participants may revise monitoring plan in order to improve accuracy and/or completeness of information, subject to the revision being validated by a Designated Operational Entity.

This assessment opinion contains the description of the post registration changes, including their nature, extent of the non-conforming monitoring and the proposed alternative monitoring of the project activity, as well as any other complementary information required by the PCP, PS and VVS, to submit a request for approval by the Board prior to the submission of the request for issuance.

### 1.2 Scope

The scope of the validation is to assess all changes from the project activity as described in the registered project design document, including their potential impact on the estimates of the emissions reductions, the level of accuracy of the monitoring activity, the additionality or scale of the project activity and the applicability and application of approved methodology.

The following documents were reviewed as part of the scope of the activity:

- PDD and monitoring plan registered.
- PDD revised.
- Approved Methodology: AM0026, version 2.0
- Decision 3/CMP.1 and relevant decision and guidelines from the EB
- CDM Validation and Verification Standard, version 02.0.
- Clean Development Mechanism Project Cycle Procedure, version 02.0.
- Clean Development Mechanism Project Standard, version 01.0.
- Associated documentation (manufacturer documentation, design documentation, agreements, etc.)

The validation scope is defined as an independent and objective review the post registration changes included in the revised project design document, including the revised monitoring plan and other relevant documents. The information in these documents is reviewed against Kyoto Protocol requirements, UNFCCC rules and associated interpretations. AENOR, based on the PCP, the PS and the VVS, has used a risk-based approach in the validation, focusing on the identification of significant risks for the project implementation and the generation of CERs.

The validation is not meant to provide any consultancy services to the Client. However, stated requests for clarification and/or corrective actions may provide input for improvement of the revised PDD.

### 1.3 Description of the Project Activity

Host Country:	Chile
Title of project activity:	Chile: Quilleco Hydroelectric Project
UNFCCC registration No:	1265
Project Participants:	Hidroelectrica Guardia Vieja AS

International Bank for Reconstruction and Development (IBRD) as  
Trustee of the Netherlands Clean Development Mechanism Facility  
(NCDMF)

Netherlands' Ministry of Infrastructure and the Environment (IenM)  
Electrabel NV/SA

Location of the project activity: The coordinates of the powerhouse are 37°20'10" (37.336111) South,  
71°56'59" (71.949722) West  
Project's crediting period: 09/07/2008 to 08/07/2015 (First renewable period)  
Verification period: 09/07/2008 to 08/07/2009.  
Project starting date: 26/10/2004

The validation and previous verifications are summarised below:

Process	DOE	Crediting/Monitoring Period	Registration Date	Amount of CERs
Validation	DNV (DET NORSKE VERITAS))	09/07/2008 - 08/07/2015	09/07/2008	172,176
1 <sup>st</sup> verification	AENOR	09/07/2008 - 08/07/2009	On going	

The "Chile: Quilleco Hydroelectric Project", hereafter, the Project, consists of a run-of-river power plant with two sets of vertical Francis turbines/generators, connected to a 13.8/220 kV power transformer, obtaining an effective installed total power of 70 MW (71.76 MW turbines nameplate installed capacity) that produces an average annual generation of 422 GWh.

The project is built in the 8th Region of Bio-Bio of Chile, at about 35 km east of Los Angeles and 500 km south of Santiago, with the purpose of generating clean electrical energy, free of greenhouse gas emissions, for the Central Interconnected System (SIC).

The commercial operations of the Project started in April 2007, when Unit 1 began commercial operation, but the crediting period started on 09 July 2008, when the project was registered by the CDM Executive Board.

The project activity was commissioned on 17/04/2007, when the project started generating, although the project did not start the commercial operation until 30/04/2007, after finishing internal tests, when Unit 1 was officially delivered to CDEC-SIC. Afterwards, on 28/05/2007 Unit 2 was also delivered.

## 2 METHODOLOGY

### 2.1 Appointment of team members and technical reviewers

The list of involved personnel and the qualification status are summarised in the table below. The appointment certificates are included in Annex 1.

Name	Qualification	
	Position on the team	Technical areas
Luis Javier ARRIBAS ALONSO	Chief Validator	TA 1.2

Fernando SEGARRA ORERO	Validator	TA 1.2
José Luis FUENTES PÉREZ	Technical Reviewer	TA 1.2

Technical areas (TA) mentioned above correspond to the following:

TA code	Technical area
TA 1.1	Thermal energy generation from fossil fuels and biomass including thermal electricity from solar (COMPLEX)
TA 1.2	Energy generation from renewable energy sources
TA 2.1	Electricity distribution
TA 2.2	Heat distribution
TA 3.1	Energy demand
TA 4. 1	Cement sector (COMPLEX)
TA 4.2	Aluminium (COMPLEX)
TA 4.3	Iron and steel (COMPLEX)
TA 4.4	Refinery (COMPLEX)
TA 5.1	Chemical process industries (COMPLEX)
TA 6.1	Construction
TA 7.1	Transport
TA 8.1	Mining and mineral processes, excluding those included in TA 8.2 below
TA 8.2	Oil and gas industry, coal mine methane recovery and use (COMPLEX)
TA 9.1	Metal production
TA 10.1	Mining and mineral processes, excluding those included in TA 10.2 below
TA 10.2	Oil and gas industry, coal mine methane recovery and use (COMPLEX)
TA 11.1	Chemical process industries (COMPLEX)
TA 11.2	GHG capture and destruction
TA 12.1	Chemical process industries (COMPLEX)
TA 13.1	Waste handling and disposal
TA 13.2	Animal waste management
TA 14.1	Forestry
TA 15.1	Agriculture
TA 15.2	Animal waste management

## 2.2 Review of Documentation

The desk review involved a review of:

- Project documentation: PDD registered and Validation Report.
- Relevant decisions, clarifications and guidance from the CMP and the CDM Executive Board.
- The applied monitoring methodology, paying close attention to the frequency of measurements, the quality of metering equipment and the quality assurance and quality control procedures.

A complete list of all documents reviewed is attached in section 5 of this report.

## 2.3 Site Visits

As part of the verification process of the first monitoring period, on 13, 14 and 16 October 2009, Luis Javier Arribas Alonso and Fernando Segarra carried out the on-site visit, including visits to the facilities of the project. Also, during the on-site visit the verification team was able to complete:

- A review of the implementation and operation of the project activity as per the registered PDD.
- A review of information flows for generating, aggregating and reporting the monitoring parameters.
- A cross-check between monitoring information required in the monitoring plan and data from other sources such as plant logbooks, inventories, purchase records or similar data sources.
- A check of the monitoring equipment including calibration performance and observations of monitoring practices against the requirements of the PDD and the selected methodology.
- A review of calculations and assumptions made in determining the GHG data and emission reductions in accordance with the proposed changes.
- An identification of quality control and quality assurance procedures in place to prevent or identify and correct any errors or omissions in the reported monitoring parameters.
- Interviews with relevant personnel to confirm that the operational and data collection procedures are implemented in accordance with the monitoring plan and the registered PDD.

## 2.4 Internal Quality Control

Following the completion of the assessment process by the validation team, all documentation undergoes an internal quality control through a technical review before submission to the CDM-EB. The technical reviewer is a qualified member of AENOR, independent from the team that carried out the validation of the project activity. The technical reviewer or the team appointed for the technical review are qualified in the technical area(s) and sectoral scope(s) of the project activity.



### 3 POST REGISTRATION CHANGES

#### 3.1 Remaining issues, CARs, FARs from Previous Validation or Verification

During the validation, the DOE might have raised issues that could not be closed or resolved during the validation stage. For this purpose FARs might have been raised. No such issues were identified for this project.

Any other findings have been taken into account.

#### 3.2 Temporary deviations from the registered monitoring plan and/or applied methodology

##### 3.2.1 Description

It is not necessary to request temporary deviations.

##### 3.2.2 Applicable period for proposed deviations (inclusive)

**Start date of the earliest included deviation:** Not applicable.

**End date of the latest included deviation:** Not applicable.

##### 3.2.3 Assessment

Not applicable.

#### 3.3 Corrections

##### 3.3.1.1 Description

Project participants have documented in a revised PDD, in accordance with the requirements of the Project standard, the following corrections to project information as described in the registered PDD:

- 1) In sections A.2. and A.4.3. has been clarified that 70 MW is the effective installed capacity of the project activity, and has been included the value of the nameplate capacity of the installed turbines. Moreover, in section A.2. has been included a footnote to clarify the effective capacity of 70 MW installed in the project activity represents the power that the project can deliver to the grid at the connection point, whereas the nominal installed capacity of the power plant is 71.76 MW (capacity determined by the nameplate capacity of turbines, 35.88 MW each one).
- 2) In section A.3. and in Annex 1 Electrabel NV/SA has been included as project participant.

##### 3.3.1.2 Assessment

After reviewing all evidence required to the project participants, the audit team considers that the corrected information accurately reflects the actual project information and do not affect the design of the project activity. The different corrections are requested due to:

- 1) During the on-site visit, the audit team found a small difference between the capacity of the turbines included in the registered PDD and the name plate capacity of the installed turbines, as the main technical features of the project activity included in the registered PDD are the following:
  - Pressure penstock height: 59.4 meters.
  - Design flow: 130 m<sup>3</sup>/s (65 m<sup>3</sup>/s per turbine)
  - Set of turbines/generators capacity: 35 MW

- Power plant capacity: 70 MW

Whereas the turbines and generators installed have the following main technical features indicated in their nameplates:

**Turbines:**

Type: Francis  
Model: PO70-B-280  
Serial number: 1110/1111  
Rated power: 35880 kW  
Net head: 59.35 m.  
Manufacturing date: 2006

**Generators:**

Type: CB 483/153-28 YXn4  
Serial number: N 364448/N 364453  
Rated power: 38000 kVA (36100 kW)  
Rated power factor: 0.95  
Manufacturing date: 2006

Since the installed turbines have a name plate capacity of 35.88 MW instead of 35 MW, as it is stated in the PDD, the total name plate installed capacity of the project is 71.76 MW and not 70 MW.

This difference is because the registered PDD stated the effective capacity values of the turbines instead of their nameplates capacity values.

During the design stage of the project, the project participants determined 70 MW as the effective capacity that the plant shall inject to the Central Interconnected System (SIC), and this value was the capacity included in the PDD without more details.

The Project Participant signed in March 2005 with Power Machines – ZTL, LMZ, Elektrosila, Emergomaschexport the contract for electro-mechanical equipment supply and assemblies, including the provision of two turbines available from the manufacturer with the most similar features to those required by the project design.

According to the technical specifications of the turbines indicated in the contract and show below:

- The guaranteed average efficiency is 94.82%, and
- Maximum power: 35885 kW

When:

- Net head: 59.35 meters.
- Rated flow: 65 m<sup>3</sup>/s

Therefore, the proposed corrections included in the revised PDD do not affect the design of the project activity, as shown in the above information, but clarifies the description included in the registered PDD. The technical features of the turbines and generators indicated in the contract signed before the register of the project activity are the same as the specifications of equipment provided and installed by the manufacturer during the building stage of the project activity and the same as the ones verified during the on-site visit.

AENOR verification team could check during the on-site visit that in all the other key design elements of the project (penstock length, net head, tunnel length, etc.) no changes have been done.

On the other hand, the verification team could verify that the proposed corrections do not have any impact on the accuracy of the calculations of the ERs for the verified monitoring period, as they checked that:

- The project's electricity generated during the monitoring period was 384 GWh, 9% less than the electrical energy estimated in the registered PDD, 422 GWh.
- The hourly average generation of the project for the monitoring period was 44.6 MWh, much lower than the capacity of the project established in the registered PDD (70 MW).
- The hourly average generation of the maximum daily generation of the project for the monitoring period was 69.1 MWh.

- 2) The project participants of the project activity were not in accordance with the information of the UNFCCC website. The revised PDD includes all project participants published in the UNFCCC website and their contact information, in accordance with the MoCs published in the UNFCCC website.

### **3.4 Permanent Changes from the registered monitoring plan or applied methodology**

#### **3.4.1.1 Description**

No permanent changes from the registered monitoring plan or applied methodology have been requested.

#### **3.4.1.2 Assessment**

Not applicable.

### **3.5 Changes to project design of registered project activity**

#### **3.5.1.1 Description**

No changes to project design of registered project activity have been requested.

#### **3.5.1.2 Assessment**

Not applicable.

### **3.6 Changes to start date of crediting period**

#### **3.6.1.1 Description**

Project participants do not want to request changes to start date of crediting period.

#### **3.6.1.2 Assessment**

Not applicable.

## 4 VALIDATION OPINION

AENOR was contracted to perform the verification of the project "Chile: Quilleco Hydroelectric Project" (Registration Ref. No. 1265) for the monitoring period from 09/07/2008 to 08/07/2009, and during the on site visit, the proposed changes were identified by the audit team.

AENOR has performed the validation of the proposed changes according to the approved methodology "AM0026 (Version 2): Methodology for zero-emissions grid-connected electricity generation from renewable sources in Chile or in countries with merit order based dispatch grid", VVS (Version 02.0), PS (version 01.0) and PCP (Version 02.0).

AENOR planned and performed its work to obtain the information and explanations considered necessary to provide sufficient evidence to give reasonable assurance that the level of accuracy of GHG emission reductions. This assessment opinion is prepared on the basis of the monitoring plan included in the revised PDD and compared with registered monitoring plan of the project activity which is not adversely affected. This assessment included:

- Collection of evidence supporting the reported data
- Checking whether the provisions of the revised monitoring plan, were consistently and appropriately applied.

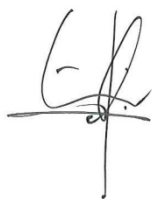
Furthermore, AENOR confirms that:

The proposed revision issues have been described, and an assessment has been provided to substantiate the reason for each of the proposed revision issues of the registered PDD, using objective evidence.

The proposed corrections to the registered PDD have been included by the project participants in the revised PDD and comply with the requirements of the Project standard.

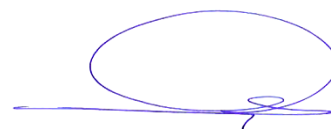
The corrected information is an accurate reflection of actual project information, improving the accuracy of information provided and consistency in the registered PDD, comply with the requirements of the applied methodologies and do not affect the design of the project activity.

Madrid, 29 October 2012



Luis Javier Arribas Alonso

Chief Validator



Luis Robles Olmos

Authorised person

## 5 REFERENCES

1	PDD registered version 2.1.
2	Revised PDD version 2.2.
3	Validation Report
4	AM0026: Methodology for zero-emissions grid-connected electricity generation from renewable sources in Chile or in countries with merit order based dispatch grid (version 2)
5	ACM0002: Consolidated baseline methodology for grid-connected electricity generation from renewable sources (version 6)
6	Nameplate of generators
7	Nameplate of turbines
8	Contract for electro-mechanical equipment supply and assemblies dated on 14/03/2005
9	Spreadsheets with the daily real operation from CDEC-SIC
10	Files with the data captured from the electric generation meters every 15 minutes
11	Clean Development Mechanism Project Cycle Procedure (Version 02.0)
12	CDM Project Standard version 01.0
13	5.1.1.1 Clean Development Mechanism Validation and Verification Standard (version 02.0)
14	MoC Annex 2 (Change/update authorized signatory, name or contact details) valid as of 16/04/2010
15	MoC Annex 2 (Add Project Participant) valid as of 03/06/2010
16	5.1.1.2 MoC Annex 2 (Change/update authorized signatory, name or contact details) valid as of 24/02/2011
17	Modalities of Communication valid as of 30/06/2011
18	Letter of authorization of the project participant Electrabel NV/SA from United Kingdom of Great Britain and Northern Ireland DNA.

## ANNEX 1. APPOINTMENT CERTIFICATES

### CERTIFICATE OF QUALIFICATION

**Subject:** Validation and Technical Review Team for "Chile: Quilleco hydroelectric Project"

Madrid, 29/10/2012

Hereby I confirm the following records of qualification, according with AENOR internal instruction "Validation, Verification and Certification of Clean Development Mechanism (CDM) project activities" IE-DTC-039, and in relation with the validation process of the above mentioned project activity:

Name: **Luis Javier Arribas Alonso**

CDM Chief Validator: Yes

CDM Validator: Yes

CDM Chief Verifier: N/A

CDM Verifier: N/A

Technical Expert: Yes

Technical areas related with the project activity:

TA1.2: Energy generation from renewable energy sources.



José Luis TEJERA OLIVER  
CDM Operational Director

Assessment opinion on Post registration changes  
"Chile: Quilleco Hydroelectric Project"

## CERTIFICATE OF QUALIFICATION

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Madrid, 29/10/2012

Hereby I confirm the following records of qualification, according with AENOR internal instruction "Validation, Verification and Certification of Clean Development Mechanism (CDM) project activities" IE-DTC-039, and in relation with the validation process of the above mentioned project activity:

Name: **Fernando Segarra Orero**

CDM Chief Validator: Yes

CDM Validator: Yes

CDM Chief Verifier: N/A

CDM Verifier: N/A

Technical Expert: Yes

Technical areas related with the project activity:

TA1.2: Energy generation from renewable energy sources.



José Luis TEJERA OLIVER  
CDM Operational Director

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Hereby I confirm the following records of qualification, according with AENOR internal instruction "Validation, Verification and Certification of Clean Development Mechanism (CDM) project activities" IE-DTC-039, and in relation with the validation process of the above mentioned project activity:

Name: **José Luis Fuentes Pérez**

CDM Chief Validator: N/A

CDM Validator: N/A

CDM Chief Verifier: N/A

CDM Verifier: N/A

Technical Expert: Yes

Technical areas related with the project activity:

TA1.2: Energy generation from renewable energy sources.



José Luis TEJERA OLIVER  
CDM Operational Director