

CDM VERIFICATION REPORT

- 1<sup>st</sup> Periodic Verification –
- 2<sup>nd</sup> Crediting Period –

INTERNATIONAL BANK FOR RECONSTRUCTION AND  
DEVELOPMENT (IBRD)

PROJECT: “Chacabuquito Hydroelectric Power Project”

UNFCCC REFERENCE NUMBER: 1052

MONITORING PERIOD:

FROM 04/11/2011 TO 31/12/2012

AENOR Reference N<sup>o</sup>: 2013/018/CDM/06

"1<sup>st</sup> Periodic Verification of Second Crediting Period"

"Chacabquito Hydroelectric Power Project "

<b>Verification Report:</b>	AENOR Reference No.:		Version of this document:		Date of this rev.:	
	2013/018/CDM/06		02		24/01/2014	
<b>Project:</b>	Title:		Registration date:		UNFCCC Reference	
	Chacabuquito Hydroelectric Power Project		07/07/2007 (Renewal Date 04/11/2011)		1052	
<b>Project Participant(s):</b>	Host Party: Chile		Other involved Parties: Sweden, France, Netherlands, Norway, Canada*, Finland, and Japan.			
	Hidroeléctrica Guardia Vieja S.A.		<b>Sweden:</b> Swedish Energy Agency; <b>France:</b> GDF Suez <b>Netherlands:</b> Electrabel S.A.; Netherlands' Ministry of Infrastructure and the Environment (IenM) ; Netherlands' Ministry of Economic Affairs, Agriculture and Innovation (EL&I); Deutsche Bank AG <b>Norway:</b> Government of Norway - Ministry of Foreign Affairs; Norsk Hydro ASA; Statoil ASA <b>Canada*:</b> Government of Canada - Ministry of Foreign Affairs and International Trade <b>Finland:</b> Government of Finland - Ministry of Foreign Affairs; Fortum Corporation; <b>Japan:</b> Chubu Electric Power Co., Inc.; The Chugoku Electric Power Co., Inc.; Japan International Cooperation Agency (JICA); Kyushu Electric Power Co., Inc.; Mitsubishi Corporation; Shikoku Electric Power Co., Inc.; Tohoku Electric Power Co. Inc.; The Tokyo Electric Power Co., Inc ; Mitsui & Co., Ltd. <b>Bilateral and Multilateral Funds:</b> International Bank for Reconstruction and Development (IBRD) as Trustee of the Prototype Carbon Fund (PCF) (Sweden, Canada*, Finland)			
<b>Applied methodology/ies:</b>	Title:		Code:		Nº. revision	
	Methodology for zero-emissions grid-connected electricity generation from renewable sources in Chile or in countries with merit order based dispatch grid		AM0026		03	
<b>Monitoring report:</b>	Title:		Draft version:		Final version:	
	MR Chacabuquito v3 10122013		01		03	
<b>Emissions reductions:</b>	Monitoring period:		Verified amount		As per draft MR:	
	04/11/2011 - 31/12/2012		82,053 tCO <sub>2</sub> e		74,252 tCO <sub>2</sub> e	
<b>Previous versions of this document:</b>			Version:		Date:	

"1<sup>st</sup> Periodic Verification of Second Crediting Period"

"Chacabucito Hydroelectric Power Project "

		1	26/12/2013
<b>Summary of verification:</b>	<p>The Spanish Association for Standardisation and Certification (AENOR) has performed the first verification, of second crediting period, of the emissions reductions of the project "Chacabucito Hydroelectric Power Project" (Registration Ref No. 1052). This monitoring period was from 04/11/2011 to 31/12/2012.</p> <p>The Chacabucito Hydroelectric Power Project consists of the construction of a run-of-river hydropower plant with an installed capacity of 30 MW that utilizes the water of the Aconcagua River.</p> <p>The purpose of the project is to generate zero emission energy to be injected in the Central Interconnected System (SIC), using the hydrological sources and displacing the use of fossil fuels.</p> <p>The project is located near to Los Andes; city placed 100 km north from Santiago (capital of the country). The hydro power plant is located in a small valley surrounded by mountains (Aconcagua Valley).</p> <p>During the on-site visit, the quality assurance of the data used for the calculation of the emissions reduction was verified. The installation of the project was also verified and the proper use of the meter and procedure controls was also tested.</p> <p>Calibration evidence allowed the verification team to verify that the meter worked correctly during the monitoring period</p> <p>A risk-based verification approach was employed to identify key risks to emission reduction estimations.</p> <p>All Corrective Action Requests (CAR) and Clarification Actions (CL) have been checked by the verification team and have been adequately resolved.</p> <p>AENOR confirms that the project is implemented in accordance with the registered Project Design Document. Furthermore, the monitoring system is in place and the emission reductions are calculated without material misstatements.</p> <p>The GHG emission reductions were calculated correctly on the basis of the approved methodologies AM0026 (version 3), and the Monitoring Plan and formula given in the renewed PDD.</p> <p>Therefore, in AENOR's opinion, the GHG emission reductions of monitoring period; from 04/11/2011 to 31/12/2012 are correct and amount 82,053 tons of CO2 equivalent.</p>		
<b>Report prepared by:</b>	Climate Change Unit. AENOR		

(\*) Party withdrawn from KP effective 15/12/2012.

## Abbreviations

AENOR	Spanish Association for Standardisation and Certification
AM0026 v3	Methodology for zero-emissions grid-connected electricity generation from renewable sources in Chile or in countries with merit order based dispatch grid, version 3.
CAR	Corrective Action Request
CDEC-SIC	Economic Dispatch Centre in the Central Interconnected System
CDM	Clean Development Mechanism
CDM EB	CDM Executive Board
CER	Certified Emission Reductions
CL	Clarification Request
CMP	Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol
CNE	National Energy Commission
CO <sub>2</sub>	Carbon Dioxide
CO <sub>2</sub> e	Carbon Dioxide equivalent
DOE	Designated Operational Entity
ER	Emission Reductions
FAR	Forwarded Action Requested
GHG	Greenhouse Gases
GWh	Gigawatt hour
IPCC	Intergovernmental Panel on Climate Change
IBRD	International Bank for Reconstruction and Development (IBRD) as Trustee of the Netherlands CDM Facility (NCDMF)
Km	Kilometre
Kv	Kilovolts
MoV	Means of Verification
MP	Monitoring Plan
MR	Monitoring Report
MWh	Megawatt hour
MW	Megawatt
PDD	Project Design Document
PP	Project Participants
PS	Clean Development Mechanism Project Standard
SIC	Central Interconnected System
tCO <sub>2</sub> e	Carbon dioxide equivalent tonnes
UNFCCC	United Nations Framework Convention for Climate Change
VVS	Validation and Verification Standard

## TABLE OF CONTENTS

1	<i>Introduction</i> .....	6
1.1	Objective.....	6
1.2	Scope .....	6
1.3	Description of the Project Activity .....	7
2	<i>Methodology</i> .....	9
2.1	Verification Steps.....	9
2.1.1	Appointment of team members and technical reviewers.....	9
2.1.2	Publication of the Monitoring Report .....	11
2.1.3	Review of Documentation.....	11
2.1.4	Site Visits.....	11
2.1.5	Findings.....	13
2.1.6	Internal Quality Control .....	14
3	<i>Verification findings</i> .....	14
3.1	Remaining issues, CARs, FARs from Previous Validation or Verification.....	14
3.2	Post Registration Changes.....	15
3.2.1	Temporary deviation from the registered monitoring plan or applied methodology .....	15
3.2.2	Corrections.....	15
3.2.3	Permanent changes from the registered monitoring plan or applied methodology.....	15
3.2.4	Changes to the project design of registered project activity .....	15
3.2.5	Changes to start date of crediting period .....	15
3.3	Implementation of Project Activity.....	15
3.4	Update on changes and incidents.....	16
3.5	Compliance of the monitoring plan with the monitoring methodology.....	17
3.6	Compliance of monitoring with the Monitoring Plan.....	17
3.7	Compliance with calibration frequency requirement for measuring instruments.....	18
3.8	Assessment of data and calculation of greenhouse gas emission reductions .....	18
3.9	Quality of Evidence to Determine Emission Reductions.....	21
3.10	Management System and Quality Assurance.....	21
3.11	Hints for next periodic Verification.....	22
4	<i>Verification and certification statement</i> .....	23
5	<i>Clarification, corrective action requests and forward action request</i> .....	24
6	<i>References</i> .....	28
	<i>ANNEX 1. CDM VERIFICATION PROTOCOL</i> .....	29
	<i>ANNEX 2. APPOINTMENT CERTIFICATES</i> .....	73

## **1 INTRODUCTION**

IBRD has commissioned AENOR to carry out the first verification (of second crediting period) and certification of the emission reductions generated by the "Chacabuquito Hydroelectric Power Project" in Chile for the period from 04/11/2011 to 31/12/2012. This report contains the findings from the verification and a certification statement for the certified emission reductions.

### **1.1 Objective**

According to the Modalities and Procedures for the CDM (Decision 3/CMP1, paragraph 61), the purpose of the verification is the periodic independent review and ex-post determination by the DOE of the monitored reductions in anthropogenic emissions by sources of GHG that have occurred as a result of a registered CDM project activity during the verification period.

Certification is the written assurance by the DOE that, during a specified period of time and based upon verifiable evidence, a project activity achieved the reductions in anthropogenic emissions by sources of greenhouse gases as verified.

### **1.2 Scope**

The verification, as an independent and objective review, shall assess and verify that the implementation of the project activity and the steps taken to report emission reductions comply with the CDM criteria and relevant guidance provided by the CMP and the CDM Executive Board.

The verification shall:

- 1.** Ensure that the project activity has been implemented and operated as per the renewed registered PDD /1/ and that all physical features (technology, project equipment, and monitoring and metering equipment) of the project are in place. It is therefore necessary to:
  - Interview relevant personnel to confirm that the operational and data collection procedures are implemented in accordance with the Monitoring Plan /2/ included in the PDD.
  - Check the monitoring equipment, including calibration performance and observations of monitoring practices, against the requirements of the PDD and the selected methodology.
  - Check that the manual operating provisions are duly followed (processes, routines, instructions, forms and related provisions).
- 2.** Ensure that the final version of the Monitoring Report and other supporting documents provided are complete and verifiable and in accordance with applicable CDM requirements. It is therefore necessary to carry out a review of:
  - Relevant documentation as well as the on-site visit(s).
  - Data and information presented to verify their completeness.
  - Indicators that must be addressed in the Monitoring Plan.
  - The Monitoring Plan and monitoring methodology, paying particular attention to the frequency of measurements, the quality of metering equipment including calibration requirements, and the quality assurance and quality control procedures.
- 3.** Ensure that actual monitoring systems and procedures comply with the monitoring systems and procedures described in the Monitoring Plan and the approved methodology, carrying out:
  - A review of information flows for generating, aggregating and reporting the monitoring parameters.
  - A cross-check between information provided in the Monitoring Report and data from other sources such as plant logbooks, inventories, purchase records or similar data sources.

- A review of calculations and assumptions made in determining the GHG data and emission reductions.
  - A review of the project documentation provided by the project participants to check that it is based upon both quantitative and qualitative information on emission reductions. Quantitative information comprises the reported numbers in the Monitoring Report submitted to the DOE. Qualitative information comprises information on internal management controls, calculation procedures, and procedures for transfer of data, frequency of emissions reports, and review and internal audit of calculations.
4. Evaluate the data recorded and stored as per the monitoring methodology, carrying out:
    - An evaluation of data management and the quality assurance and quality control system in the context of their influence on the generation and reporting of emission reductions.
    - 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.
  5. Identify and inform the project participants of any concerns related to the project's activity and operation conformance with the registered project design document. The project participants shall address the concerns and supply additional relevant information.
  6. Provide a verification report to the project participants, the Parties involved and the CDM Executive Board. The report shall be made publicly available.

The verification is not meant to provide any consultancy services to the client. However, stated requests for clarifications and/or corrective actions may provide input for improvement of the Monitoring Report.

AENOR, based on the Specific Instruction for the Validation, Verification and Certification of Clean Development Mechanism (CDM) Project Activities (IE/DTC/039) [3], which is in turn based on the CDM Validation and Verification Standard version 05.0 (CDM-EB 75) [4], has used a risk-based approach in the verification, focusing on the identification of significant risks for the generation of CERs and verifying the mitigation measures for these issues.

### 1.3 Description of the Project Activity

Host Country:	Chile
Title of project activity:	Chacabucito Hydroelectric Power Project
UNFCCC registration No:	1052
Project Participants:	<p><b>Hidroelectrica Guardia Vieja S.A.</b> Av. Apoquindo 4775, Piso 11 – Santiago – Chile +56-2-460-4280 <a href="mailto:cmosella@colbun.cl">cmosella@colbun.cl</a></p> <p><b>International Bank for Reconstruction and Development (IBRD) as Trustee of the Prototype Carbon Fund (PCF)</b> 1818 H street NW; Washington DC; 20433; USA +12024739189 <a href="mailto:IBRD-carbonfinance@worldbank.org">IBRD-carbonfinance@worldbank.org</a></p> <p><b>Government of Sweden - Swedish Energy Agency</b></p> <p><b>GDF Suez</b></p> <p><b>Electrabel S. A.</b></p> <p><b>Netherlands' Ministry of Infrastructure and the Environment (IenM)</b></p> <p><b>Netherlands' Ministry of Economic Affairs</b></p> <p><b>Agriculture and Innovation (EL&amp;I)</b></p> <p><b>Deutsche Bank AG</b></p>

"1<sup>st</sup> Periodic Verification of Second Crediting Period"  
"Chacabuquito Hydroelectric Power Project "

**Government of Norway - Ministry of Foreign Affairs**  
**Government of Canada - Ministry of Foreign Affairs and International Trade** (Party withdrawn from KP effective 15/12/2012)  
**Norsk Hydro ASA**  
**Statoil ASA**  
**Government of Finland - Ministry of Foreign Affairs**  
**Fortum Corporation**  
**Chubu Electric Power Co., Inc.**  
**The Chugoku Electric Power Co., Inc.**  
**Japan International Cooperation Agency (JICA)**  
**Kyushu Electric Power Co., Inc.**  
**Mitsubishi Corporation**  
**Shikoku Electric Power Co., Inc.**  
**Tohoku Electric Power Co. Inc.**  
**The Tokyo Electric Power Co., Inc**  
**Mitsui & Co., Ltd.**

Location of the project activity: The coordinates of the project are:  
32°51'12.35" S - 70°30'22.21" W

Project's crediting period: 04/11/2011 to 03/11/2018 (Second Crediting Period)  
Verification period: 04/11/2011 to 31/12/2012  
Project starting date: 12/03/2001

The validation and previous verifications are summarised below:

Process	DOE	Crediting period	Registration Date	Amount of CERs (annual Average) tCO <sub>2</sub> e
Renewal of Crediting Period	TÜV NORD	04/11/2011 to 03/11/2018	04/11/2011	54,179

The Chacabuquito Hydroelectric Power Project is a run-of-river hydropower plant with an installed capacity of 30 MW, given by four Francis turbines of 7.5 each one, which utilizes the water of the Aconcagua River. Main facilities consists of a diversion weir, a system of channels (11 km) and tunnels (3 km), a pressure penstock, water fall of 137 m (134.58 m net water fall), a powerhouse and a high voltage line, and upgrade of existing transmission system.

The Chacabuquito plant is in cascade with two existing upstream hydropower plants (Aconcagua of 81 MW and Los Quilos of 39 MW).

The project is located near to Los Andes, city placed 100 km north from Santiago (capital of the country). The hydro power plant is located in a small valley surrounded by mountains (Aconcagua Valley).

The purpose of the project is to generate zero emission energy to be injected in the Central Interconnected System (SIC), using the hydrological sources and displacing the use of fossil fuels.

The construction of Chacabuquito Hydroelectric Power Project began on 28/02/2001 and the commissioning took place on 01/07/2002 to successfully start of commercial operation on 22 July 2002. Since then, Chacabuquito Hydroelectric plant has been continuously operating and delivering energy to the National Grid.



This monitoring period comprises the period 04 November 2011 to 31 December 2012. In this period the project produced 163,678 MWh of net energy to the grid, which accounts for emission reduction of 82,053 tCO<sub>2</sub>.

According to the MR, Chacabuquito Power Plant had been operating continuously and no mayor events occurred during the monitoring period, other than normal events that face most hydropower plants. However, the MR includes most important events; which were verified during the visit, against electronic log books and the audit team found that they properly overcame.

## 2 METHODOLOGY

The verification has assessed the quality of the information, including:

- A desk review of the relevant information of all issues that constitute the basis for emission reductions from the project.
- On-site inspections; a review of performance records, interviews with the project participants, collection of measurements, observation of established practices and testing of the accuracy of monitoring equipment.
- A review of additional data from other sources relevant to the project activity's resulting emission reductions (IPCC reports, data on electricity generation in the electricity system of the Host Country, calibration reports).

Special focus is given to:

- The proper implementation of the project activity as described in the registered PDD.
- The data collection system, verifying that it meets the requirements of the Monitoring Plan as per the applied methodology.
- Whether sufficient evidence is available, both in terms of frequency (time period between evidence) and in covering the full monitoring period.
- The source and nature of the evidence (external or internal, oral or documented).

The available information from sources other than those used in the latest version of the Monitoring Report were cross-checked against the data in the Monitoring Report to confirm that the stated figures included in it are correct.

The verification of emission reductions has assessed all factors and issues that constitute the basis for emission reductions from the project, as detailed in the verification protocol, included in this report as Annex 1.

### 2.1 Verification Steps

Preparations	:	08/01/2013 to 11/01/2013
On-site verification	:	28/01/2013 to 29/01/2013
Reporting	:	30/01/2013 to 24/01/2014

#### 2.1.1 Appointment of team members and technical reviewers

The list of involved personnel and the qualification status are summarised in the following table:

Name	Qualification	
	Position in the team	Technical areas
Luis Javier ARRIBAS ALONSO	Chief Verifier	TA 1.2

“1<sup>st</sup> Periodic Verification of Second Crediting Period”

“Chacabquito Hydroelectric Power Project ”

Richard Daniel GONZALES TOLEDO	Trainee Chief Verifier	TA 1.2
Manuel GARCIA-ROSELL RODRIGUEZ	Verifier	TA 1.2
José Luis FUENTES	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

### **2.1.2 Publication of the Monitoring Report**

AENOR made the MR Version 1, dated on 09/01/2013, publicly available on the UNFCCC web site on 11/01/2013, before the on-site visit.

### **2.1.3 Review of Documentation**

Version 01 of the monitoring report /5/ was made publicly available, on UNFCCC website, on 11 January 2013. After the on-site visit, and due to the on-site visit conclusions, the Monitoring Report was updated to address the CARs and CLs, and a final version of the Monitoring Report dated 10/12/2013 /6/ had to be edited.

The desk review involved a review of:

- Project documentation: PDD registered (renewed), validation of renewal of the crediting period /7/ and previous verification reports /8/
- Relevant decisions, clarifications and guidance from the CMP and the CDM Executive Board.
- The Monitoring Plan and the applied monitoring methodologies, paying close attention to the frequency of measurements, the quality of metering equipment and the quality assurance and quality control procedures.
- The data and information presented to verify their completeness, including the Monitoring Report and the measuring records of the different monitored parameters.
- The influence of data management and the quality assurance and quality control system on the generation and reporting of emission reductions.

A complete list of all documents reviewed is attached in section 6 of this report.

### **2.1.4 Site Visits**

From 28/01/2013 to 29/01/2013 AENOR's verification team visited the "Chacabuquito Hydroelectric Power Project" (Registration Ref. No. 1052). During the on-site visit the verification team was able to see the project facilities and carry out:

- An assessment 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 information provided in the Monitoring Report 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.
- 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 included in the registered PDD.

The persons interviewed are indicated below:

Interviewed organisation Person/Position	Interview topics
<p><b><u>COLBÚN, S.A. – Headquarters</u></b> Cristián Mosella Vial, Sustainability and Unit Climate Change Area Paula Reyes Figueroa, Project Engineer</p> <p><b><u>CDM Consultant - POCH</u></b> María Luz Farah G., CDM Consultant</p>	<ul style="list-style-type: none"> <li>• Flows for generating, aggregating and reporting the monitoring parameters.</li> <li>• Crosscheck between information provided in the monitoring report and data from monitoring system, plant log books, purchase records, etc.</li> <li>• Monitoring report and emission reduction calculations.</li> <li>• Estimates and assumptions for determining GHG data.</li> <li>• Controls established to detect and correct any error or omission in monitoring parameters.</li> <li>• Testing of monitoring equipment and observation of monitoring practices.</li> <li>• Calibration of meters.</li> <li>• Running of specific checks and trials on data sources and data management practices where risks are detected.</li> <li>• Clarifications related to monitoring procedures.</li> <li>• Generation of data verification.</li> <li>• Sufficiency of Monitoring Plan.</li> <li>• Reliability of internal and external data.</li> <li>• Internal data quality control.</li> <li>• Electrical energy generation reports.</li> <li>• Procedures.</li> </ul>

“1<sup>st</sup> Periodic Verification of Second Crediting Period”  
“Chacabquito Hydroelectric Power Project ”

Interviewed organisation Person/Position	Interview topics
<p><b>COLBÚN, S.A. - Chacabquito hydroelectric plant</b></p> <p>Eduardo Aguilera López, Operation Power Plant Manager.</p> <p>Leonel Arancibia, Power Plant operator.</p>	<ul style="list-style-type: none"> <li>• Crosscheck between information provided in the monitoring report and data from monitoring system, plant log books, etc.</li> <li>• Controls established to detect and correct any error or omission in monitoring parameters.</li> <li>• Testing of monitoring equipment and observation of monitoring practices.</li> <li>• Calibration of meters.</li> <li>• Running of specific checks and trials on data sources and data management practices where risks are detected.</li> <li>• Clarifications related to monitoring procedures.</li> <li>• Generation of data verification.</li> <li>• Reliability of internal and external data.</li> <li>• Internal data quality control.</li> </ul>

## 2.1.5 Findings

As an outcome of the verification process, the team can raise different types of findings according to the CDM Validation and Verification Standard, related to the monitoring, implementation or operations of the proposed CDM project activity that could impair the capacity of the proposed CDM project activity to achieve emissions reductions, or influence the reporting of emissions reductions.

Findings established during the verification could either be seen as a non-fulfilment of criteria ensuring the proper implementation of a project or as an instance in which a risk to deliver high quality emission reductions is identified.

Corrective Action Requests (CARs) are issued, when:

- (a) Non-conformities with the Monitoring Plan or methodology are found in monitoring and reporting, or if the evidence provided to prove conformity is insufficient;
- (b) Mistakes have been made in applying assumptions, data or calculations of emission reductions which will impair the estimate of emission reductions;
- (c) Issues identified in a FAR during verification to be verified during verification have not been resolved by the project participants.

Clarification Requests (CLs) are issued if information is insufficient or is not clear enough to determine whether the applicable CDM requirements have been met and additional information is needed to fully clarify an issue. Failure to address a CL may result in a CAR. Information or clarifications provided as a result of a CL may also lead to a CAR.

Forward Action Requests (FARs) are issued for actions if the monitoring and reporting require attention and/or adjustment for the next verification period.

The project participants were requested to address all validation findings and finally provided the verification team with sufficient evidence to determine that the applicable CDM requirements have been met. The project participants modified the initial monitoring report to resolve the verification team concerns and resubmitted a final version. AENOR has prepared this report based on the final monitoring report.

All of the verification findings are summarised in section 3 and documented in further detail in section 5 and in the verification protocol included in Annex 1.

## 2.1.6 Internal Quality Control

Following the completion of the assessment process by the verification team, all documentation undergoes an internal quality control through a technical review before the request for Issuance of CERs is submitted. The Technical reviewer is a qualified member of AENOR, independent from the team that carried out the verification of the project activity. The technical reviewer or the team appointed for the technical review is qualified in the technical area and sectoral scope of the project activity.

## 3 VERIFICATION FINDINGS

The summary of CARs, FARs and CLs issued are shown in following table:

	Verification topic	Nº. of CAR	Nº. of CL	Nº. of FAR
<b>1</b>	Project history	-	-	-
<b>2</b>	Project implementation	-	-	-
<b>3</b>	Monitoring report	<b>CAR 1</b>	-	-
<b>4</b>	Compliance with the monitoring methodology	<b>CAR 3</b>	-	-
<b>5</b>	Compliance with the Monitoring Plan	-	-	-
<b>6</b>	Monitoring Parameters	-	-	-
<b>7</b>	Compliance with the calibration frequency	-	-	-
<b>8</b>	Emission Reduction Calculations	<b>CAR 2</b>	-	-
<b>9</b>	Quality of Evidence to determine ER	-	-	-
<b>10</b>	Management System and Quality Assurance	-	-	-
	<b>SUM</b>	<b>3</b>	<b>0</b>	<b>0</b>

All corrective action requests and clarification requests have been checked by the verification team and have been adequately resolved.

In the following paragraphs the findings from the desk review of the Monitoring Report, the calculation spreadsheets, the registered PDD, the validation report, the 1st periodic verification report, Monitoring Plan and other supporting documents as well as findings from the on-site assessment and the interviews are summarised.

All CARs and CLs raised are explained briefly in the following sections. An in-depth evaluation of all verification items can be found by referring to the verification protocol (see Annex 1 and Section 5).

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

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

Furthermore, no remaining issues such as CARs, CLs and FARs have been raised from validation report of renewal crediting period.

## **3.2 Post Registration Changes**

### **3.2.1 Temporary deviation from the registered monitoring plan or applied methodology**

For the current monitoring period no deviation from the registered monitoring plan or applied methodology has been requested.

### **3.2.2 Corrections**

No corrections to the project information or parameters fixed at validation as is described in the revised PDD have been requested.

### **3.2.3 Permanent changes from the registered monitoring plan or applied methodology**

For the current monitoring period no changes to the monitoring plan contained in the registered PDD have been requested.

### **3.2.4 Changes to the project design of registered project activity**

During this verification process the audit team verified that the project activity was implemented and operated according to registered PDD, and no new changes had to be requested.

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

No changes to the start date of the crediting period stated in the registered PDD have been requested.

## **3.3 Implementation of Project Activity**

During the on-site visit, the audit team verified that:

- The implementation and operation of the project activity was as per the registered PDD.
- The information provided in the Monitoring Report was in accordance with data from other sources such as plant logbooks, inventories, purchase records or similar data sources.
- The monitoring equipment, including calibration performance and observations of monitoring practices, complied with the requirements of the PDD and the selected methodology.
- The operational and data collection procedures are implemented in accordance with the Monitoring Plan and the registered PDD.

The renewed registered PDD, previous verification reports and other documents related to the project are available on the UNFCCC website:

[\(http://cdm.unfccc.int/Projects/DB/DNV-CUK1175238807.52/view?cp=1/\)](http://cdm.unfccc.int/Projects/DB/DNV-CUK1175238807.52/view?cp=1/)

The renewal of the crediting period was accepted on 04 November 2011 against AM0026 version 3 [9].

This is the first monitoring, of second crediting period, under verification, which began on 04/11/2011 and ended on 31/12/2012.

---

"1<sup>st</sup> Periodic Verification of Second Crediting Period"  
"Chacabquito Hydroelectric Power Project "

---

Through the on-site visit and desk-review of documents provided by the project participants, the audit team reviewed the technical features of turbines, generators and transformers among other facilities.

The final version of the Monitoring Report includes clear, correct and complete information in accordance with the registered PDD.

No fossil fuels were used for power generation by the project during this monitoring period. This has been confirmed through the on-site visit and interview with the project participants. There are no other sources of GHG emissions attributable to the project activity.

The audit team also checked the hourly generation data of the project activity and the adequate maintenance and operation of the electric meter during the monitoring period.

The verification team reviewed whether the Monitoring Report and other supporting documents, such as the calculation spreadsheets, were in accordance with the requirements of the "Issuance information and reporting checklist" /10/, the "Guidelines for Completing the Monitoring Report Form" /11/ and the "Issuance completeness checklist" /12/. Also, the verification team reviewed the Monitoring Report was free of material misstatements, was transparent, clear and unequivocal.

The monitoring of reductions in GHG emissions to result from the proposed CDM project activity is implemented in accordance with registered PDD and the project participants are recoding the data and parameters following the monitoring plan included in the registered PDD.

In accordance with the requirements of the Clean Development Mechanism Project Standard /13/ (paragraph 201 of the PS) PP shall provide a comparison of actual GHG emission reductions or net anthropogenic removal of the registered CDM project activity with estimates in the registered PDD. Hence, the final version of the Monitoring Report contains a comparison of the actual emission reductions claimed in the monitoring period with the estimate in the registered PDD.

In the first version of the monitoring report the estimated emission reduction (74,252 tCO<sub>2</sub>e) were lower than actual claimed emission reduction due to fact that the net energy were not properly monitored, energy from November 2012 were not considered in the calculation and; moreover, grid emission factors were updated to be in accordance with applied methodology.

The claimed emission reductions for this monitoring period are 82,053 tCO<sub>2</sub>e compared with the estimated emission reductions of 96,121 (82,746 tCO<sub>2</sub>/year \* 424 days / 365 days) tCO<sub>2</sub>e as per the registered PDD for the same period. Then, the emission reductions achieved during the current monitoring period are lower, but close to the estimations in the registered CDM-PDD.

During this monitoring period the project has produced 163,678 MWh of net energy to the grid (32,317 MWh during 2011 and 131, 361 MWh during 2012) lower than 197,479 MWh (170,000 MW\*424/365), which is the ex-ante energy generation declared in the PDD for the same period (the yearly average value stated in the PDD is 170,000 MWh/year).. In addition, the grid emission factor stated in the PDD is 0.5038 tCO<sub>2</sub>/MWh; whereas, the grid emissions factor for years 2011 and 2012 are 0.48696 tCO<sub>2</sub>/MWh and 0.50484 tCO<sub>2</sub>/MWh respectively. Therefore, the values for energy generation and grid emission factors are rather similar to the established in the PDD.

In AENOR's opinion, the difference between estimated ERs in the registered PDD and this monitoring is only due to the real condition of operation. Therefore, it can be concluded that the project was adequately implemented and it can be confirmed that technology, project equipment and monitoring and metering equipment have been implemented and operated in line with the registered PDD.

### 3.4 Update on changes and incidents

During the on-site visit and the desk review process, the audit team reviewed different information from the operational system of the plant, as logbooks, generation records and internal reports, the metering system and communications from CDEC-SIC, and met several plant operators in order to identify incidents, deviation operation modes or downtime during the operation of the plant during the monitoring period.

After crosschecking the available information, the audit team found that the project was operating normally during the monitoring period, according to the requirements established in the registered PDD, and there



have not been significant incidents (overhauled, downed or exchanged equipment) regarding the operation of the project activity during this monitoring period; except the programmed stops for maintenance and common operational failures that faces hydropower plants.

Furthermore, it was verified that there were new personnel involved in the monitoring of the energy production. However, after the interview, it was verified that new personnel received training by qualified COLBÚN staff.

### **3.5 Compliance of the monitoring plan with the monitoring methodology**

The verification team reviewed whether the CDM project activity was in accordance with the applied methodologies and if any other monitoring aspect of the project activity that is not specified in the methodologies was established.

During the on-site visit, the auditing team was able to review different records and found that the most important aspects of monitoring methodology were adequately considered and documented.

The audit team verified that the monitoring of reductions in GHG emissions to result from the proposed CDM project activity is implemented in accordance with registered PDD and the project participants are recording the data and parameters following the monitoring methodologies applied.

Therefore, the audit team considers that the monitoring plan is in compliance with the approved methodologies applied (AM0026, version 3) by the CDM project activity.

### **3.6 Compliance of monitoring with the Monitoring Plan**

Regarding compliance with the Monitoring Plan, the verification team confirmed that:

- The monitoring of reductions in GHG emissions to result from the proposed CDM project activity was implemented in accordance with the Monitoring Plan contained in the registered PDD.
- The Monitoring Plan and the applied methodology had been properly implemented and followed by the project participants.
- All parameters stated in the Monitoring Plan, the applied methodology and relevant CDM EB decisions have been sufficiently monitored and updated.
- The responsibilities and authorities for monitoring and reporting were in accordance with the responsibilities and authorities stated in the Monitoring Plan.

The monitoring system and all applied procedures are in compliance with the Monitoring Plan contained in the registered PDD and the applied methodologies.

The audit team has verified that the monitoring of reductions in GHG emissions to result from the proposed CDM project activity is implemented in accordance with the Monitoring Plan contained in the registered PDD.

The project complies with the requirements. The Monitoring Plan and the applied methodologies have been properly implemented and followed by the PPs, and all management and operational system parameters have been sufficiently monitored and updated.

The parameters for achieving emission reduction calculation by the prescribed equations for baseline emissions, project emissions, leakage and emission reductions have been listed in section D. of the MR in a complete manner.

The audit team verified the information flow (from data generation, aggregation, to recording, calculation and reporting) for the monitoring parameters including the values in the monitoring report, as detailed in section 7 of the verification protocol (Annex I).

Therefore, the monitoring system and all applied procedures are in compliance with the monitoring plan contained in the registered PDD and the applied methodologies.

### 3.7 Compliance with calibration frequency requirement for measuring instruments

According to the monitoring plan, equipment used for monitoring the parameter Electricity delivered to the grid (*Generation<sub>h</sub>*) is calculated as per net electricity measurements from e-meters located at Totoralillo substation as the sum from meters M2 and M3. Furthermore, monitored data from those meters are cross checked against electricity measurements from power plant, recorded by meter M1, and the most conservative values are chosen for emission reduction calculation

In AENOR’s opinion the meters are adequately controlled and calibrated in accordance with the monitoring plan. Furthermore, no delays or equipment changes were detected during monitoring period.

The following table summarises the principal information of the meter involved in the verification process:

Meter	Details of Meter
<b><u>Meter M2:</u></b>	Type: Ion 8500 Accuracy class: 0.2% Serial number: PQ-0502A117-03 Calibration frequency: At least every two years  ✓ Previous Calibration : 26/10/2011 ✓ Last Calibration: 27/06/2012
<b><u>Meter M3:</u></b>	Type: Ion 8500 Accuracy class: 0.2% Serial number: PQ-0502A188-03 Calibration frequency: At least every two years ✓ Previous Calibration : 26/10/2011 ✓ Last Calibration: 27/06/2012
<b><u>Meter M1:</u></b>	Type: Ion 8600 Accuracy class: 0.2% Serial number: PT-0809A131-01 Calibration frequency: At least every two years ✓ Previous Calibration : 26/10/2011 ✓ Last Calibration: 29/06/2012

The audit team could verify the calibration certificates /14/ provided by the project participant. Therefore, AENOR confirmed that the calibrations were conducted at the frequency specified by the methodology and revised monitoring plan.

### 3.8 Assessment of data and calculation of greenhouse gas emission reductions

The audit team carried out a review of information flows for generating, aggregating and reporting the monitoring parameter to assess a completeness of monitoring in line with the registered Monitoring Plan and the applied methodology, including:

- The measurement/determination method used.
- Relevant monitoring equipment, their features and the control and calibration procedures.
- Significant inaccuracies occurred in case of measured or estimated values of some parameters.
- Measuring, reading and/or recording frequency.
- QA/QC procedures applied to prevent or identify and correct any errors or omissions in the reported monitoring parameters.

Monitoring of reductions in GHG emissions to result from the registered project has been implemented in accordance with the Monitoring Plan. The monitoring mechanism is effective and reliable. All applicable parameters stated in the monitoring plan, the applied methodology and relevant CDM Executive Board decisions have been sufficiently monitored.

“1<sup>st</sup> Periodic Verification of Second Crediting Period”  
“Chacabquito Hydroelectric Power Project ”

According to the applied methodologies, the emission reduction ( $ER_y$ ) by the project activity during year  $y$  is the difference between the baseline emissions ( $BE_y$ ), project emissions ( $PE_y$ ) and emissions due to leakage ( $L_y$ ).

### **Leakage ( $L_y$ )**

According to the applied baseline methodology, Project Participants do not need to consider leakage ( $L_y=0$ ).

### **Project emissions ( $PE_y$ )**

According to registered PDD, since the Project is a hydro power plant, there are no project emissions ( $PE_y=0$ ).

### **Baseline emissions ( $BE_y$ )**

Baseline emissions are calculated as follow:

$$BE_y = EF_y * Generation_y$$

Where:

$EF_y$  : Baseline emission factor, in  $tCO_2/MWh$

$Generation_y$  : Electricity generated by the proposed CDM Project in year  $y$  (in  $MWh$ ).

The baseline emission factor ( $EF_y$ ) is calculated as a combined margin (CM) emission factor, consisting of the combination of operating margin (OM) and build margin (BM) emission factors according to the following formula:

$$EF_y = W_{OM} * EF_{OM,y} + W_{BM} * EF_{BM}$$

Where:

$EF_{OM,y}$  : Emission factor for operating margin power generation sources, in  $tCO_2/MWh$

$EF_{BM}$  : Emission factor for build margin power generation sources, in  $tCO_2/MWh$

$W_{OM}$  : Weight for operating margin emission factor.

$W_{BM}$  : Weight for build margin emission factor

In accordance to the monitoring plan and applied methodology AM0026, version 3; the operating margin has been determined ex-post from the dispatch data obtained from CDEC-SIC and data by the CNE. In the case of build margin it had been fixed in the renewed PDD, owing to this monitoring corresponds to the second crediting period.

The weights established in the PDD for calculating the combined margin are:

$$W_{OM}=0.25$$

$$W_{BM}=0.75$$

As the monitoring period is from 04/11/2011–31/12/2012, the emission factors of the grid, the operating margin are calculated for 2011 and 2012.

During the verification process, the audit team has evaluated the  $EF_{OM,y}$  calculated by the Project Participants for the monitoring period, and after checking all information received by the Project Participants, AENOR has found that they are correct and comply with the Monitoring Plan and the applied methodologies.

However, due to the complexity of calculations required by the methodology, which requires monitoring of many parameters, most of them by the hour, it is necessary to use a large amount of data and formulae to determine the  $EF_{OM,y}$ .

For this reason, the Project Participants have created many spreadsheets in order to obtain the emission operating margin. The spreadsheets “*EF OM 2011 v2.xlsx*” [15] and “*EF OM 2012 v3.xlsx*” [16] contain  $EF_{OM,y}$  calculations and their sources. The spreadsheets “*EF Calc 2011 Chacabquito v2.xlsx*” [17] and “*EF Calc 2012 Chacabquito v3.xlsx*” [18] contain  $EF_{CM,y}$  calculations and their sources.

The Project Participants have also created several monthly spreadsheets (“*Hourly OM Data\_mm*” [19] and “*Marginal Plants Data Base\_mm*” [20]), which show the traceability of all calculations as stated in the methodology.

AENOR was able to cross check the results obtained from these excel files against CDEC-SIC web page (dispatch data [21]), CNE web page and CDEC-SIC yearbooks [22]. The auditing team has reproduced the calculation made by the PPs in spreadsheets and the same results have been obtained. Therefore, the calculation is deemed appropriate and consistent with the evidence provided and cross-checked by AENOR. Furthermore, appropriate methods and formulae for calculating baseline emissions, project emissions and leakage have been followed, and assumptions and emission factor correctly applied and justified, being in accordance with the approved methodology and the revised Monitoring Plan.

Following the review of the remaining monitoring parameters needed to determine the operating margin and build margin emission factors, the verification team verified their information flow (from data generation, aggregation, to recording, calculation and reporting) as described with details in the verification protocol, included in this report as Annex I.

On the other hand, following the Monitoring Plan, the other important monitoring parameter is the net electricity supplied by the project activity to the grid in MWh. According to the Monitoring Plan, the “*Generation<sub>y</sub>*” should be measured with a meter with a maximum error of 0.2% and calibrated periodically.

The monitoring of energy generation was measured directly with a calibrated meter, in accordance with all requirements of the monitoring plan, which states that the Electricity delivered to the grid is calculated as per net electricity measurements from e-meters located at Totoralillo substation as the sum from meters M2 and M3, monitored data is cross checked against electricity measurements at the generator of the power plant (M1).

All involved meters have not been exchanged and there is no case of failure. The monitored data of this parameter are registered in the spreadsheet “*Chacabucito\_ER\_v3.xls*” [23], where also is included the final calculation of the emission reductions.

During the on-site visit, the verification team was able to check technical characteristics, control and maintenance of the meter and found that it is in accordance with the monitoring plan. Furthermore, Calibration certificates were submitted to AENOR, which verified that the meter was calibrated properly.

The metering data are recorded every 15 minutes and they are integrated hourly for recording and sent every two hours to CDEC-SIC.

### **Emission reductions (ER)**

Thus, according to the AM0026 v3, the emission reductions (*ER<sub>y</sub>*) are calculated as follows:

$$ER_y = BE_y = EF_y * Generation_y$$

The last version of the Monitoring Report and spreadsheets were updated with the correct information in accordance with the registered PDD and the Monitoring Plan.

Finally, after reviewing the spreadsheets and all the documents referred to in this report, AENOR was able to verify the net amount of electricity for the monitoring period, 04/11/2011–31/12/2012, which is summarized below:

Considering  $W_{OM}=0.25$  and  $W_{BM}=0.75$ , for determining baseline emission factor (*EF<sub>y</sub>*); then:

<i>Year/Parameter</i>	<i>EF<sub>BM,y</sub></i> <i>(tCO<sub>2</sub>/MWh)</i>	<i>EF<sub>OM,y</sub></i> <i>(tCO<sub>2</sub>/MWh)</i>	<i>EF<sub>y</sub></i> <i>(tCO<sub>2</sub>/MWh)</i>
<b>2011</b>	0.44810	0.60352	0.48696
<b>2012</b>	0.44810	0.67506	0.50484

And,

<i>Year/Parameter</i>	<i>Generation<sub>y</sub> (MWh)</i>	<i>EF<sub>y</sub> (tCO<sub>2</sub>/MWh)</i>	<i>ER<sub>y</sub> (tCO<sub>2</sub>)</i>
<b>2011</b>	32,317	0.48696	15,737
<b>2012</b>	131,361	0.50484	66,316

Therefore, the emissions reductions corresponding to this monitoring period amounts to 82,053 tCO<sub>2</sub>e.

The verification team checked the following evidence and information:

- Characteristics of equipment installed. After performing the on-site assessment, AENOR can confirm that these technical characteristics are correct and have been stated in the MR.
- Net electricity generation measured in Chacabucito power meters.
- Cross-check of the energy generation data measured against the energy generation data provided by the CDEC-SIC.

In AENOR's opinion, the monitoring process carried out during the current period is deemed appropriate and consistent with the registered Monitoring Plan and the relevant guidance provided by the CDM Executive Board.

### 3.9 Quality of Evidence to Determine Emission Reductions

The verification team confirmed that:

- The reported emission reductions were supported by sufficient evidence and records, with the adequate frequency and covering the full monitoring period, in accordance with the requirements established in the monitoring plan and the approved monitoring methodology.
- The source and nature of the evidence was adequate, verifiable and correctly defined or identified.
- Information provided in the monitoring report is correct because it was cross-checked against comparable data from other sources such as plant logbooks, inventories, purchase records or similar data sources.

In the desk review and during the on-site visit, the audit team cross-checked all information provided in the monitoring report and in the calculation spreadsheets against data from other sources such as the plant logbook, technical documents, purchase records, and other similar data sources included in the references section of this report (section 6). The team found that the quality of evidence and the data collection system used to determine emission reductions of the project activity were in accordance with the Monitoring Plan of the registered PDD and the applied methodology.

The net amount of electricity of 163,678 MWh and thus the claimed emission reductions of 82,053 tCO<sub>2</sub>e reported for the period 04/11/2011 to 31/12/2012 was verified by reviewing the data from the original source (CDEC-SIC databases). The audit team also verified the internal registers of the plant's operator.

Sufficient evidence was presented for the reported net electricity generation since the official measure registers and the Calibration Certificates with a positive opinion have been provided to the verification team.

In AENOR's opinion, the evidence provided are adequate to support and validate the figures stated in the Monitoring Report and they are in accordance with the Monitoring Plan of the registered PDD and the selected methodology.

### 3.10 Management System and Quality Assurance

During the on-site visit, the verification team performed an identification of quality control and quality assurance procedures to prevent or identify and correct any errors or omissions in the reported monitoring

parameters, and verified the level of implementation of the management system and quality assurance required by the Monitoring Plan.

During the on-site visit, the audit team was able to verify that monitoring systems and all applied procedures are in compliance with the Monitoring Plan and the approved methodology. The different QA/QC procedures established in the Monitoring Plan are applied.

All important monitoring tasks are established adequately and the audit team considers that the responsibilities and authorities for monitoring and reporting are in accordance with the ones stated in the Monitoring Plan. All roles and positions are well defined and implemented. Qualified personnel are involved in the monitoring procedures (monitoring plan, job descriptions, and organization chart /24/). Moreover, training for personnel involved in the monitoring procedures was held. All above statements were verified during the on-site visit and document review.

After the audit team reviewed the evidence of the fulfilment of data collection and processing, data quality control system and daily recording provided by the project participants, the team found that the procedure applied to the emission reduction calculation was in accordance with the QA/QC procedure of the monitoring plan.

In AENOR's opinion, the management system and quality assurance procedures have been implemented in accordance with the Monitoring Plan of the registered PDD.

### **3.11 Hints for next periodic Verification**

No FAR has been raised during this verification.

#### **4 VERIFICATION AND CERTIFICATION STATEMENT**

**Reporting period:** From 04/11/2011 to 31/12/2012

**Verified emission reductions in the above reporting period:**

**Emission reductions:** **82,053 tCO<sub>2</sub>equivalent**

AENOR has performed the verification of the emission reductions of the "Chacabquito Hydroelectric Power Project" for the period 04 November 2011 to 31 December 2012.

Verification is performed in accordance with the Validation and Verification Standard version 05.0, and relevant decisions of the CDM EB and COP/MOP.

AENOR planned and performed the verification by obtaining evidence, the information and explanations that AENOR considers necessary to give reasonable assurance that the reported amount of GHG emission reductions for the period is fairly stated.

AENOR conducted the verification having regard to the Monitoring Plan included in the Renewed Project Design Document /1/, and the applied baseline as registered for the project. This assessment included:

- Collection of evidence supporting the reported data.
- Checking whether the provisions of the Monitoring Plan, were consistently and appropriately applied.

AENOR has verified whether the information included in the monitoring report version 3 /6/ is correct and that the emission reductions achieved have been determined correctly.

In AENOR's opinion, GHG emission reported for the project in monitoring report version 3 /6/ are fairly stated.

The GHG emissions reductions were calculated correctly on the basis of the approved baseline and monitoring methodology AM0026, version 3; and the monitoring plan and formulae provided in the PDD /1/.

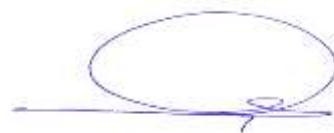
AENOR is able to certify that the emission reductions from the "**Chacabquito Hydroelectric Power Project**" for the period 04 November 2011 to 31 December 2012 amount to **82,053 tCO<sub>2</sub>** equivalent.

Madrid, 24 January 2014



Luis Javier Arribas Alonso

Chief Verifier



Luis Robles Olmos

Authorised person

"1<sup>st</sup> Periodic Verification of Second Crediting Period"

"Chacabuquito Hydroelectric Power Project "

## 5 CLARIFICATION, CORRECTIVE ACTION REQUESTS AND FORWARD ACTION REQUEST

<b>PROJECT ACTIVITY</b>	<b>Chacabuquito Hydroelectric Power Project</b>		
<b>FINDING</b>	<b>Nº 1</b>		
<b>Classification</b>	<b>CAR</b> <input checked="" type="checkbox"/>	<b>CL</b> <input type="checkbox"/>	<b>FAR</b> <input type="checkbox"/>
<b>Description of finding</b> <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	The PP is requested to complete the monitoring report in accordance with latest applicable version of the Guidelines for completing the monitoring report form (F-CDM-MR). Section E.5, the comparison of actual emission reduction and estimated in the PDD shall be done for the same period. Furthermore, section E.7 shall be filled only if the monitoring period starts before 31 December 2012 and ends anytime thereafter.		
<b>PP RESPONSE #1</b> <i>It shall address the corrective action taken in details</i>	The MR has been modified accordingly.		
<i>It shall provide and identified the evidences proposed (if applicable)</i>			
<b>DOE Assessment #1</b> <i>The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added</i>	The MR has been updated considering the Guidelines for completing the monitoring report form and the most updated version is used (version 03.2)		
<b>Conclusion</b> <i>Tick the appropriate checkbox</i>	<b>CAR/CL CLOSED</b> <input checked="" type="checkbox"/>	To be checked during the periodic verification <input type="checkbox"/>	



PROJECT ACTIVITY	Chacabquito Hydroelectric Power Project		
FINDING	Nº 2		
Classification	CAR <input type="checkbox"/>	CL <input checked="" type="checkbox"/>	FAR <input type="checkbox"/>
<p><b>Description of finding</b> <i>Describe the finding in unambiguous style; address the context (e.g. section)</i></p>	<p>Emission reduction shall be properly calculated, considering the net energy for the current monitoring period. Furthermore; following misstates, found in the spreadsheets, shall be properly corrected</p> <p><u>Chacabquito ER s</u></p> <ul style="list-style-type: none"> <li>The parameter <math>EG_{PJ,y,2011}</math> is not considering the whole energy monitored for year 2011 (Generation between 04/11/2011 – 31/12/2011). Furthermore, the net energy shall correspond only to the monitoring period (i.e. energy monitored on 4 November 2011 at 00:00 hours)</li> </ul> <p><u>EF OM 2011</u></p> <ul style="list-style-type: none"> <li>Many values of Marginal Plant i, from Displace Data worksheet, are not in accordance with regarding source (Hourly OM Data_ "month")</li> </ul> <p><u>EF Calc 2011 Chacabquito and EF Calc 2012 Chacabquito</u></p> <ul style="list-style-type: none"> <li>The BM calculation shall be deleted as it was fixed in the PDD (i.e. worksheet <i>EF BM</i> from <i>EF Calc 2012 Chacabquito</i> spreadsheets).</li> <li>No other language than English shall be used in the inserted comments</li> <li>The values of NCVs for LNG an LPG shall be different and according to provided evidence.</li> <li>In <i>Data Sources</i> worksheet, there are some links that are no longer valid: i.e. (<a href="http://www.cne.cl/cnewww/opencms/07_Tarifacion/01_Electricidad/Otros/Preciosnudo/otros_precios_de_nudo/precios_de_nudo.html">http://www.cne.cl/cnewww/opencms/07_Tarifacion/01_Electricidad/Otros/Preciosnudo/otros_precios_de_nudo/precios_de_nudo.html</a>)</li> <li>The reference related to Hornitos power plant in Data Sources worksheet from <i>EF Calc 2011 Chacabquito</i> worksheet shall be corrected.</li> <li>According to the registered PDD, the parameter <math>CEF_{OM,i}</math> will be monitored using IPCC guidelines in a conservative manner; therefore lower values shall be considered in the calculation, as used in the annex 3 of the PDD.</li> </ul>		
<p><b>PP RESPONSE #1</b></p>	<p><u>Chacabquito ER s</u></p> <p>Chacabquito ERs calculation spreadsheet has been modified in order to account for the whole period considering data measurements from 00:15 to 1:00 as the first hour of the day and 23:15 to 00:00 hours as the last hour of the day. According to this, energy monitored on 04 November 2011 at 00:00 hours was excluded as it is out of the monitoring period and energy measurements from 01<sup>st</sup> January 2013 at 00:00 hours was included as it is accounted as part of the last hour of the year 2012.</p> <p><u>EF OM 2011:</u></p>		

"1<sup>st</sup> Periodic Verification of Second Crediting Period"

"Chacabuquito Hydroelectric Power Project "

	<p><i>The Emission Factor calculation has been updated and the EF OM2011 spreadsheet is now in accordance with its source (Hourly OM data_"month").</i></p> <p><u>EF Calc 2011 Chacabuquito and EF Calc 2012 Chacabuquito</u>  <i>The emission factor of 2011 and 2012 were re-calculated considering Lower Values from IPCC CO2 emission factors and "EF Calc 2011 Chacabuquito" and "EF Calc 2012 Chacabuquito" spreadsheets were updated accordingly with this change and modified in accordance with DOE comments (correction of data source links, values for LNG and LPG, etc). Please refer to the last version of the emission factor spreadsheets that will be provided along with the latest version of the Monitoring Report.</i></p>	
<p><i>It shall address the corrective action taken in details</i></p>		
<p><i>It shall provide and identified the evidences proposed (if applicable)</i></p>		
<p><b>DOE Assessment #1</b>  <i>The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added</i></p>	<p>Grid emissions factors calculations have been properly updated, they are in accordance with applied methodology and IPCC guidelines.</p>	
<p><b>Conclusion</b>  <i>Tick the appropriate checkbox</i></p>	<p><b>CAR/CL CLOSED</b>  <input checked="" type="checkbox"/></p>	<p>To be checked during the periodic verification <input type="checkbox"/></p>

"1<sup>st</sup> Periodic Verification of Second Crediting Period"

"Chacabuquito Hydroelectric Power Project "

<b>PROJECT ACTIVITY</b>	<b>Chacabuquito Hydroelectric Power Project</b>		
<b>FINDING</b>	<b>Nº 3</b>		
<b>Classification</b>	<b>CAR</b> <input checked="" type="checkbox"/>	<b>CL</b> <input type="checkbox"/>	<b>FAR</b> <input type="checkbox"/>
<b>Description of finding</b> <i>Describe the finding in unambiguous style; address the context (e.g. section)</i>	<b>The monitoring of the net energy shall performed as per established in the monitoring plan of registered PDD (version 5), which states that the sum of energy measured by M2 and M3 meters is directly sent and validated by the CDEC-SIC.</b>		
<b>PP RESPONSE #1</b>	<p><i>The monitoring report has been modified in accordance with the monitoring plan stated in the registered PDD, describing the net energy measurement as the sum of M2 and M3monitored data (referred as "M2 + M3"). Spreadsheet was modified in order to be consistent with the monitoring plan stated in the registered PDD and M2 + M3 formula is now being used, by considering M3 data as "negative" values. M3 measurement data are considered as negative values in the last version of the spreadsheet as per the applicable energy flow convention. With this adjustment, net energy calculation is in accordance with the "M2 + M3"calculation stated in the registered PDD.</i></p>		
<i>It shall address the corrective action taken in details</i>			
<i>It shall provide and identified the evidences proposed (if applicable)</i>			
<b>DOE Assessment #1</b> <i>The assessment shall encompass all open issues. In case of non-closure additional corrective action and DOE assessments (#2, #3, etc.) shall be added</i>	<p>Energy record from meter M3 are considered as negative due the applicable energy flow convention. Verification reviewed monitored data and compared with energy considered in the emission reduction calculation. All the assumption is considered conservative and in line with applied methodology and monitoring plan.</p>		
<b>Conclusion</b> <i>Tick the appropriate checkbox</i>	<b>CAR/CL CLOSED</b> <input checked="" type="checkbox"/>	To be checked during the periodic verification <input type="checkbox"/>	

## 6 REFERENCES

- /1/ Renewed Registered PDD, version 5 and dated on 21/04/2011.
- /2/ Monitoring Plan
- /3/ Validation, Verification and Certification of Clean Development Mechanism (CDM) Project Activities (IE/DTC/039)
- /4/ CDM Validation and Verification Standard (VVS) version 05.0 (EB 75)
- /5/ Monitoring Report, version 1
- /6/ Monitoring Report, Version 3 (final version)
- /7/ Validation of renewal of the crediting period
- /8/ Previous verification reports
- /9/ AM0026, version 3: "Methodology for zero-emissions grid-connected electricity generation from renewable sources in Chile or in countries with merit order based dispatch grid"
- /10/ Issuance information and reporting checklist
- /11/ Guidelines for Completing the Monitoring Report Form, Version 4.0.
- /12/ Issuance completeness checklist
- /13/ Clean Development Mechanism Project Standard, version 05.0.
- /14/ Calibration Certificates
- /15/ Operating margin calculation spreadsheet for 2011: "*EF OM 2011 v2.xlsx*"
- /16/ Operating margin calculation spreadsheet for 2012: "*EF OM 2012 v3.xlsx*"
- /17/ Grid emission factor ( $EF_{CM,y}$ ) calculation spreadsheet for 2011: "*EF Calc 2011 Chacabquito v2.xlsx*"
- /18/ Grid emission factor ( $EF_{CM,y}$ ) calculation spreadsheet for 2012: "*EF Calc 2012 Chacabquito v3.xlsx*"
- /19/ Hourly data spreadsheets: Hourly OM Data\_ "mm"
- /20/ Monthly Marginal Plants spreadsheets: Marginal Plants Data Base\_ "mm"
- /21/ CDEC-SIC Dispatch data
- /22/ CDEC-SIC Yearbooks
- /23/ Emission reduction calculation spreadsheet: "*Chacabquito\_ER\_v3.xls*"
- /24/ Organization chart

## **ANNEX 1. CDM VERIFICATION PROTOCOL**

VERIFICATION PROTOCOL

PROJECT: "CHACABUQUITO HYDROELECTRIC POWER PROJECT"

UNFCCC REFERENCE NUMBER: 1052

MONITORING AND REPORTING PERIOD:

FROM 2011/11/04 TO 2012/12/31

**1<sup>st</sup> Periodic Verification**  
**2<sup>nd</sup> Crediting Period**

Verification Team:	
Luis Javier Arribas Alonso	Chief Verifier
Richard Daniel Gonzáles Toledo	Trainee chief Verifier
Manuel Garcia-Rosell Rodriguez	Verifier
Version of this Verification Protocol: 02	Date: 24/01/2014

TABLE 1 Verification requirements based on the Validation and Verification Standard (VVS) version 05.0 (CDM-EB75)

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<b>1. Project history</b>				
<b>Open issues from validation</b> <i>Check (in case of 1st periodic verification) whether there are any open issues indicated in the validation report (e.g. FAR) Have they been addressed appropriately?</i>	1.1.	This is the 1 <sup>st</sup> periodic verification of 2 <sup>nd</sup> crediting period. The validation report of renewal crediting period has been reviewed and no open issues are indicated.	OK	<b>OK</b>
<b>Open issues from previous verification</b> <i>Check (in case of further periodic verifications) whether there are any open issues indicated in previous verification (FAR) Have they been addressed appropriately?</i>	1.2.	N/A. This is the 1 <sup>st</sup> periodic verification of 2 <sup>nd</sup> crediting period.	N/A	<b>N/A</b>
<b>Requests for Deviations/Revisions of Monitoring Plan</b> <i>Check if there have been any requests for deviations from the monitoring methodology or requests for revisions of the monitoring plan. If any, make sure that they are considered during verification</i>	1.3.	During the document review, the information submitted on the UNFCCC website was checked and no request for deviation/revision has been requested. Furthermore, It has not been necessary to request any deviation or revision of the Monitoring Plan during the current verification process.	OK	<b>OK</b>
<b>2. Project implementation in accordance with the registered project design document</b>				
<i>Has the CDM project activity been implemented as per the registered PDD?</i>	2.1.	Yes. During the on-site visit, it was verified that the project is located in the physical location established in the registered PDD; version 5, dated on 21/04/2011.	OK	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
		<p>Moreover, the equipment installed in the project has similar features to the technical design of the project described in the accepted PDD, version 5.</p> <p>The main equipment installed includes:</p> <ul style="list-style-type: none"> <li>• Four vertical Francis turbines with a nominal capacity of 7.5 MW each one</li> <li>• Four generators with a nominal capacity of 8020 KVA and a nominal capacity factor of 0.9</li> <li>• One transformer with a nominal capacity of 33000 KVA</li> </ul> <p>According to the registered PDD the installed power capacity is given by the turbines. Therefore the installed capacity is 30 MW (4 X 7.5 MW )</p>		
<p><i>Are all physical features of the CDM project activity proposed in the registered PDD, in place?</i></p> <p><i>All figures and features included in the registered PDD shall be checked during the on-site visit. Any discrepancy found shall be reported and the post registration changes procedure shall be applied.</i></p>	2.2.	Yes, all physical features of the project activity are in place in accordance with the registered PDD (dated on 21 April 2011, version 5)	OK	<b>OK</b>
<p><i>Have the project participants operated the CDM project activity as per the registered PDD?</i></p>	2.3.	Yes, the project participants have operated the CDM project activity as per the registered PDD.	OK	<b>OK</b>
<p><b>Actual status of installation works</b></p> <p><i>Project installation should be finished at time of initial verification in so far as the project should be ready to generate emission reductions afterwards.</i></p> <p><i>It shall be clearly described the starting date of operation and the progress of the project activity? Is the implementation delayed? What were the reasons for the</i></p>	2.4.	This is the 1 <sup>st</sup> verification of 2 <sup>nd</sup> crediting period. Therefore, when the on-site was carried out, the installation was already generated and supplied electrical energy to the grid and the audit team could verify that the power plant was operating without any relevant incident during the monitoring period.	OK	<b>OK</b>



Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<i>delay?</i>				
<b>Contractors for equipment and installation works</b> <i>Who has installed the equipment? Who was contracted for planning etc.?</i>	2.5.	The civil Works was made by Zublin and the electro mechanic equipment was installed by VATECH HYDRO Zurich.	OK	<b>OK</b>
<b>Project boundaries</b> <i>Check whether the project boundaries are still in compliance with the ones indicated by the PDD.</i>	2.6.	The project boundaries are in compliance with the ones indicated by the PDD	OK	<b>OK</b>
<b>On-site visit</b> <i>Was an on-site visit conducted?</i> <i>If not, justify the rationale of the decision.</i>	2.7.	Yes. The visit to the power plant was from 28/01/2013 to 29/01/2013. During the visit to the power plant it was verified the data generation, testing of monitoring equipment, calibration of official meters, sufficiency of monitoring plan and internal data quality control, monitoring procedures, among others. The visit included a meeting at the COLBÚN headquarters; which was on 29/01/2013. During that meeting, different data from the monitoring reports and spreadsheets calculation were verified.	OK	<b>OK</b>
<b>3. Update on Changes and Incidents (during the Monitoring Period)</b>				
<b>Incidents</b> <i>Identify if there have been any significant incidents, deviant operation modes and/or downtimes of the equipment?</i> <i>Consider e.g. interviews with operational personnel, operational log sheets and analysis of performance data.</i>	3.1.	During the on-site visit, the DOE reviewed documents (logbook, maintenance data base) and met to different operators. It was verified that there have not been any significant incident, deviant operation modes or downtimes of the equipment during the monitoring period. All downtimes identified in the monitoring report by the Project Participants have been due to normal operation of power plant. In addition, the audit team could verify the maintenance shutdowns and downtimes, listed in the monitoring report, against the sources: "events" spreadsheets	OK	<b>OK</b>
<i>Is the information (data and variables) provided in the monitoring report</i>	3.2.	No. During this monitoring period, recorded energy has been lower than expected in registered PDD. Estimated Energy in the PDD is 170 GWh/year; while energy for 2011 had been 32.317 GWh and in	<b>CAR 1</b>	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<i>different from that stated in the registered PDD? Has it caused an increase in estimates of the emission reductions in the current monitoring period or is highly likely to increase the estimates of emission reductions in the future monitoring periods?</i>		2012 was 131.361 GWh.  In addition, the grid emission factor stated in the PDD is 0.5038 tCO <sub>2</sub> /MWh; whereas the grid emissions factor for years 2011 and 2012 are 0.48696 tCO <sub>2</sub> /MWh and 0.50484 tCO <sub>2</sub> /MWh respectively. Then, the values are rather similar to the established in the PDD.  Therefore, there are no data or variables that caused an increase of emission reduction in the current monitoring period.	<b>CAR 2</b>	
<b>Personnel</b> <i>Find out, if relevant monitoring personnel have been exchanged?</i>  <i>In case of changes, assure that the implemented monitoring procedures have not been affected.</i>	3.3.	During document on-site visit it was found that there were new personnel involved in the monitoring of the energy production. However, after the interview, it was verified that new personnel received training by qualified COLBÚN staff.  The personnel interviewed during the on-site visit were: <ul style="list-style-type: none"><li>• Eduardo Aguilera: Power plant Manager</li><li>• Cristian Mosella: Sustainability and Climate Change Area</li><li>• Paula Reyes: Project Engineer</li><li>• Leonel Arencibia: Plant operator.</li></ul>	OK	<b>OK</b>
<b>Legislation</b> <i>Find out whether relevant legislation with effect on the project activity in the host country has been changed.</i>	3.4.	Relevant legislation was considered. No relevant changes since the validation were identified.	OK	<b>OK</b>
<b>4. Monitoring Report – General</b>				
<i>Is the monitoring report (and other supporting documents) provided complete in accordance with latest applicable version of the Issuance information and reporting checklist?</i>	4.1.	Yes, the monitoring report is complete in accordance with the applicable version of the Completeness checklist, and Information and reporting checklist for request for issuance of CERs.	OK	<b>OK</b>
<i>Is the Monitoring Report Form (F-CDM-MR) used by the Project participants in the monitoring report?</i>	4.2.	Yes, the project participant is using the latest monitoring report form: MONITORING REPORT FORM (F-CDM-MR) Version 03.1	OK	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<i>Are the monitoring report and other supporting documents provided complete in accordance with latest applicable version of the Guidelines for completing the monitoring report form (CDM-MR)?</i>	4.3.	<p>The first version of the monitoring report is not complete in accordance with latest applicable version of the Guidelines for completing the monitoring report form (CDM-MR)</p> <p><b>CAR 1: The PP is requested to complete the monitoring report in accordance with latest applicable version of the Guidelines for completing the monitoring report form (F-CDM-MR). Section E.5, the comparison of actual emission reduction and estimated in the PDD shall be done for the same period. Furthermore, section E.7 shall be filled only if the monitoring period starts before 31 December 2012 and ends anytime thereafter.</b></p> <p>All section stated in the guideline for completed the MR has been covered in the updated MR; furthermore, last version (03.2) of the MR form is used.</p> <p><b>CAR 1 is closed</b></p> <p>Yes, the monitoring report and the supporting documents provided (spreadsheets for emission factor calculation and emission reduction calculation, control procedure, raw data, etc.) are complete and in accordance with the latest applicable version of the "Guidelines for completing the monitoring report form" (CDM-MR).</p>	<b>CAR 1</b>	<b>OK</b>
<p><b>Monitoring period</b></p> <p><i>Check if the monitoring period is in line with a) the crediting period and/or b) previous monitoring periods?</i></p>	4.4.	<p>This is the second crediting period and according to the PDD the starting date of the second crediting period was estimated on 01/07/2009, but the registration of the project was delayed until 04/11/2011. Therefore, the starting date of the second crediting period is the renewal date of the project.</p> <p>On the other hand, according to UNFCCC website:</p> <ul style="list-style-type: none"> <li>The first crediting period is from 01/07/2002 to 30/06/2009</li> <li>The second crediting period is from 04/11/2011 03/11/2018</li> </ul> <p>The current monitoring period, 04 November 2011 to 31 December 2012; therefore, is in line with the renewal of the crediting period (second crediting period)</p>	OK	<b>OK</b>
<p><b>Publication of Monitoring Report</b></p> <p><i>Check if the monitoring report has been made publicly available on the UNFCCC website before the verification commenced.</i></p>	4.5.	<p>The monitoring report, as received from the project participants was made public on 11 January 2013, before the verification commenced.</p>	OK	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<b>Transparency</b> <i>Assess if the monitoring report is transparent, i.e. clear and unequivocal</i>	4.6.	The final version of the monitoring report is transparent, and includes clear and unequivocal information.	<b>CAR 1</b> <b>CAR 2</b>	<b>OK</b>
<b>Misstatements on general issues</b> <i>Assess whether the monitoring report is free of material misstatements regarding issues other than the monitoring parameters.</i> <i>Discuss the monitoring parameters in detail in chapter "Monitoring Parameters".</i>	4.7.	The final version of the monitoring report is free of material misstatements regarding issues other than the monitoring parameters.	<b>CAR 1</b> <b>CAR 2</b>	<b>OK</b>
<b>5. Compliance of the monitoring plan with the monitoring methodology.</b>				
<i>Is the validated monitoring plan of the proposed CDM project activity in accordance with the applied methodology?</i>	5.1.	During the document review, it was verified the Project Design Document, including the Monitoring Plan and Monitoring Report. It was found that the monitoring plan is in accordance with applied methodology:  <i>AM0026 ver. 3 - Methodology for zero-emissions grid-connected electricity generation from renewable sources in Chile or in countries with merit order based dispatch grid</i>	OK	<b>OK</b>
<i>Are there any monitoring aspects of the project activity that are not specified in the methodology, particularly in the case of small-scale methodologies (e.g. additional monitoring parameters, monitoring frequency and calibration frequency)?</i>	5.2.	Yes.  Although the methodology does not specify the frequency of calibration, the PP has included the calibrations procedures in the monitoring plan.  The calibration is to be performed every two years by qualified and competent certifier, authorized by the national official organisms. If the equipment does not fulfil the Class 02, it will be replaced.	OK	<b>OK</b>
<b>6. Compliance of monitoring with the monitoring plan</b>				
<i>Is the monitoring of reductions in GHG emissions to result from the proposed</i>	6.1.	During the document review it was found some inconsistencies regarding the monitoring plan. The calculations of emission reductions and emission factor have some mistakes.	<b>CAR 2</b>	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
CDM project activity implemented in accordance with the monitoring plan contained in the registered PDD or the accepted revised monitoring plan?		<p><b>CAR 2: Emission reduction shall be properly calculated, considering the net energy for the current monitoring period. Furthermore; following misstates, found in the spreadsheets, shall be properly corrected</b></p> <p><b><u>Chacabuquito ER s</u></b></p> <ul style="list-style-type: none"> <li>The parameter <math>EG_{P1,y,2011}</math> is not considering the whole energy monitored for year 2011 (Generation between 04/11/2011 – 31/12/2011). Furthermore, the net energy shall correspond only to the monitoring period (i.e. energy monitored on 4 November 2011 at 00:00 hours)</li> </ul> <p><b><u>EF OM 2011</u></b></p> <ul style="list-style-type: none"> <li>Many values of Marginal Plant i, from Displace Data worksheet, are not in accordance with regarding source (Hourly OM Data_ "month")</li> </ul> <p><b><u>EF Calc 2011 Chacabuquito and EF Calc 2012 Chacabuquito</u></b></p> <ul style="list-style-type: none"> <li>The BM calculation shall be deleted as it was fixed in the PDD (i.e. worksheet <i>EF BM</i> from <i>EF Calc 2012 Chacabuquito</i> spreadsheets).</li> <li>No other language than English shall be used in the inserted comments</li> <li>The values of NCVs for LNG an LPG shall be different and according to provided evidence.</li> <li>In <i>Data Sources</i> worksheet, there are some links that are no longer valid: i.e. (<a href="http://www.cne.cl/cnewww/opencms/07_Tarificacion/01_Electricidad/Otros/Precios_nudo/otros_precios_de_nudo/precios_de_nudo.html">http://www.cne.cl/cnewww/opencms/07_Tarificacion/01_Electricidad/Otros/Precios_nudo/otros_precios_de_nudo/precios_de_nudo.html</a>)</li> <li>The reference related to Hornitos power plant in Data Sources worksheet from <i>EF Calc 2011 Chacabuquito</i> worksheet shall be corrected.</li> <li>According to the registered PDD, the parameter <math>CEF_{OM,i}</math> will be monitored using IPCC guidelines in a conservative manner; therefore lower values shall be considered in the calculation, as used in the annex 3 of the PDD.</li> </ul> <p>Grid emissions factors calculations have been properly updated; they are in accordance with applied methodology and IPCC guidelines.</p> <p><b>CAR 2 is closed</b></p> <p>Yes, the proposed CDM project activity is implemented in accordance with the monitoring plan contained in the registered PDD.</p>		

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
		The baseline emissions and emission reduction are calculated in the spreadsheet called: "Chacabuquito_ER_v3"		
Have the monitoring plan and the applied methodology been properly implemented and followed by the project participants?	6.2.	The power plant has three electricity meters, M1, M2 and M3. The electricity meter M1, which is located between the generation bar and the power transformer, measures the electricity from the four units. The meters M2 and M3 (main meters for the CDM monitoring plan) measure the electricity at the interconnection point.  During the on-site visit the verification team found that the meters used for recording the energy, generated by the project, were properly registering the energy submitted to CDEC-SIC.	<b>CAR 2</b> <b>CAR 3</b>	<b>OK</b>
Have all parameters stated in the monitoring plan, the applied methodology and relevant CDM Executive Board decisions been sufficiently monitored and updated as applicable (Project emission, baseline emission, leakage, management and operational system and environmental and social parameters)	6.3.	The audit team could verify that all parameters stated in the monitoring plan, the applied methodology and relevant CDM Executive Board decisions have been sufficiently monitored and updated.  <ul style="list-style-type: none"> <li>All project emission parameters have been monitored.</li> <li>All baseline emission parameters have been monitored.</li> <li>N/A. There is no leakage as per the methodology.</li> </ul>	OK	<b>OK</b>
Are the responsibilities and authorities for monitoring and reporting in accordance with the responsibilities and authorities stated in the monitoring plan?	6.4.	Yes. All important monitoring tasks are established adequately and are in accordance with the responsibilities and authorities stated in the Monitoring Plan.	OK	<b>OK</b>
<b>7. Monitoring Parameters</b> (List all parameters of the PDD chapter B.7.1; pl. copy the lines below for each parameter)				
<b>7.1. Symbol of parameter:</b> <b>Generation,</b>	<b>7.1.</b>	<b>Description: Electricity exported to the grid by proposed CDM project, in year y</b>		
<b>Measurement / Determination method</b>  Describe how the monitoring parameter was measured   determined.  Check if relevant equipment has been	7.1.1.	According to the monitoring report, the power plant has three electricity meters, M1, M2 and M3. The electricity meter M1, which is located between the generation bar and the power transformer, measures the electricity from the four units. The meters M2 and M3 (main meters for the CDM monitoring plan) measure the net electricity submitted to the grid.  On the other hand, registered PDD version 5 states that the sum of energy measured by M2 and M3	<b>CAR 3</b>	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<p><i>exchanged and if in cases of failures   downtimes of standard equipment other measurement   determination methods have been used.</i></p> <p><i>Assess whether the measurement or determination method (data generation, frequency, aggregation, equipment, recording, reporting, standards) is in line with the registered monitoring plan of the PDD and the applied methodology.</i></p>		<p>meters is directly sent and validated by the CDEC-SIC. While, the monitoring reports stated that the electricity delivered to the grid is calculated as per net electricity measurements from meters located at Totoralillo substation as the difference from M2 –M3.</p> <p><b>CAR 3: The monitoring of the net energy shall be performed as per established in the monitoring plan of registered PDD (version 5), which states that the sum of energy measured by M2 and M3 meters is directly sent and validated by the CDEC-SIC.</b></p> <p>Energy record from meter M3 are considered as negative due the applicable energy flow convention. Verification reviewed monitored data and compared with energy considered in the emission reduction calculation. All the assumption is considered conservative and in line with applied methodology and monitoring plan.</p> <p><b>CAR 3 is closed.</b></p> <p>Electricity measurements are taken automatically every 15 minutes. Then, the hourly total is calculated. Electricity delivered to the grid is calculated as per net electricity measurements from e-meters located at Totoralillo substation as the sum from meters M2 and M3. Furthermore, monitored data from those meters are cross checked against electricity measurements from power plant, recorded by meter M1.</p>		
<p><b>Monitoring Equipment</b></p> <p><i>Is the equipment of used for monitoring (quality, type, accuracy, calibration requirements) in accordance with the relevant guidance provided by the CDM Executive Board and is equipment controlled and calibrated in accordance with the monitoring plan?</i></p>	7.1.2.	<p>Equipment used for monitoring is adequate and is controlled and calibrated in accordance with the monitoring plan. Furthermore, during the on-site visit, the verification team could check technical characteristics, control and maintenance of the meters and found that they are in accordance with the monitoring plan.</p> <p>Net energy is registered by two electricity meters, with following characteristics:</p> <p><b><u>Meter M2:</u></b></p> <p>Type: Ion 8500              Accuracy class: 0.2%              Serial number: PQ-0502A117-03              Calibration frequency: At least every two years</p> <p>✓ Previous Calibration : 26/10/2011              ✓ Last Calibration: 27/06/2012</p> <p><b><u>Meter M3:</u></b></p> <p>Type: Ion 8500              Accuracy class: 0.2%</p>		<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
		Serial number: PQ-0502A188-03 Calibration frequency: At least every two years ✓ Previous Calibration : 26/10/2011 ✓ Last Calibration: 27/06/2012 Energy from the four units is recorded by the following meter: <b><u>Meter M1:</u></b> Type: Ion 8600 Accuracy class: 0.2% Serial number: PT-0809A131-01 Calibration frequency: At least every two years ✓ Previous Calibration : 26/10/2011 ✓ Last Calibration: 29/06/2012		
<b>Accuracy</b> <i>In case of measured (or estimated) values, check whether significant inaccuracies occur; in this case, make sure that appropriate discounts have been considered for ER calculation.</i>	7.1.3.	The calibration certificates of the meters, verified by the audit team, indicate that the meters did not have significant inaccuracies during the monitoring period.	OK	<b>OK</b>
<b>Monitoring results</b> <i>Are monitoring results consistently recorded as per approved frequency?</i>	7.1.4.	Yes, monitoring results were recorded as per approved frequency in the monitoring plan.	<b>CAR 3</b>	<b>OK</b>
<b>Quality assurance and quality control procedures</b> <i>Have quality assurance and quality control procedures been applied in accordance with the monitoring plan to prevent or identify and correct any errors or omissions in the reported monitoring</i>	7.1.5.	Yes, there is a quality assurance and quality control procedure. The measurement equipment has to comply with Chilean Official Regulation NCh 2542.Of2001: "Alternating Current Watt-Meter for Active Energy Classes 0.2 S and 0.5 S" will be applied. The elaboration of the NCh 2542 considered the international norm IEC 60687 "Alternating Current Watt-Meter for Active Energy (Classes 0.2 S and 0.5 S)" in addition to others like NCh 2024/1 and IEC 61036. Furthermore, project participant has developed a procedure for gathering recorded energy:	<b>CAR 3</b>	<b>OK</b>



Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
parameters?		Procedure PO.18, which accounts the procedures for data collection related to the CDM.		
<b>Verification</b> <i>Describe how the value and the information flow (from data generation, aggregation, to recording, calculation and reporting) were verified. Consider the measurement   determination procedure, accuracies,</i> <i>QA/QC procedure, source and nature of the evidences. Consider as well plausibility checks as far as possible. Check if the applied value could be backed up by corresponding evidences covering the full monitoring period.</i>	7.1.6.	The audit team verified the data from the original source (CDEC-SIC databases). The audit team also verified the internal registers of the plant's operator and the operator of Colbún Operations Centre, finding that the information flow was in accordance with the implemented procedures and Monitoring Plan.	<b>CAR 3</b>	<b>OK</b>
<b>7.2. Symbol of parameter: EF<sub>y</sub></b>	<b>7.2.</b>	<b>Description: CO<sub>2</sub>e Emission factor of the displaces energy from the grid</b>		
<b>Measurement   Determination method</b> <i>Describe how the monitoring parameter was measured   determined.</i> <i>Check if relevant equipment has been exchanged and if in cases of failures   downtimes of standard equipment other measurement   determination methods have been used.</i> <i>Assess whether the measurement or determination method (data generation, frequency, aggregation, equipment, recording, reporting, standards) is in line with the registered monitoring plan of the PDD and the applied methodology.</i>	7.2.1.	The monitoring parameter is calculated as the weighted sum of build margin - EF <sub>BM</sub> - fixed for the second crediting period, and operating margin - EF <sub>OM</sub> - emission factors, according to the formula (7) of the methodology AM0026 version 3.	OK	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<b>Monitoring Equipment</b> <i>Is the equipment of used for monitoring (quality, type, accuracy, calibration requirements) in accordance with the relevant guidance provided by the CDM Executive Board and is equipment controlled and calibrated in accordance with the monitoring plan?</i>	7.2.2.	Not applicable, as this parameter is not measured.	OK	<b>OK</b>
<b>Accuracy</b> <i>In case of measured (or estimated) values, check whether significant inaccuracies occur; in this case, make sure that appropriate discounts have been considered for ER calculation.</i>	7.2.3.	There is no significant inaccuracy in the calculation of this parameter.	OK	<b>OK</b>
<b>Monitoring results</b> <i>Are monitoring results consistently recorded as per approved frequency?</i>	7.2.4.	This parameter is calculated annually, according to the methodology. The years 2011 and 2012 have been used for this purpose.	OK	<b>OK</b>
<b>Quality assurance and quality control procedures</b> <i>Have quality assurance and quality control procedures been applied in accordance with the monitoring plan to prevent or identify and correct any errors or omissions in the reported monitoring parameters?</i>	7.2.5.	Yes, the quality assurance and quality control procedures determined in the Monitoring Plan have been applied.	OK	<b>OK</b>
<b>Verification</b> <i>Describe how the value and the information flow (from data generation, aggregation, to recording, calculation and</i>	7.2.6.	The verification team checked spreadsheets, which include: <ul style="list-style-type: none"> <li>• EF OM 2011</li> <li>• EF OM 2012</li> </ul>	OK	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
reporting) were verified. Consider the measurement   determination procedure, accuracies,  QA/QC procedure, source and nature of the evidences. Consider as well plausibility checks as far as possible. Check if the applied value could be backed up by corresponding evidences covering the full monitoring period.		<ul style="list-style-type: none"> <li>EF Calc 2011</li> <li>EF calc 2012</li> </ul> <p>The used data and supporting document were checked against energy records provided by CDEC-SIC, CNE node price report, official statistics and 2006 IPCC Guidelines for National Greenhouse Gas Inventories.</p>		
<b>7.3. Symbol of parameter: EF<sub>OM,y</sub></b>	<b>7.3.</b>	<b>Description: <i>Operating margin emission factor</i></b>		
<b>Measurement   Determination method</b>  <i>Describe how the monitoring parameter was measured   determined.</i>  <i>Check if relevant equipment has been exchanged and if in cases of failures   downtimes of standard equipment other measurement   determination methods have been used.</i>  <i>Assess whether the measurement or determination method (data generation, frequency, aggregation, equipment, recording, reporting, standards) is in line with the registered monitoring plan of the PDD and the applied methodology.</i>	7.3.1.	<p>The parameter EF<sub>OM,y</sub> is calculated in accordance with the formula (8) of the monitoring methodology AM0026 version 3.</p> <p>During the verification process, AENOR, evaluated the EF<sub>OM,y</sub> calculated by the Project Participants for 2011 and 2012. After checking all information received, the audit team found that it is correct and complies with the Monitoring Plan and the methodology, AM0026 v3.</p> <p>However, due to the complexity of calculations required by the methodology, which requires monitoring of many parameters, most with hourly frequency, it is necessary to use a large amount of data and formulae to determine the parameters. For that reason, the project participants developed many spreadsheets for the calculation.</p> <p>Hourly data generation and dispatch priority are obtained from CDEC-SIC (dispatch centre). Data obtained are downloaded to the following spreadsheets:</p> <ul style="list-style-type: none"> <li>EF Calc 2011 and EF Calc 2012 contain EF<sub>OM,y</sub>, EF<sub>BM</sub> (Fixed) and EF<sub>CM</sub> calculation</li> </ul> <p>In order to verify the results obtained, provided data was checked against provided evidence (dispatch priority) and official information on CDEC-SIC web page.</p> <p>AENOR could cross-check the results and the traceability of all calculations as stated in the methodology.</p>	<b>CAR 2</b>	<b>OK</b>
<b>Monitoring Equipment</b>  <i>Is the equipment of used for monitoring (quality, type, accuracy, calibration</i>	7.3.2.	Not applicable, as this parameter is not measured.	OK	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<i>requirements) in accordance with the relevant guidance provided by the CDM Executive Board and is equipment controlled and calibrated in accordance with the monitoring plan?</i>				
<b>Accuracy</b> <i>In case of measured (or estimated) values, check whether significant inaccuracies occur; in this case, make sure that appropriate discounts have been considered for ER calculation.</i>	7.3.3.	There is no significant inaccuracy in the calculation of these parameters.	OK	<b>OK</b>
<b>Monitoring results</b> <i>Are monitoring results consistently recorded as per approved frequency?</i>	7.3.4.	This parameter is calculated annually, according to the methodology.	OK	<b>OK</b>
<b>Quality assurance and quality control procedures</b> <i>Have quality assurance and quality control procedures been applied in accordance with the monitoring plan to prevent or identify and correct any errors or omissions in the reported monitoring parameters?</i>	7.3.5.	Yes, the quality assurance and quality control procedures determined in the Monitoring Plan have been applied.	OK	<b>OK</b>
<b>Verification</b> <i>Describe how the value and the information flow (from data generation, aggregation, to recording, calculation and reporting) were verified. Consider the measurement   determination procedure, accuracies, QA/QC procedure, source and nature of</i>	7.3.6.	The verification team checked all data, their sources and the calculations of the excel file used to calculate the parameters.  The results obtained in the Excel files have been checked against provided evidence and available downloaded data from dispatch centre (CDEC-SIC) web page.	OK	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<i>the evidences. Consider as well plausibility checks as far as possible. Check if the applied value could be backed up by corresponding evidences covering the full monitoring period.</i>				
<b>7.4. Symbol of parameter: <math>EF_{j,h}</math></b>	<b>7.4.</b>	<b>Description: <i>Operating Margin Emission Factor for proposed CDM project activity j for hour h</i></b>		
<b>Measurement   Determination method</b>  <i>Describe how the monitoring parameter was measured   determined.</i>  <i>Check if relevant equipment has been exchanged and if in cases of failures   downtimes of standard equipment other measurement   determination methods have been used.</i>  <i>Assess whether the measurement or determination method (data generation, frequency, aggregation, equipment, recording, reporting, standards) is in line with the registered monitoring plan of the PDD and the applied methodology.</i>	7.4.1.	<p>The parameter <math>EF_{j,h}</math> is calculated in accordance with the formula (9) of the monitoring methodology AM0026 version 3.</p> <p>During the verification process, AENOR, evaluated the <math>EF_{OM,y}</math> calculated by the Project Participants for 2011 and 2012. After checking all information received, the audit team found that it is correct and complies with the Monitoring Plan and the methodology, AM0026 v3.</p> <p>However, due to the complexity of calculations required by the methodology, which requires monitoring of many parameters, most with hourly frequency, it is necessary to use a large amount of data and formulae to determine the parameters. For that reason, the project participants developed many spreadsheets for the calculation.</p> <p>Hourly data generation and dispatch priority are obtained from CDEC-SIC (dispatch centre). Data obtained are downloaded to the following spreadsheets:</p> <ul style="list-style-type: none"> <li><math>EF_{OM}</math> 2010 and <math>EF_{OM}</math> 2011, which contain <math>EF_{j,h}</math> and <math>EF_{OM,y}</math> calculation.</li> </ul> <p>In order to verify the results obtained, provided data was checked against provided evidence (dispatch priority) and official information on CDEC-SIC web page.</p> <p>AENOR could cross-check the results and the traceability of all calculations as stated in the methodology.</p>	<b>CAR 2</b>	<b>OK</b>
<b>Monitoring Equipment</b>  <i>Is the equipment of used for monitoring (quality, type, accuracy, calibration requirements) in accordance with the relevant guidance provided by the CDM Executive Board and is equipment controlled and calibrated in accordance with the monitoring plan?</i>	7.4.2.	Not applicable, as this parameter is not measured.	OK	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<b>Accuracy</b> <i>In case of measured (or estimated) values, check whether significant inaccuracies occur; in this case, make sure that appropriate discounts have been considered for ER calculation.</i>	7.4.3.	There is no significant inaccuracy in the calculation of these parameters.	OK	<b>OK</b>
<b>Monitoring results</b> <i>Are monitoring results consistently recorded as per approved frequency?</i>	7.4.4.	This parameter is calculated hourly, according to the methodology.	OK	<b>OK</b>
<b>Quality assurance and quality control procedures</b> <i>Have quality assurance and quality control procedures been applied in accordance with the monitoring plan to prevent or identify and correct any errors or omissions in the reported monitoring parameters?</i>	7.4.5.	Yes, the quality assurance and quality control procedures determined in the Monitoring Plan have been applied.	OK	<b>OK</b>
<b>Verification</b> <i>Describe how the value and the information flow (from data generation, aggregation, to recording, calculation and reporting) were verified. Consider the measurement   determination procedure, accuracies, QA/QC procedure, source and nature of the evidences. Consider as well plausibility checks as far as possible. Check if the applied value could be backed up by corresponding evidences covering the full monitoring period.</i>	7.4.6.	The verification team checked all data, their sources and the calculations of the excel file used to calculate the parameters.  The results obtained in the Excel files have been checked against provided evidence and available downloaded data from dispatch centre (CDEC-SIC) web page.	OK	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<b>7.5. Symbol of parameter: <math>D(j,i)</math></b>	<b>7.5.</b>	<b>Description: Energy displacement of the marginal plant <math>i^{\text{th}}</math> due to the proposed CDM project <math>j^{\text{th}}</math></b>		
<b>Measurement / Determination method</b> <i>Describe how the monitoring parameter was measured   determined.</i> <i>Check if relevant equipment has been exchanged and if in cases of failures   downtimes of standard equipment other measurement   determination methods have been used.</i> <i>Assess whether the measurement or determination method (data generation, frequency, aggregation, equipment, recording, reporting, standards) is in line with the registered monitoring plan of the PDD and the applied methodology.</i>	7.5.1.	This parameter is calculated in accordance with the formula (11) of the monitoring methodology AM0026 version 3. The calculation is done in a monthly and using the spreadsheets called Hourly_OM_Data_"month".xls	OK	<b>OK</b>
<b>Monitoring Equipment</b> <i>Is the equipment of used for monitoring (quality, type, accuracy, calibration requirements) in accordance with the relevant guidance provided by the CDM Executive Board and is equipment controlled and calibrated in accordance with the monitoring plan?</i>	7.5.2.	Not applicable, as this parameter is not measured.	OK	<b>OK</b>
<b>Accuracy</b> <i>In case of measured (or estimated) values, check whether significant inaccuracies occur; in this case, make sure that appropriate discounts have been</i>	7.5.3.	There is no significant inaccuracy in the calculation of this parameter.	OK	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<i>considered for ER calculation.</i>				
<b>Monitoring results</b> <i>Are monitoring results consistently recorded as per approved frequency?</i>	7.5.4.	This parameter is calculated hourly, according to the methodology. Data from 2011 and 2012 have been used for the monitoring period	OK	<b>OK</b>
<b>Quality assurance and quality control procedures</b> <i>Have quality assurance and quality control procedures been applied in accordance with the monitoring plan to prevent or identify and correct any errors or omissions in the reported monitoring parameters?</i>	7.5.5.	Yes, the quality assurance and quality control procedures determined in the Monitoring Plan have been applied.	OK	<b>OK</b>
<b>Verification</b> <i>Describe how the value and the information flow (from data generation, aggregation, to recording, calculation and reporting) were verified. Consider the measurement   determination procedure, accuracies, QA/QC procedure, source and nature of the evidences. Consider as well plausibility checks as far as possible. Check if the applied value could be backed up by corresponding evidences covering the full monitoring period.</i>	7.5.6.	The verification team checked all data and their sources and the calculations of the Excel files used to calculate the parameter " <i>Hourly OM Data_"month".xls</i> ".  The Excel files have been compared with data used from others spreadsheets used in the calculation, and official data provided by the project participant and the dispatch centre (CDEC-SIC) web page.	OK	<b>OK</b>
<b>7.6. Symbol of parameter: <math>d_i</math></b>	<b>7.6.</b>	<b>Description: <i>Emission factor for electricity displaced <math>D(j,i)</math></i></b>		
<b>Measurement   Determination method</b> <i>Describe how the monitoring parameter was measured   determined.</i>	7.6.1.	This parameter is calculated in accordance with the formula (12) of the monitoring methodology AM0026 version 3, using the monthly calculation spreadsheet <i>Hourly OM Data_"month"</i> .	OK	<b>OK</b>



Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<p><i>Check if relevant equipment has been exchanged and if in cases of failures   downtimes of standard equipment other measurement   determination methods have been used.</i></p> <p><i>Assess whether the measurement or determination method (data generation, frequency, aggregation, equipment, recording, reporting, standards) is in line with the registered monitoring plan of the PDD and the applied methodology.</i></p>				
<p><b>Monitoring Equipment</b></p> <p><i>Is the equipment of used for monitoring (quality, type, accuracy, calibration requirements) in accordance with the relevant guidance provided by the CDM Executive Board and is equipment controlled and calibrated in accordance with the monitoring plan?</i></p>	7.6.2.	Not applicable, as this parameter is not measured.	OK	<b>OK</b>
<p><b>Accuracy</b></p> <p><i>In case of measured (or estimated) values, check whether significant inaccuracies occur; in this case, make sure that appropriate discounts have been considered for ER calculation.</i></p>	7.6.3.	There is no significant inaccuracy in the calculation of this parameter.	OK	<b>OK</b>
<p><b>Monitoring results</b></p> <p><i>Are monitoring results consistently recorded as per approved frequency?</i></p>	7.6.4.	This parameter is calculated according to the methodology	OK	<b>OK</b>
<p><b>Quality assurance and quality control procedures</b></p>	7.6.5.	Yes, the quality assurance and quality control procedures determined in the Monitoring Plan have been applied.	OK	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<i>Have quality assurance and quality control procedures been applied in accordance with the monitoring plan to prevent or identify and correct any errors or omissions in the reported monitoring parameters?</i>				
<b>Verification</b> <i>Describe how the value and the information flow (from data generation, aggregation, to recording, calculation and reporting) were verified. Consider the measurement   determination procedure, accuracies, QA/QC procedure, source and nature of the evidences. Consider as well plausibility checks as far as possible. Check if the applied value could be backed up by corresponding evidences covering the full monitoring period.</i>	7.6.6.	The verification team checked all data and their sources and the calculations of the Excel files used to calculate the parameter; " <i>Marginal Plants Data Base_"month".xls</i> ".	OK	<b>OK</b>
<b>7.7. Symbol of parameter: SCFi</b>	<b>7.7.</b>	<b>Description: Specific fuel consumption per unit of electric energy produced in the "i<sup>th</sup>" marginal plant</b>		
<b>Measurement   Determination method</b> <i>Describe how the monitoring parameter was measured   determined.</i> <i>Check if relevant equipment has been exchanged and if in cases of failures   downtimes of standard equipment other measurement   determination methods have been used.</i> <i>Assess whether the measurement or determination method (data generation, frequency, aggregation, equipment,</i>	7.7.1.	This parameter is calculated by dividing annual fuel consumption by annual generation of each power source (information available in the CDEC-SIC databases). If this information is not available, the specific fuel consumption presented in the CNE node price report is used.	OK	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<i>recording, reporting, standards) is in line with the registered monitoring plan of the PDD and the applied methodology.</i>				
<b>Monitoring Equipment</b> <i>Is the equipment of used for monitoring (quality, type, accuracy, calibration requirements) in accordance with the relevant guidance provided by the CDM Executive Board and is equipment controlled and calibrated in accordance with the monitoring plan?</i>	7.7.2.	Not applicable, as this parameter is not measured.	OK	<b>OK</b>
<b>Accuracy</b> <i>In case of measured (or estimated) values, check whether significant inaccuracies occur; in this case, make sure that appropriate discounts have been considered for ER calculation.</i>	7.7.3.	There is no significant inaccuracy	OK	<b>OK</b>
<b>Monitoring results</b> <i>Are monitoring results consistently recorded as per approved frequency?</i>	7.7.4.	This parameter is obtained annually, according to the Monitoring Plan.	OK	<b>OK</b>
<b>Quality assurance and quality control procedures</b> <i>Have quality assurance and quality control procedures been applied in accordance with the monitoring plan to prevent or identify and correct any errors or omissions in the reported monitoring parameters?</i>	7.7.5.	Yes, the quality assurance and quality control procedures determined in the Monitoring Plan have been applied.	OK	<b>OK</b>
<b>Verification</b>	7.7.6.	The audit team verified the data from the original source.	OK	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<i>Describe how the value and the information flow (from data generation, aggregation, to recording, calculation and reporting) were verified. Consider the measurement   determination procedure, accuracies, QA/QC procedure, source and nature of the evidences. Consider as well plausibility checks as far as possible. Check if the applied value could be backed up by corresponding evidences covering the full monitoring period.</i>				
<b>7.8. Symbol of parameter: <math>NCV_{i,y}</math></b>	<b>7.8.</b>	<b>Description: <i>Net calorific value of fossil fuel type i in year y</i></b>		
<b>Measurement   Determination method</b> <i>Describe how the monitoring parameter was measured   determined.</i> <i>Check if relevant equipment has been exchanged and if in cases of failures   downtimes of standard equipment other measurement   determination methods have been used.</i> <i>Assess whether the measurement or determination method (data generation, frequency, aggregation, equipment, recording, reporting, standards) is in line with the registered monitoring plan of the PDD and the applied methodology.</i>	7.8.1.	NCV is determined from gross calorific values published by CNE in the Energy Balance Report; these values were corrected to Net Calorific Values based on the IPCC 2006 assumption, which states that for liquid fuels, Net Calorific Value is 5% lower than its Gross Calorific Value and for Gas fuels; Net Calorific Value is 10% lower than its Gross Calorific Value.	<b>CAR 2</b>	<b>OK</b>
<b>Monitoring Equipment</b> <i>Is the equipment of used for monitoring (quality, type, accuracy, calibration requirements) in accordance with the relevant guidance provided by the CDM</i>	7.8.2.	Not applicable, as this parameter is not measured.	OK	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<i>Executive Board and its equipment controlled and calibrated in accordance with the monitoring plan?</i>				
<b>Accuracy</b> <i>In case of measured (or estimated) values, check whether significant inaccuracies occur; in this case, make sure that appropriate discounts have been considered for ER calculation.</i>	7.8.3.	There is no significant inaccuracy in these parameters.	OK	<b>OK</b>
<b>Monitoring results</b> <i>Are monitoring results consistently recorded as per approved frequency?</i>	7.8.4.	Annually, according to the monitoring plan	OK	<b>OK</b>
<b>Quality assurance and quality control procedures</b> <i>Have quality assurance and quality control procedures been applied in accordance with the monitoring plan to prevent or identify and correct any errors or omissions in the reported monitoring parameters?</i>	7.8.5.	Yes, the quality assurance and quality control procedures determined in the Monitoring Plan have been applied.	OK	<b>OK</b>
<b>Verification</b> <i>Describe how the value and the information flow (from data generation, aggregation, to recording, calculation and reporting) were verified. Consider the measurement   determination procedure, accuracies,  QA/QC procedure, source and nature of the evidences. Consider as well plausibility checks as far as possible.</i>	7.8.6.	Data included in the spreadsheets were checked against official sources. Gross calorific values are published in the CNE Energy Balance Report. The values are in accordance with the source.	<b>CAR 2</b>	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<i>Check if the applied value could be backed up by corresponding evidences covering the full monitoring period.</i>				
<b>7.9. Symbol of parameter: <math>CEF_{OM,i}</math></b>	<b>7.9.</b>	<b>Description: <math>CO_2</math> emission factor of fuel used in <math>i^{th}</math> marginal power plant.</b>		
<b>Measurement / Determination method</b> <i>Describe how the monitoring parameter was measured   determined.</i> <i>Check if relevant equipment has been exchanged and if in cases of failures   downtimes of standard equipment other measurement   determination methods have been used.</i> <i>Assess whether the measurement or determination method (data generation, frequency, aggregation, equipment, recording, reporting, standards) is in line with the registered monitoring plan of the PDD and the applied methodology.</i>	7.9.1.	This data is obtained from IPCC. Default values at the lower limit of the uncertainty at 95% confidence interval, provided in Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories is used.	OK	<b>OK</b>
<b>Monitoring Equipment</b> <i>Is the equipment of used for monitoring (quality, type, accuracy, calibration requirements) in accordance with the relevant guidance provided by the CDM Executive Board and is equipment controlled and calibrated in accordance with the monitoring plan?</i>	7.9.2.	Not applicable, as this parameter is not measured.	OK	<b>OK</b>
<b>Accuracy</b> <i>In case of measured (or estimated) values, check whether significant</i>	7.9.3.	There is no significant inaccuracy in the calculation of these parameters.	OK	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<i>inaccuracies occur; in this case, make sure that appropriate discounts have been considered for ER calculation.</i>				
<b>Monitoring results</b> <i>Are monitoring results consistently recorded as per approved frequency?</i>	7.9.4.	Annually, according to the monitoring plan.	OK	<b>OK</b>
<b>Quality assurance and quality control procedures</b> <i>Have quality assurance and quality control procedures been applied in accordance with the monitoring plan to prevent or identify and correct any errors or omissions in the reported monitoring parameters?</i>	7.9.5.	Yes, the quality assurance and quality control procedures determined in the Monitoring Plan have been applied.	OK	<b>OK</b>
<b>Verification</b> <i>Describe how the value and the information flow (from data generation, aggregation, to recording, calculation and reporting) were verified. Consider the measurement   determination procedure, accuracies, QA/QC procedure, source and nature of the evidences. Consider as well plausibility checks as far as possible. Check if the applied value could be backed up by corresponding evidences covering the full monitoring period.</i>	7.9.6.	Data included in the monitoring report and spreadsheets have been checked against the data of table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.	<b>CAR 2</b>	<b>OK</b>
<b>7.10. Symbol of parameter: M</b>	<b>7.10.</b>	<b>Description: Number of electricity generation plants on the margin, that would supply to the system in the absence of the CDM projects in the system</b>		

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<b>Measurement / Determination method</b>  <i>Describe how the monitoring parameter was measured   determined.</i>  <i>Check if relevant equipment has been exchanged and if in cases of failures   downtimes of standard equipment other measurement   determination methods have been used.</i>  <i>Assess whether the measurement or determination method (data generation, frequency, aggregation, equipment, recording, reporting, standards) is in line with the registered monitoring plan of the PDD and the applied methodology.</i>	7.10.1.	This parameter is calculated using formula (10) of the monitoring methodology AM0026 version 3, using the spreadsheets <i>Hourly OM Data_ "month"</i>	OK	<b>OK</b>
<b>Monitoring Equipment</b>  <i>Is the equipment of used for monitoring (quality, type, accuracy, calibration requirements) in accordance with the relevant guidance provided by the CDM Executive Board and is equipment controlled and calibrated in accordance with the monitoring plan?</i>	7.10.2.	Not applicable, as this parameter is not measured.	OK	<b>OK</b>
<b>Accuracy</b>  <i>In case of measured (or estimated) values, check whether significant inaccuracies occur; in this case, make sure that appropriate discounts have been considered for ER calculation.</i>	7.10.3.	There is no significant inaccuracy in the calculation of these parameters	OK	<b>OK</b>
<b>Monitoring results</b>	7.10.	This parameter is calculated hourly, according to the methodology.	OK	<b>OK</b>



Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<i>Are monitoring results consistently recorded as per approved frequency?</i>	4.			
<b>Quality assurance and quality control procedures</b>  <i>Have quality assurance and quality control procedures been applied in accordance with the monitoring plan to prevent or identify and correct any errors or omissions in the reported monitoring parameters?</i>	7.10. 5.	Yes, the quality assurance and quality control procedures determined in the Monitoring Plan have been applied.	OK	<b>OK</b>
<b>Verification</b>  <i>Describe how the value and the information flow (from data generation, aggregation, to recording, calculation and reporting) were verified. Consider the measurement   determination procedure, accuracies, QA/QC procedure, source and nature of the evidences. Consider as well plausibility checks as far as possible. Check if the applied value could be backed up by corresponding evidences covering the full monitoring period.</i>	7.10. 6.	The verification team checked all data and their sources and the calculations of the Excel files used to calculate the parameter.	OK	<b>OK</b>
<b>7.11. Symbol of parameter: <i>N</i></b>	<b>7.11.</b>	<b>Description: Total number of CDM projects in the system, where <i>N</i> is the CDM project built first and 1 is the last CDM project built in the system.</b>		
<b>Measurement   Determination method</b>  <i>Describe how the monitoring parameter was measured   determined.</i>  <i>Check if relevant equipment has been</i>	7.11. 1.	The information of this parameter is obtained from CDEC-SIC and UNFCCC registered projects for the country.	OK	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<i>exchanged and if in cases of failures   downtimes of standard equipment other measurement   determination methods have been used.</i>  <i>Assess whether the measurement or determination method (data generation, frequency, aggregation, equipment, recording, reporting, standards) is in line with the registered monitoring plan of the PDD and the applied methodology.</i>				
<b>Monitoring Equipment</b> <i>Is the equipment of used for monitoring (quality, type, accuracy, calibration requirements) in accordance with the relevant guidance provided by the CDM Executive Board and is equipment controlled and calibrated in accordance with the monitoring plan?</i>	7.11. 2.	Not applicable, as this parameter is not measured.	OK	<b>OK</b>
<b>Accuracy</b> <i>In case of measured (or estimated) values, check whether significant inaccuracies occur; in this case, make sure that appropriate discounts have been considered for ER calculation.</i>	7.11. 3.	There is no significant inaccuracy.	OK	<b>OK</b>
<b>Monitoring results</b> <i>Are monitoring results consistently recorded as per approved frequency?</i>	7.11. 4.	As required, the correct information is obtained every monitoring period or when a new plant in Chile is registered as a CDM project activity.	OK	<b>OK</b>
<b>Quality assurance and quality control procedures</b> <i>Have quality assurance and quality</i>	7.11. 5.	Yes, the quality assurance and quality control procedures determined in the Monitoring Plan have been applied.	OK	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<i>control procedures been applied in accordance with the monitoring plan to prevent or identify and correct any errors or omissions in the reported monitoring parameters?</i>				
<b>Verification</b> <i>Describe how the value and the information flow (from data generation, aggregation, to recording, calculation and reporting) were verified. Consider the measurement   determination procedure, accuracies,</i> <i>QA/QC procedure, source and nature of the evidences. Consider as well plausibility checks as far as possible. Check if the applied value could be backed up by corresponding evidences covering the full monitoring period.</i>	7.11.6.	The audit team checked CDM registered plants against the UNFCCC web page	OK	<b>OK</b>
<b>7.12. Symbol of parameter: <math>C_j</math></b>	<b>7.12.</b>	<b>Description: <i>Electricity generated by <math>j^{\text{th}}</math> CDM plant in hour <math>h</math></i></b>		
<b>Measurement   Determination method</b> <i>Describe how the monitoring parameter was measured   determined.</i> <i>Check if relevant equipment has been exchanged and if in cases of failures   downtimes of standard equipment other measurement   determination methods have been used.</i> <i>Assess whether the measurement or determination method (data generation, frequency, aggregation, equipment,</i>	7.12.1.	The data of this parameter are obtained from CDEC-SIC databases.	OK	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<i>recording, reporting, standards) is in line with the registered monitoring plan of the PDD and the applied methodology.</i>				
<b>Monitoring Equipment</b> <i>Is the equipment of used for monitoring (quality, type, accuracy, calibration requirements) in accordance with the relevant guidance provided by the CDM Executive Board and is equipment controlled and calibrated in accordance with the monitoring plan?</i>	7.12. 2.	Not applicable, as this parameter is obtained from CDEC-SIC databases.	OK	<b>OK</b>
<b>Accuracy</b> <i>In case of measured (or estimated) values, check whether significant inaccuracies occur; in this case, make sure that appropriate discounts have been considered for ER calculation.</i>	7.12. 3.	There is not any significant inaccuracy in the calculation of these parameters.	OK	<b>OK</b>
<b>Monitoring results</b> <i>Are monitoring results consistently recorded as per approved frequency?</i>	7.12. 4.	This parameter is calculated hourly, according to the methodology. Data from 2011 and 2012 were used.	OK	<b>OK</b>
<b>Quality assurance and quality control procedures</b> <i>Have quality assurance and quality control procedures been applied in accordance with the monitoring plan to prevent or identify and correct any errors or omissions in the reported monitoring parameters?</i>	7.12. 5.	Yes, the quality assurance and quality control procedures determined in the Monitoring Plan have been applied.	OK	<b>OK</b>
<b>Verification</b>	7.12.	The audit team verified the data from the original source.	OK	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
Describe how the value and the information flow (from data generation, aggregation, to recording, calculation and reporting) were verified. Consider the measurement   determination procedure, accuracies,  QA/QC procedure, source and nature of the evidences. Consider as well plausibility checks as far as possible. Check if the applied value could be backed up by corresponding evidences covering the full monitoring period.	6.			
<b>7.13. Symbol of parameter: <math>A_i</math></b>	<b>7.13.</b>	<b>Description: Generation capacity of the <math>i^{th}</math> plant on the margin during hour <math>h</math></b>		
<b>Measurement   Determination method</b>  Describe how the monitoring parameter was measured   determined.  Check if relevant equipment has been exchanged and if in cases of failures   downtimes of standard equipment other measurement   determination methods have been used.  Assess whether the measurement or determination method (data generation, frequency, aggregation, equipment, recording, reporting, standards) is in line with the registered monitoring plan of the PDD and the applied methodology.	7.13. 1.	The data of this parameter are obtained from CDEC-SIC databases.	OK	<b>OK</b>
<b>Monitoring Equipment</b>  Is the equipment of used for monitoring (quality, type, accuracy, calibration	7.13. 2.	Not applicable, as this parameter is obtained from an external source.	OK	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<i>requirements) in accordance with the relevant guidance provided by the CDM Executive Board and is equipment controlled and calibrated in accordance with the monitoring plan?</i>				
<b>Accuracy</b> <i>In case of measured (or estimated) values, check whether significant inaccuracies occur; in this case, make sure that appropriate discounts have been considered for ER calculation.</i>	7.13.3.	There is no significant inaccuracy in the calculation of these parameters.	OK	<b>OK</b>
<b>Monitoring results</b> <i>Are monitoring results consistently recorded as per approved frequency?</i>	7.13.4.	This parameter is calculated hourly, according to the methodology. Data from 2011 and 2012 were used.	OK	<b>OK</b>
<b>Quality assurance and quality control procedures</b> <i>Have quality assurance and quality control procedures been applied in accordance with the monitoring plan to prevent or identify and correct any errors or omissions in the reported monitoring parameters?</i>	7.13.5.	Yes, the quality assurance and quality control procedures determined in the Monitoring Plan have been applied.	OK	<b>OK</b>
<b>Verification</b> <i>Describe how the value and the information flow (from data generation, aggregation, to recording, calculation and reporting) were verified. Consider the measurement   determination procedure, accuracies, QA/QC procedure, source and nature of</i>	7.13.6.	The audit team verified the data from the original source.	OK	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<i>the evidences. Consider as well plausibility checks as far as possible. Check if the applied value could be backed up by corresponding evidences covering the full monitoring period.</i>				
<b>7.14. Symbol of parameter: <math>B_i</math></b>	<b>7.14.</b>	<b>Description: Electricity generated by <math>i^{\text{th}}</math> plant on the margin during hour <math>h</math></b>		
<b>Measurement / Determination method</b>  <i>Describe how the monitoring parameter was measured   determined.</i>  <i>Check if relevant equipment has been exchanged and if in cases of failures   downtimes of standard equipment other measurement   determination methods have been used.</i>  <i>Assess whether the measurement or determination method (data generation, frequency, aggregation, equipment, recording, reporting, standards) is in line with the registered monitoring plan of the PDD and the applied methodology.</i>	7.14. 1.	The data of this parameter are obtained from CDEC-SIC databases.	OK	<b>OK</b>
<b>Monitoring Equipment</b>  <i>Is the equipment of used for monitoring (quality, type, accuracy, calibration requirements) in accordance with the relevant guidance provided by the CDM Executive Board and is equipment controlled and calibrated in accordance with the monitoring plan?</i>	7.14. 2.	Not applicable, as this parameter is obtained from an external source.	OK	<b>OK</b>
<b>Accuracy</b>	7.14.	There is no significant inaccuracy in the calculation of these parameters.	OK	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<i>In case of measured (or estimated) values, check whether significant inaccuracies occur; in this case, make sure that appropriate discounts have been considered for ER calculation.</i>	3.			
<b>Monitoring results</b> <i>Are monitoring results consistently recorded as per approved frequency?</i>	7.14.4.	This parameter is calculated hourly, according to the methodology. Data from 2011 and 2012 were used.	OK	<b>OK</b>
<b>Quality assurance and quality control procedures</b> <i>Have quality assurance and quality control procedures been applied in accordance with the monitoring plan to prevent or identify and correct any errors or omissions in the reported monitoring parameters?</i>	7.14.5.	Yes, the quality assurance and quality control procedures determined in the Monitoring Plan have been applied.	OK	<b>OK</b>
<b>Verification</b> <i>Describe how the value and the information flow (from data generation, aggregation, to recording, calculation and reporting) were verified. Consider the measurement   determination procedure, accuracies, QA/QC procedure, source and nature of the evidences. Consider as well plausibility checks as far as possible. Check if the applied value could be backed up by corresponding evidences covering the full monitoring period.</i>	7.14.6.	The audit team verified the data from the original source.	OK	<b>OK</b>
<b>7.15. Symbol of parameter:</b>	<b>7.15.</b>	<b>Description: <i>Fraction of fuel oxidized on combustion</i></b>		



Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<b>Oxid<sub>i</sub></b>				
<b>Measurement / Determination method</b> <i>Describe how the monitoring parameter was measured   determined.</i> <i>Check if relevant equipment has been exchanged and if in cases of failures   downtimes of standard equipment other measurement   determination methods have been used.</i> <i>Assess whether the measurement or determination method (data generation, frequency, aggregation, equipment, recording, reporting, standards) is in line with the registered monitoring plan of the PDD and the applied methodology.</i>	7.15.1.	The data of this parameter are obtained from IPCC.	OK	<b>OK</b>
<b>Monitoring Equipment</b> <i>Is the equipment of used for monitoring (quality, type, accuracy, calibration requirements) in accordance with the relevant guidance provided by the CDM Executive Board and is equipment controlled and calibrated in accordance with the monitoring plan?</i>	7.15.2.	Not applicable, as this parameter is obtained from an external source.	OK	<b>OK</b>
<b>Accuracy</b> <i>In case of measured (or estimated) values, check whether significant inaccuracies occur; in this case, make sure that appropriate discounts have been considered for ER calculation.</i>	7.15.3.	There is no significant inaccuracy in the calculation of these parameters.	OK	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<b>Monitoring results</b> <i>Are monitoring results consistently recorded as per approved frequency?</i>	7.15.4.	This parameter is monitored yearly, according to the methodology.	OK	<b>OK</b>
<b>Quality assurance and quality control procedures</b> <i>Have quality assurance and quality control procedures been applied in accordance with the monitoring plan to prevent or identify and correct any errors or omissions in the reported monitoring parameters?</i>	7.15.5.	Yes, the quality assurance and quality control procedures determined in the revised Monitoring Plan have been applied.	OK	<b>OK</b>
<b>Verification</b> <i>Describe how the value and the information flow (from data generation, aggregation, to recording, calculation and reporting) were verified. Consider the measurement   determination procedure, accuracies, QA/QC procedure, source and nature of the evidences. Consider as well plausibility checks as far as possible. Check if the applied value could be backed up by corresponding evidences covering the full monitoring period.</i>	7.15.6.	The audit team verified the data from the original source.	OK	<b>OK</b>
<b>8. Compliance with the calibration frequency requirements for measuring instruments</b>				
<i>Has the calibration been delayed and the calibration has been implemented after the monitoring period in consideration (results of delayed calibration are</i>	8.1	The calibrations were properly performed, according to the MP. No delays were registered during the monitoring.	OK	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<p>available)?</p> <p>If so, which conservative approach has been adopted:</p> <p>a) Applying the maximum permissible error of the instrument to the measured values taken during the period between the schedule date of calibration and the actual date of calibration, if the results of the delayed calibration do not show any error, or if the error is smaller than maximum permissible error, or</p> <p>b) Applying the error identified in the delayed calibration test, if the error is beyond the maximum permissible error.</p>				
<p>Has the error been applied:</p> <p>a) In a conservative manner, such that the adjusted measured values of the delayed calibration has result in fewer claimed emission reductions?, and</p> <p>b) For all measures taken during the period between the scheduled date of calibration and the actual date of calibration.</p>	8.2	Not applicable.	N/A	<b>N/A</b>
<p>If the results of the delayed calibration are not available, or the calibration has not been conducted at the time of the verification; has been request to the project participants to conduct the required calibration? If so, has the project participants calculated the emission reductions conservatively?</p>	8.3	Not applicable.	N/A	<b>N/A</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<i>If it is not possible for the project participant to conduct the calibration at a frequency specified by either the applied methodology, guidance provided by the Board, and/or registered monitoring plan due to reasons beyond the control of project participants; has been followed the requirements for post registration changes in accordance with VVS?</i>	8.4	Not applicable.	N/A	<b>N/A</b>
<i>If calibration frequency for measuring equipments are not specified neither the monitoring methodology nor the monitoring plan; has the equipments been calibrated in accordance with specifications of the local/national standards, or as manufacturer's specification, or international standards?</i>	8.5	Not applicable.	N/A	<b>N/A</b>
<i>Has the project participant provided information regarding the accreditation of the entity performing the test of the measurement equipment and/or standard/regulation against which calibration was done and/or acceptance criteria for the calibration of the measurement equipment?</i>	8.6	PP has provided calibration certificates, developed by CAM Chile S.A. The conclusion of the certificates states that the meters are within the accuracy class (0.2) and comply with the standard IEC 62053-22.	OK	<b>OK</b>
<b>9. Assessment of data and calculation of greenhouse gas emission reductions</b>				
<i>It is assessed if GHG emission reductions achieved by the proposed CDM project activity are calculated applying the selected methodology.</i>	9.1.	Yes. The emission reductions achieved by the proposed CDM project activity have been calculated applying the selected methodology	<b>CAR 2</b> <b>CAR 3</b>	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<i>Is a complete set of data for the specified monitoring period available? Are available evidences sufficient both in terms of frequency and in covering the full monitoring period? Are the source and the nature of evidences identified (external or internal, oral or documented, etc.)?</i>	9.2.	Yes. A complete set of data is available for the specified monitoring period and the properly evidence to support them.  The final version of the monitoring report and calculations spreadsheets provide the correct reference or link of the source or evidence to obtain the necessary data for covering the full monitoring period, with the frequency required in the monitoring plan.	<b>CAR 2</b> <b>CAR 3</b>	<b>OK</b>
<i>Whether data were not available because activity levels or non-activity parameters were not monitored in accordance with the registered monitoring plan has the most conservative assumption theoretically possible been made?</i>	9.3.	Not Applicable.  All data is available	N/A	<b>N/A</b>
<i>Assess if the calculation is fully traceable. In case of complex calculations an Excel calculation spreadsheet shall be used. All applied formulae must be visible.</i>	9.4	The final versions of the calculation spreadsheets include all applied formulae, which are visible, and the calculation is fully traceable.	<b>CAR 2</b> <b>CAR 3</b>	<b>OK</b>
<i>Is the spreadsheet with the emission reductions calculations provided complete in accordance with latest applicable version of the Issuance information and reporting checklist?</i>	9.5.	The audit team was able to verify that the final version of the spreadsheets with the emissions reductions calculations were in accordance with the latest applicable version of the issuance information and reporting checklist	<b>CAR 2</b> <b>CAR 3</b>	<b>OK</b>
<i>Has information provided in the monitoring report been cross-checked with other sources such as plant log books, inventories, purchase records, laboratory analysis?</i>	9.6.	Data included in the Monitoring Report and spreadsheets provided by the project participants have been checked against data included on the CDEC-SIC website, data from IPCC Guidelines on National GHG Inventories, calibration certificates, manufacturer documents and technical reports.	<b>CAR 2</b> <b>CAR 3</b>	<b>OK</b>
<i>Have calculations of baseline emissions, CDM project activity emissions and leakage, as appropriate, been carried out in accordance with the formulae and</i>	9.7.	The audit team found that calculations of baseline emissions, CDM project activity emissions and leakage have been carried out in accordance with the formulae and methods described in the Monitoring Plan and the applied methodology document.	OK	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<i>methods described in the monitoring plan and the applied methodology document?</i>				
<i>Have any assumptions used in emission calculations been justified?</i>	9.8.	All assumptions used in emission calculations have been adequately justified.	<b>CAR 2</b> <b>CAR 3</b>	<b>OK</b>
<i>Have appropriate emission factors, IPCC default values and other reference values been correctly applied?</i>  <i>Are the most recent data incorporated into the calculation of the ex-post grid emission factor?</i>	9.9.	The project participant has used appropriate emissions factors, IPCC default values and other reference values, incorporating into the calculation of the ex-post grid emission factor the most recent data.	<b>CAR 2</b> <b>CAR 3</b>	<b>OK</b>
<b>10. Quality Management; defined organizational structure, responsibilities and competencies Internal QA/QC and document control</b>				
<b>Management System</b>  <i>Have the GHG data monitoring system and all CDM monitoring procedures been implemented? Do they comply with the monitoring systems and procedures described in the monitoring plan and the approved methodology?</i>	10.1.	The Emissions Reductions Calculation Procedure, Energy Generation Data, Quality Control and Monitoring Procedure are in accordance with procedures described in the monitoring plan. Moreover, the company has a certified management system; therefore, the company has many procedures integrated into the management system, allowing to have a better quality in monitoring procedures.	OK	<b>OK</b>
<b>Roles and Positions</b>  <i>Check if all roles and positions of each person in the GHG data management process are clearly defined and implemented, from raw data generation to submission of the final data.</i>  <i>Check further if only duly qualified personnel is involved in the monitoring procedures.</i>	10.2.	During the on-site visit the audit team found that all roles and positions are well defined and implemented. Qualified personnel are involved in the monitoring procedures (monitoring plan, job descriptions, and organisation chart).	OK	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<b>Trainings</b> <i>Check if initial trainings have been carried out, in case deemed necessary.</i>	10.3.	<p>According to the MR, the responsible for monitoring data related to the CER's calculation are the Power Plant Staff (Operations), TI Management (from Finance and Administration Department Management), Sustainability and Climate Change Unit (as part of the Environmental Management).</p> <p>Moreover, during the on-site visit AENOR was able to verify that the team involved in CDM procedures is well trained. Also, the new staff was properly trained by qualified personnel from COLBÚN.</p>	OK	<b>OK</b>
<b>Troubleshooting procedures</b> <i>Assess whether troubleshooting procedures have been implemented.</i>	10.4.	<p>During the on-site visit the audit team found that troubleshooting procedures have been implemented. Furthermore, due to the company has a certified management system, the procedures are included in the management system. The troubleshooting procedures are described in the Management and Operation System Manual.</p>	OK	<b>OK</b>
<b>Maintenance procedures</b> <i>Are appropriate maintenance procedures in place?</i>	10.5.	<p>During the on-site visit the audit team found that maintenance procedures have been implemented, according to the monitoring plan and manufacturer requirements. Furthermore, due to the company has a certified management system, the procedures are included in the management system. The Maintenance procedures are properly described in the Management and Operation System Manual.</p>	OK	<b>OK</b>
<b>Reporting procedures</b> <i>Check how reports with relevance for the later determination of emission reductions will be generated.</i> <i>Is the frequency of emissions reports established?</i>	10.6.	<p>The project participant has developed a Management and Operation System Manual in order to establish all the procedures and responsibilities related to the fulfilment of the CDM related issues. This System includes all the procedures related to the monitoring plan, such as the monitoring and verification procedures, in order to assure the proper development of the activities of the monitoring plan.</p>	OK	<b>OK</b>
<b>Internal QA/QC</b> <i>Assess whether there are any procedures in place on when, where and how checks and reviews are to be carried out, and what evidence needs to be documented? (This might include spot checks by a second person not performing the calculations over manual data transfers, changes in assumptions and the overall</i>	10.7.	<p>The project participant has developed a Management and Operation System Manual in order to establish all the procedures and responsibilities related to the fulfilment of the CDM related issues. This System includes all the procedures related to the monitoring plan, such as the monitoring and verification procedures, in order to assure the proper development of the activities of the monitoring plan.</p>	OK	<b>OK</b>

Checklist Question	Ref	Comments	Draft conclusion	Final conclusion
<i>reliability of the calculation processes.)</i>				
<b>Data collection and data processing systems</b> <i>Check the eligibility of used systems.</i> <i>Does data collection system meet the requirements of the monitoring plan as per the applied methodology?</i>	10.8.	The project participant has developed a Management and Operation System Manual in order to establish all the procedures and responsibilities related to the fulfilment of the CDM related issues. This System includes all the procedures related to the monitoring plan, such as the monitoring and verification procedures, in order to assure the proper development of the activities of the monitoring plan.  Moreover, the project participant has developed a specific procedure for data collection: PO.18. Data collection from energy meters, established in the Management and Operation System Manual	OK	<b>OK</b>
<b>Data archive</b> <i>Check whether all data of monitoring parameters are recorded and archived according to the monitoring plan and the approved methodology.</i>	10.9.	All records of monitoring parameters are archived according to the monitoring plan and the approved methodology.  Several different software are used for this reason by the project participants, such as SIGO, for operational data; ION Enterprise, for measurement data; or, LIVELINK, for documentation.	OK	<b>OK</b>
<b>Data protection</b> <i>Assess whether appropriate measures have been take in order to avoid unintended or intended manipulation of the measured data.</i>	10.10 .	During the on-site visit the audit team checked the security procedures implemented in the power plant, the audit team verified that appropriate measures have been taking to avoid unintended or intended manipulation of the measured data.	OK	<b>OK</b>



## ANNEX 2. APPOINTMENT CERTIFICATES

### CERTIFICATE OF QUALIFICATION

**Subject:** Verification and Technical Review Team for "Chacabuquito Hydroelectric Power Project"

Madrid, 24/01/2014

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 verification process of the above mentioned project activity:

Name: **Luis Javier ARRIBAS ALONSO**

CDM Chief Validator: N/A

CDM Validator: N/A

CDM Chief Verifier: Yes

CDM Verifier: Yes

External Technical Expert: N/A

Technical areas related with the project activity:

TA1.2: Energy generation from renewable energy sources.



Luis Robles Olmos  
Technology Coordinator

## CERTIFICATE OF QUALIFICATION

**Subject:** Verification and Technical Review Team for "Chacabuquito Hydroelectric Power Project"

Madrid, 24/01/2014

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 verification process of the above mentioned project activity:

Name: **José Luis FUENTES PÉREZ**

CDM Chief Validator: N/A

CDM Validator: N/A

CDM Chief Verifier: Yes

CDM Verifier: Yes

External Technical Expert: N/A

Technical areas related with the project activity:

TA1.2: Energy generation from renewable energy sources.



Luis Robles Olmos  
Technology Coordinator

## CERTIFICATE OF QUALIFICATION

**Subject:** Verification and Technical Review Team for "Chacabuquito Hydroelectric Power Project"

Madrid, 24/01/2014

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 verification process of the above mentioned project activity:

Name: **Richard Daniel GONZALES TOLEDO**

CDM Chief Validator: N/A

CDM Validator: N/A

CDM Chief Verifier: No

CDM Verifier: Yes

External Technical Expert: N/A

Technical areas related with the project activity:

TA1.2: Energy generation from renewable energy sources.



Luis Robles Olmos  
Technology Coordinator

## CERTIFICATE OF QUALIFICATION

**Subject:** Verification and Technical Review Team for "Chacabuquito Hydroelectric Power Project"

Madrid, 24/01/2014

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 verification process of the above mentioned project activity:

Name: **Manuel GARCÍA-ROSELL RODRIGUEZ**

CDM Chief Validator: N/A

CDM Validator: N/A

CDM Chief Verifier: No

CDM Verifier: Yes

External Technical Expert: N/A

Technical areas related with the project activity:

TA1.2: Energy generation from renewable energy sources.



Luis Robles Olmos  
Technology Coordinator