Monitoring report form
(Version 04.0)

Complete this form in accordance with the Attachment "Instructions for filling out the monitoring report form" at the end of this form.

MONITORING REPORT	
Title of the project activity	Chile: Quilleco Hydroelectric Project
Reference number of the project activity	Project 1265
Version number of the monitoring report	01
Completion date of the monitoring report	01/07/2014
Registration date of the project activity	09/07/2008
Monitoring period number and duration of this monitoring period	03 (01/12/2011-31/12/2013)
Project participant(s)	Hidroeléctrica Guardia Vieja S.A.; Netherlands' Ministry of Infrastructure and the Environment (IenM); International Bank for Reconstruction and Development (IBRD) as Trustee of the Netherlands CDM Facility (NCDMF); Electrabel NV/SA.
Host Party(ies)	Chile
Sectoral scope and selected methodology(ies), and where applicable, applied standardized baseline(s)	Sectoral Scope 1: Energy industries (renewable - / non-renewable sources). AM0026 "Methodology for zero-emissions grid-connected electricity generation from renewable sources in Chile or in countries with merit order based dispatch grid" (version 2). ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (version 6).
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	358,975 tCO_2e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	416,246 tCO_2e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period up to 31	244,075 tCO_2e

December 2012(if applicable)	
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period from 1 January 2013 onwards (if applicable).	172,171 tCO_2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

>> The Quilleco Hydroelectric Project consists of a run-of-river power plant of 70 MW effective installed capacity (71.76 MW turbines nameplate installed capacity) run-of-the-river hydropower plant that utilizes the water discharged by the Rucúe hydropower plant ($130m^3$/sec). The project generates approximately 422 GWh per year and injects 47 MW of firm power to the SIC electric grid (Sistema Interconectado Central). The estimates were based on long-term observations of water conditions of the Laja River.

The project developer and operator is Colbún S.A., the second largest electric holding company in Chile, with a total installed capacity of 2,962 MW, from which 43% are hydraulic power units. In the third quarter of 2005 Colbún acquired Cenelca S.A. and Hidroeléctrica Guardia Vieja A.S (HGV). The latest company was one of the first private companies worldwide to submit hydroelectric projects under the Kyoto Protocol CDM, this is the case of Chacabuquito (26 MW) power plant, operating since 01/07/2002.

Quilleco uses well-proven technologies for run-of-river power generation. The project considers a 4.4 km concrete channels, 3.2 km aqueduct tunnel, 105 m pressure penstock of 59.4 m height, a power house with two sets of 35.88 MW vertical Francis turbines/generators, 13.8/220 kV power transformer and a 220 kV double circuit transmission line connected to the existing 220 kV double circuit transmission line to the high voltage Charrúa substation in the Central Interconnected System (SIC).

This project contributes to the sustainable development in Chile through:

- Use of local renewable energy resources (small hydro) to displace coal and natural gas thermal power generation in the SIC.
- Increased commercial activity through clean and renewable source of power.
- Employment generation in the 8th Region where the project is located, improving economic benefits it the surrounding communities such as Tucapel, Antuco and Quilleco.

The total amount of emission reductions during this monitoring period is 416,242 tonnes of CO_2e.

Table A.1. Implementation of the Project

Date	Key events
20/01/2005	The construction activities started
17/04/2007	Commissioning date
30/04/2007	Start of commercial operation
09/07/2008	Registration date and starting date of the crediting period

A.2. Location of project activity

>> Quilleco Hydroelectric Project is located in the 8th region of Bio-Bío of Chile, at about 35 km east from Los Angeles city and 500 km south from Santiago. All project facilities are sited on the

south bank of a branch of the Laja River, 8 km downstream of existing Rucúe power plant, receiving the waters from this plant in hydraulic series.

The road from Los Angeles to Antuco is the main road in the entire area. Secondary and rural roads connect the communes of Quilleco and Tucapel.

Table A.2. Project Coordinates

	Latitude	Longitude
Power house	37°20'10"S -37.33611111111111	71°56'59"W -71.94972222222222
Intake	37°21'26"S -37.35722222222223	71°52'39"W -71.8775

The location of the project activity is illustrated in Figure A.1

Figure A.1.a- Project activity geographical location

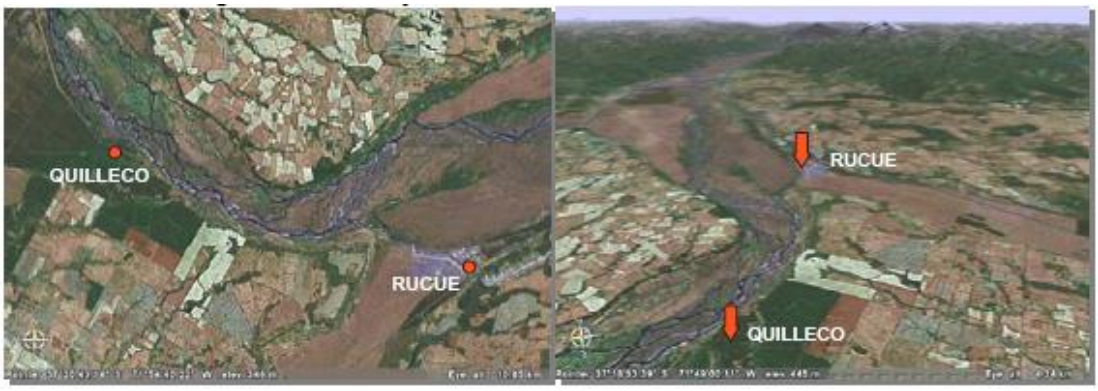

Figure A.1.b- Project Location. Satellite and Panoramic View

A.3. Parties and project participant(s)

Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Chile (host)	Hidroeléctrica Guardia Vieja S.A.	No

Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Netherlands	Netherlands' Ministry of Infrastructure and the Environment (IenM); International Bank for Reconstruction and Development (IBRD) as Trustee of the Netherlands CDM Facility (NCDMF)	Yes
United Kingdom of Great Britain and Northern Ireland	Electrabel NV/SA	No

A.4. Reference of applied methodology and standardized baseline

>> The applied methodology is: AM0026: "Methodology for zero-emissions grid-connected electricity generation from renewable sources in Chile or in countries with merit order based dispatch grid" (Version 2.0).

http://cdm.unfccc.int/methodologies/DB/OOI7OYUFZOXN07H7EDBA9GVHJ4GK20

The applied methodology refers to the methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" Version 6.0). This methodology is used as per PDD version 2.2 date 05/10/2012 although is no longer the official version.

http://cdm.unfccc.int/methodologies/DB/UB3431UT9I5KN2MUL2FGZXZ6CV71LT

A.5. Crediting period of project activity

>>1st crediting period: 09/07/2008 – 08/07/2015 (7 years, Renewable)

A.6. Contact information of responsible persons/ entities

>> Colbún S.A. / Avenida Apoquindo 4775, 11th Floor, Santiago, Chile / +5624604000
Sustainability Manager: Mr Cristián Mosella (cmosella@colbun.cl)

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

>> Technical description of the project

The technical design of the Quilleco Hydroelectric Project uses a simple layout and technologies well proven in Chile and worldwide, and used in other Colbún operating power units. The table B.1 below shows a brief description of the project technology.

Table B.1. Project

PHYSICAL INFRASTRUCTURE	POWER PLANT
- 4.4 km of open channel - 3.2 km aqueduct tunnel - 59.4 m pressure penstock - 2 sets of vertical Francis turbines and generators - 0.5 km 220 KV transmission line	- Effective installed capacity: 70 MW - Turbines nameplate installed capacity: 71.76MW - Average Net Generation: 422 GWh/year - Located 35 km east from Los Angeles

- Design flow: 130 m^3/s	city and 500 km south from Santiago - Construction time: 30 months

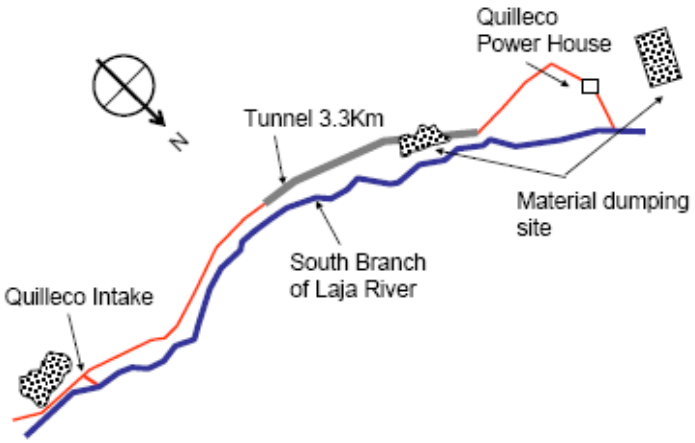

Figure B.1. Project Design

Relevant dates

The construction of the project activity started on 20/01/2005.
The project started generating with Unit 1 on 17/04/2007, on 30/04/2007 Unit 1 was officially delivered to CDEC SIC, afterwards, on 28/05/2007 Unit 2 was also delivered.

During this monitoring period Quilleco power plant has continuously operated, with some exceptions due to the special events that are detailed in the table below. However, it is worth to mention that none of the following events are considered as a serious situation, and most of them are part of the normal events faced by power plants like Quilleco:

Table B.2. Special events occurred during monitoring period

Unit	Start time	Start date	End time	End date	Details
Year 2012					
U1	8:29	05-03-2012	11:30	15-03-2012	Scheduled Maintenance
U2	8:48	19-03-2012	11:35	27-03-2012	Scheduled Maintenance
U1	17:42	28-05-2012	18:27	28-05-2012	Failure
U2	17:43	28-05-2012	18:33	28-05-2012	Failure
U1	8:34	02-10-2012	21:17	10-10-2012	Scheduled Maintenance
U2	9:30	16-10-2012	9:13	26-10-2012	Scheduled Maintenance
U1	13:52	29-11-2012	14:41	29-11-2012	Failure
Year 2013					
U2	14:20	22-03-2013	17:09	22-03-2013	Failure
U2	17:15	22-03-2013	20:53	28-03-2013	Failure
U2	16:34	01-06-2013	17:05	01-06-2013	Failure
U2	0:08	13-09-2013	1:12	13-09-2013	Scheduled Maintenance
U1	8:37	11-11-2013	19:15	15-11-2013	Scheduled Maintenance
U2	8:32	18-11-2013	18:40	22-11-2013	Scheduled Maintenance
U2	1:00	30-12-2013	8:05	30-12-2013	Failure
U1	1:00	30-12-2013	8:05	30-12-2013	Failure

Events reported in Table B.2 don't have an impact on the applicability of the applied methodology.

B.2. Post registration changes

B.2.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline

>> The following deviation has been applied and accepted for a previous monitoring period and is not applicable to this monitoring period:

Status: Accepted on 28/06/2011

Reference: I-DEV0405

Title/subject of deviation: Use of redundant energy measurements instead of primary measurements for estimating baseline emissions.

Deviation duration: 09/07/2008 to 14/08/2010

Description: The project deviated from the Monitoring Plan due to the two following reasons, there was a recording failure of the primary meters M1 & M2 at the Quilleco substation from 09/07/2008 to 14/08/2010 and the meter for measurement of auxiliary services consumption was not properly verified for accuracy, according to local standards for electricity transactions in CDEC-SIC.

For the period of the deviations (from 09/07/2008 to 14/08/2010), the value of the parameter "$Generation_h$", taking into account the proposed deviation approach (based on both conservative analytical approaches) was calculated considering the secondary energy meters, as:

$$Generation_{h,dev\ app.} = (M3+M4) – losses – (M5+0.4\%M5)$$

After concluding the period of the deviations, since 15/08/2010, the value of the parameter "$Generation_h$" is determinated, according to the registered Monitoring Plan, as the electricity generation supplied by the project activity in the interconnection point and measured with primary meters (M1 and M2), minus the electricity consumption for auxiliary services of the project activity and measured with meter M5.

$$Generation_h = (M1+M2-M5)$$

B.2.2. Corrections

>>N/A

B.2.3. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline

>>N/A

B.2.4. Changes to project design of registered project activity

>>N/A

B.2.5. Changes to start date of crediting period

>>N/A

B.2.6. Types of changes specific to afforestation or reforestation project activity

>>N/A

SECTION C. Description of monitoring system

>> During year 2005, Colbún S.A. merged with Hidroeléctrica Cenelca S.A., including the assets that belonged to this company, which considered the set of hydroelectric power plants owned by Hidroeléctrica Guardia Vieja S.A.

Consequently, the administration, operation, maintenance, commercial aspects and environmental management of the Quilleco Power Plant is currently conducted by Colbún S.A.

In order to fulfil the commitments established in the Quilleco Project Design Document, and the ones associated to the related Emission Reduction Purchase Agreement, Colbún S.A. has the following CDM functional management structure:

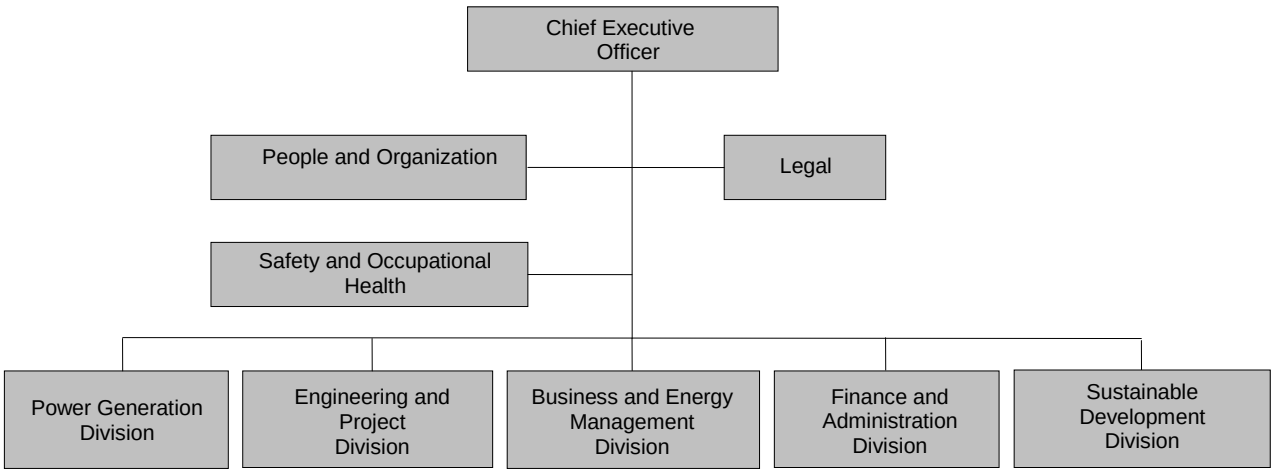

Figure C.1. General Management structure

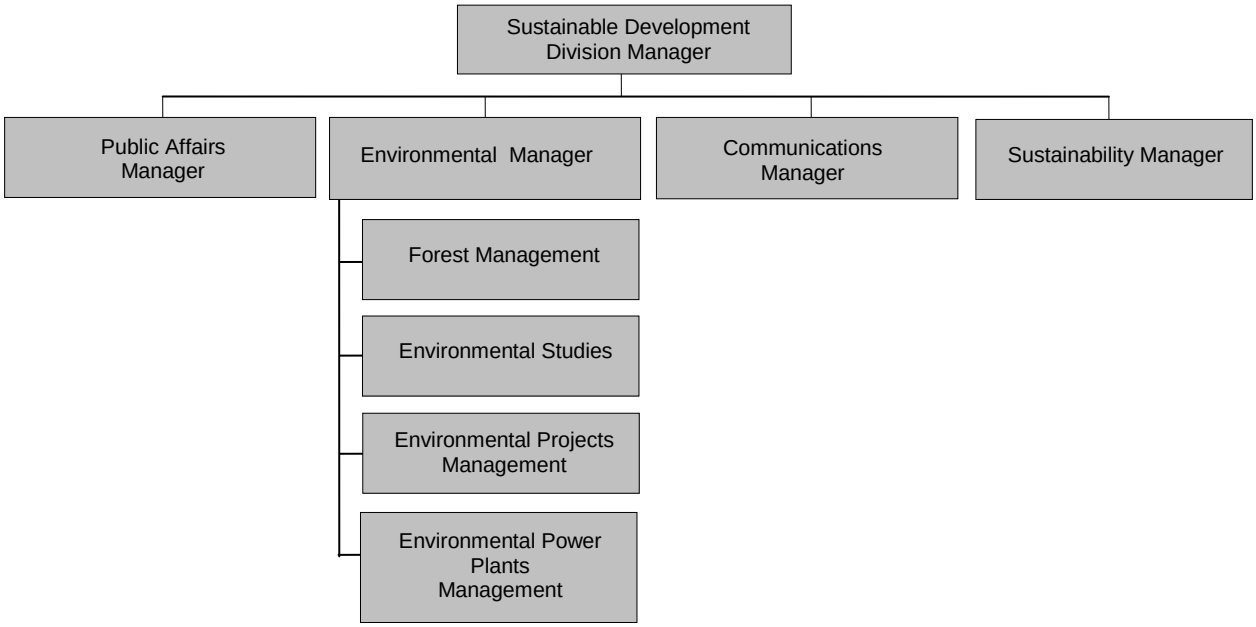

Figure C.2. Sustainable Development Department structure

Under this structure CDM related responsibilities are accomplished as follows:

- Internal training:

  I. Trainings related to specific operational procedures such as PO.17.Verification and replacement of energy meters and PO.18. Data collection from energy meters, established in the Management and Operation System Manual, and CDM topics are executed by the Sustainability Department from the Sustainable Development Division.
  II. Operator trainings are performed by a staff which is established by the Power Plant Manager (from the Hydroelectric Power Plants Department – Power Generation Division).

- CER's trading: Sustainability Department from the Sustainable Development Division.

- Monitoring (data recording, measurements, etc.): The responsible for monitoring related data to the CER's calculation are the Power Plant Staff (Operations), TI Management (from Finance and Administration Division), Sustainability Department (as part of the Sustainable Development Division).

- CER's calculation: This is performed by the Sustainability Department (as part of the Sustainable Development Division).

Monitoring system

The monitoring methodology determines the baseline emissions by observing the actual power dispatch data from CDEC-SIC and the official expansion plan provided by CNE.

The monitoring methodology involves the monitoring of the following:

- Net electricity generated and fed into the grid by the proposed CDM project, and other CDM registered projects (data available at CDEC-SIC).
- Public data on dispatch of electricity and other relevant information from the CDEC-SIC. This data is used to calculate the emission factor for the operating margin based on a dispatch increment analysis.
- Data needed to calculate the emission factor consistent with the Consolidated Baseline methodology for grid-connected electricity generation from renewable sources (AM0026).

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 CDM 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 monitoring plan activities.

Monitoring equipment

At Quilleco substation there are two primary energy meters, presented as M1 and M2. Electricity generation supplied to the grid shall be measured at Quilleco substation owned and operated by Colbún S.A., where the project connects to the grid (primary measurement).

At Quilleco Power Plant (the project site) there are also two energy meters located at the generator units, which are defined as redundant energy meters and are presented in the following figure as M3 and M4. These meters are used for cross-checking tasks (secondary measurement) for CDM purposes.

Measurements at M1 and M2 meters were crosschecked against M3 and M4. In isolated cases where M3 and M4 measurements are lower than M1 and M2 measurements, M3 and M4 measured values are conservatively considered for the emission reduction calculation.

Also, the Project requires electricity for auxiliary services (own consumptions of the power plant), which is fed through a separate direct power line. This electricity is measured by a dedicated electricity meter (M5), so what is read by M1 to M4 excludes the auxiliary service consumptions.

A simplified diagram below illustrates the connection lines for Quilleco Hydroelectric Power Plant to the grid and the specific line for auxiliary services:

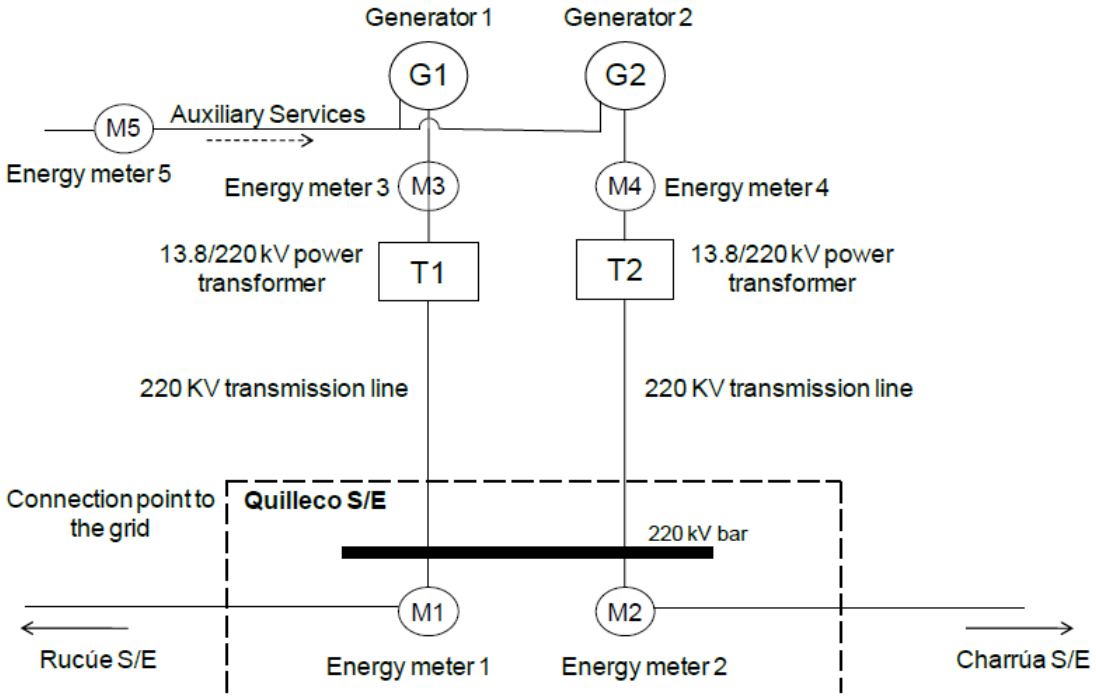

Figure C.2. Measurement equipment diagram

For the current monitoring period the generation is measured considering the two primary energy meters, presented as M1 and M2, and the auxiliary services through the accordingly calibrated meter, M5. Therefore, electricity generation supplied to the grid is measured at Quilleco substation, using the following equation:

$$Generation_h = (M1 + M2) - M5$$

Energy Measurement Equipment Periodic Calibration

During this monitoring period, calibration of the meters was performed by CAM. Calibration dates of monitoring equipment are reported in the following table:

Table C.1. Electricity meters information

M1 (Rucúe Line / Quilleco Substation)			
Calibration Dates	**Certifier**	**Equipment**	**Serial Number**
19/10/2011	Cam	ION 7650	PJ-0911A507-02
15/11/2012	Cam	ION 7650	PJ-0911A507-02
07/11/2013	Cam	ION 7650	PJ-0911A507-02
M2 (Charrúa Line / Quilleco Substation)			
Calibration Dates	**Certifier**	**Equipment**	**Serial Number**
19/10/2011	Cam	ION 7650	PJ-1009A683-02
15/11/2012	Cam	ION 7650	PJ-1009A683-02
07/11/2013	Cam	ION 7650	PJ-1009A683-02

M3 (Generator 1)			
Calibration Dates	**Certifier**	**Equipment**	**Serial Number**
06/10/2011	Cam	ION 7650	PJ-0911A868-02
14/11/2012	Cam	ION 7650	PJ-0911A868-02
06/11/2013	Cam	ION 7650	PJ-0911A868-02
M4 (Generator 2)			
Calibration Dates	**Certifier**	**Equipment**	**Serial Number**
18/10/2011	Cam	ION 7650	PJ-0911A860-02
14/11/2012	Cam	ION 7650	PJ-0911A860-02
06/11/2013	Cam	ION 7650	PJ-0911A860-02
M5 (Auxiliary Consumptions)			
Calibration Dates	**Certifier**	**Equipment**	**Serial Number**
20/10/2011	Cam	ION 7650	PJ-0911A866-02
16/11/2012	Cam	ION 7650	PJ-0911A866-02
08/11/2013	Cam	ION 7650	PJ-0911A866-02

Monitoring of environmental, social and developmental impacts:

The following two points are sustained beyond the construction phase of the project:

- Local community job creation (during the operation of the power plant):

The following table summarizes the amount of personnel and companies (local service suppliers) from the local communities currently working at Quilleco power plant:

Table C.2. Personnel from local community currently working at Quilleco power plant

Company	Job performed at Quilleco Power Plant	Local Community	Amount of Workers
DINSA	Electrical and Mechanical Maintenance Service	Antuco	1
		Villa Mercedes	2
		Tucapel	2
		Quilleco	1
Trongol	Civil Works	Mirrihue	9
		Villa Mercedes	5
		Cerro Yanque	2

Increase in economic activity due to the Project Activity:

According to the implementation of Colbún's Sustainability Policy, some examples of social and development impacts of the project activity are listed below:

1. Contribution to farmers of Laja Valley

A contribution in the form of work tools was given to the farmers' association from Laja valley. This contribution was achieved through an agreement between Colbún, the Farming Development Institute (INDAP as per acronym in Spanish) and PROdeMU (Foundation for the promotion and development of women).

2. Donation to promote sports

In the middle of 2013, Colbún provided support on sport implements for the soccer teams of Antuco community. The objective of this donation was to promote sports in the area.

3. FORCOM Programs with INACAP[1]

Since 2008, through an alliance with INACAP (a national technical education institute), Colbún implemented an educational program which provides competences and abilities to public school teenagers. During 2012, Colbún developed an annual program called "Computers: Assemblage and Configuration, Office Automation", in the communities of Antuco, Quilleco and Canteras. This program benefited over 75 teenagers and provided specialized knowledge to young people of vulnerable sectors with low opportunities of access to higher education, allowing them to get a certification provided by INACAP, improving their job access and promoting their entrepreneurship capacities. In the same line, during 2013, 29 teenagers from Canteras community got an international certificate through the participation in an "Office Automation course" of 150 hours.

Monitoring of internal training during the monitoring period:

The following table summarized training activities performed during the monitoring period:

Table C.3. Training activities

Subject	Date	Attendance	Exhibitor
Skin safety (UV radiation)	02/12/2011	22	Darío Cáceres
Electric risks	05/12/2011	18	Hernán Telles
Integrated Management System in Livelink	13/12/2011	7	Alfonso Ávalos
Driving (Prevention and Time)	14/12/2011	4	Gabriel Montero
Driving (Prevention and Time)	15/12/2011	4	Gabriel Montero
Effective supervision in the management of work team	19/12/2011	10	Roxana Toro
Clean Development Mechanism	21/12/2011	11	Víctor Pucci
Induction Training - Right to know	01/03/2012	23	Darío Cáceres
Induction Training - Right to know	02/03/2012	38	Darío Cáceres
Induction Training - Right to know	08/03/2012	6	Darío Cáceres
Integrated policy of environment, safety and occupational health	26/04/2012	45	Darío Cáceres
Contingency plan	10/05/2012	9	Darío Cáceres
Accident prevention	16/05/2012	22	Erasmo Espinoza
Skin safety (UV radiation)	30/05/2012	11	Darío Cáceres
Skin safety (UV radiation)	31/05/2012	27	Darío Cáceres
Clean Development Mechanism	21/06/2012 22/06/2012	37	Víctor Pucci
Handling of Dangers Matrix and Environmental aspects	27/07/2012	9	Mario Gajardo
Retraining Driving (Prevention and Time)	28/06/2012	9	Gabriel Montero
Retraining Driving (Prevention and Time)	29/06/2012	5	Gabriel Montero
Handling of Danger Substances	26/11/2012	16	Alexis Avad
Clean Development Mechanism	20/12/2012	17	Paula Reyes Cristián Mosella
Integrated policy of environment, safety and occupational health	20/08/2013	41	José Fuentealba
Integrated policy of environment, safety and occupational health	26/08/2013	23	José Fuentealba
Forestry Management	24/09/2013	13	Juan Tarbes Lucía Vilches

[1] Page 115, Colbún Sustainability Report 2012.

Lockout and tagout procedure	17/12/2013	29	Mario Gajardo
Clean Development Mechanism, Carbon Footprint, Sustainability Report	12/12/2013	21	Paula Reyes Ramón Arrué

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante or at renewal of crediting period

(Copy this table for each piece of data and parameter.)

Data / Parameter:	**Fuel Carbon Content**
Unit:	tC/TJ
Description:	Determination of carbon content for different fuels
Source of data:	IPCC Revised Guidelines
Value(s) applied):	Diesel: 20.2 tC/TJ Natural Gas: 15.30 tC/TJ Coal: 25.8 tC/TJ Petcoke: 27.134 tC/TJ (following IPCC 2006 revised emission factor)
Purpose of data:	Calculation of baseline emissions
Additional comment:	

Data / Parameter:	**Combustion efficiency**
Unit:	%
Description:	Determination combustion efficiency of different fuel based generation technologies
Source of data:	IPCC Revised Guidelines
Value(s) applied):	Diesel: 99.0% Natural Gas: 99.5% Coal: 98.0% Petcoke: 98.0%
Purpose of data:	Calculation of baseline emissions
Additional comment:	

Data / Parameter:	**CO_2 conversion factor**
Unit:	%
Description:	Molecular weight of carbon dioxide relative of that of carbon
Source of data:	IPCC Revised Guidelines
Value(s) applied):	44/12=3.67
Purpose of data:	Calculation of baseline emissions
Additional comment:	

D.2. Data and parameters monitored

(Copy this table for each piece of data and parameter.)

Data / Parameter:	**$Generation_h$**
Unit:	MWh
Description:	Energy Generation of the Project for each hour “h”

Measured/ Calculated / Default:	Measured
Source of data:	On-site metering system (same data submitted to CDEC-SIC)
Value(s) of monitored parameter:	Please refer to emission reductions calculation spreadsheet.
Monitoring equipment:	During this monitoring period, energy was monitored using the following equipments: Meter M1: • Type: ION 7650 • Accuracy class: 0.2% • Serial number: PJ-0911A507-02 • Calibration frequency: Every two years • Last Calibrations: 19/10/2011, 15/11/2012 and 07/11/2013 Meter M2: • Type: ION 7650 • Accuracy class: 0.2% • Serial number: PJ-1009A683-02 • Calibration frequency: Every two years • Last Calibrations: 19/10/2011, 15/11/2012 and 07/11/2013 Meter M5: • Type: ION 7650 • Accuracy class: 0.2% • Serial number: PJ-0911A866-02 • Calibration frequency: Every two years • Last Calibrations: 20/10/2011, 16/11/2012 and 08/11/2013 The last calibration for these meters during the monitoring period was carried out during November 2013, which for the local industry standard is valid for two years (for further details on the calibration dates of primary and redundant meters, please refer to Table C.1 of this report).
Measuring/ Reading/ Recording frequency:	Hourly measurement
Calculation method (if applicable):	For the monitoring period the $Generation_h$ is obtained as follow: $Generation_h = (M1+ M2) - M5$ Electronic measurement system each 15 minutes. Verification procedures were based on redundant energy meters.
QA/QC procedures:	Meter should have a maximum error of 0.2% and are calibrated periodically according to local standards for electricity transactions within the CDEC-SIC. Metering data is sent regularly to CDEC-SIC where a balance is made for energy transactions between power generators. Verification procedures were applied based on redundant energy meters.
Purpose of data:	Calculation of baseline emissions
Additional comment:	

Data / Parameter:	**$COEF_{i, y}$**
Unit:	tCO_2 per mass or volume
Description:	CO_2 emission factor of each plant by fuel type used, taking into account the carbon content of the fuels used by relevant power sources i and percent of oxidation of fuel in year "y"
Measured/ Calculated / Default:	Calculated
Source of data:	2006 IPCC Guidelines and CNE Node Price Reports
Value(s) of monitored parameter:	Please refer to emission factor calculation spreadsheets for Quilleco 2011, 2012 and 2013.
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	Yearly or twice a year
Calculation method (if applicable):	Calculation based on official data from CNE and 2006 IPCC Guidelines. Verification procedure was applied based on historical data per fuel type.
QA/QC procedures:	Internal validation check was performed contrasting historical data for existing plants. For new plants, validation should be accomplished through fuel type normal emission factors form similar plants.
Purpose of data:	Calculation of baseline emissions
Additional comment:	"i" refers to the power sources delivering electricity to the grid, not including low operating cost and must run power plants, and including imports to the grid.

Data / Parameter:	**EF_y**
Unit:	tCO_2e/MWh
Description:	CO_2e Emission factor of the displaced energy from the grid
Measured/ Calculated / Default:	Calculated
Source of data:	Calculated based on formula **f7** of this monitoring report
Value(s) of monitored parameter:	Please refer to emission factor calculation spreadsheets for Quilleco 2011, 2012 and 2013.
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	Calculated based on formula **f7** of this monitoring report Calculation based on official data from CNE s Node Price Report and AM0026 procedures.
QA/QC procedures:	Automatic calculation procedure through a revised worksheet.
Purpose of data:	Calculation of baseline emissions
Additional comment:	

Data / Parameter:	**$EF_{OM,y}$**
Unit:	tCO_2e/MWh
Description:	Operating Margin Emission Factor

Measured/ Calculated / Default:	Calculated
Source of data:	Calculated based on formula **f1** of this monitoring report, using CDEC-SIC data
Value(s) of monitored parameter:	Please refer to emission factor calculation spreadsheets for Quilleco 2011, 2012 and 2013.
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	Calculated based on formula **f1** of this monitoring report, using CDEC-SIC databases and AM0026 procedures.
QA/QC procedures:	Automatic calculation procedure through a revised worksheet. Calculation was done after CDEC-SIC makes the data official (validation)
Purpose of data:	Calculation of baseline emissions
Additional comment:	

Data / Parameter:	**$EF_{i,h}$**
Unit:	tCO_2e/MWh
Description:	Operating Margin Emission Factor of hour "h"
Measured/ Calculated / Default:	Calculated
Source of data:	Calculated based on formula **f2** of this monitoring report, using CDEC-SIC data
Value(s) of monitored parameter:	Please refer to emission factor calculation spreadsheets for Quilleco 2011, 2012 and 2013.
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	Hourly
Calculation method (if applicable):	Calculated based on formula **f2** of this monitoring report, using CDEC-SIC databases and AM0026 procedures.
QA/QC procedures:	Automatic calculation procedure through a revised worksheet. Calculation was done after CDEC-SIC energy balance to ensure data validity.
Purpose of data:	Calculation of baseline emissions
Additional comment:	

Data / Parameter:	**D(j,i)**
Unit:	MWh
Description:	Energy displacement of the marginal plant 'i' due to the proposed CDM project "j"
Measured/ Calculated / Default:	Calculated
Source of data:	Calculated based on formula **f3** of this monitoring report, using CDEC-SIC data
Value(s) of monitored parameter:	Please refer to emission factor calculation spreadsheets for Quilleco 2011, 2012 and 2013.
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	Hourly

Calculation method (if applicable):	Calculated based on formula **f3** of this monitoring report, using CDEC-SIC databases and AM0026 procedures.
QA/QC procedures:	Automatic calculated through a revised worksheet. Calculation was done after CDEC-SIC makes the data official (validation).
Purpose of data:	Calculation of baseline emissions
Additional comment:	

Data / Parameter:	**d_i**
Unit:	tCO_2e/MWh
Description:	Emission factor of the marginal plant "i"
Measured/ Calculated / Default:	Calculated
Source of data:	2006 IPCC Guidelines and CNE node price report
Value(s) of monitored parameter:	Please refer to emission factor calculation spreadsheets for Quilleco 2011, 2012 and 2013.
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	Hourly
Calculation method (if applicable):	Calculated based on formula **f4** of this monitoring report. Calculation based on official data from CNE. Verification procedures were applied based on historical data per fuel type.
QA/QC procedures:	Calculation based on official data
Purpose of data:	Calculation of baseline emissions
Additional comment:	

Data / Parameter:	**SFC_i**
Unit:	Ton/MWh or TJ/MWh
Description:	Specific fuel consumption per unit of electricity produced in the "i^{th}" marginal plant
Measured/ Calculated / Default:	Estimated
Source of data:	CNE node price report
Value(s) of monitored parameter:	Please refer to emission factor calculation spreadsheets for Quilleco 2011, 2012 and 2013.
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	Twice a year
Calculation method (if applicable):	Calculation based on official data from CNE. Verification procedure was applied based on historical data per fuel type.

QA/QC procedures:	Data is obtained from official reports. Historic comparison of each unit can provide data validation for existing and new units in the system. At the first priority, this parameter is obtained using the Yearly Fuel Consumption and the Annual Generation of each power source (information available in CDEC-SIC databases). If this information is not available, is used the Specific Fuel Consumption, presented in CNE node price report. Historic comparison of each unit can provide data validation for existing and new units in the system.
Purpose of data:	Calculation of baseline emissions
Additional comment:	

Data / Parameter:	**M**
Unit:	Number
Description:	Number of electricity generation plants on margin, that would supply to the system in the absence of the CDM projects in the system
Measured/ Calculated / Default:	Estimated
Source of data:	CDEC-SIC data
Value(s) of monitored parameter:	Please refer to emission factor calculation spreadsheets for Quilleco 2011, 2012 and 2013.
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	Hourly
Calculation method (if applicable):	Calculation based on **f2** of this monitoring report, using CDEC-SIC databases and AM0026 procedures
QA/QC procedures:	Electronic worksheet was implemented to deliver automatic calculations through revised worksheet
Purpose of data:	Calculation of baseline emissions
Additional comment:	

Data / Parameter:	**N**
Unit:	Number
Description:	List of CDM plants in the system
Measured/ Calculated / Default:	N/A
Source of data:	CDEC-SIC and UNFCCC registered projects for the country
Value(s) of monitored parameter:	Please refer to emission factor calculation spreadsheets for Quilleco 2011, 2012 and 2013
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	As required
Calculation method (if applicable):	Determined from CDEC-SIC databases
QA/QC procedures:	Data was obtained from official reports

Purpose of data:	Calculation of baseline emissions
Additional comment:	

Data / Parameter:	**C_j**
Unit:	MWh
Description:	Electric energy of the j^{th} CDM project of the system (j = 1,.. , N) in the hour "h"
Measured/ Calculated / Default:	Measured/Calculated
Source of data:	CDEC-SIC
Value(s) of monitored parameter:	Please refer to emission factor calculation spreadsheets for Quilleco 2011, 2012 and 2013.
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	Hourly
Calculation method (if applicable):	Calculated based on CDEC-SIC databases and AM0026 procedures
QA/QC procedures:	Automatic calculation procedure through a revised worksheet. Calculation was done after CDEC-SIC makes the data official (validation)
Purpose of data:	Calculation of baseline emissions
Additional comment:	

Data / Parameter:	**A_i**
Unit:	MW
Description:	Generation capacity of i^{th} plant on margin during hour "h"
Measured/ Calculated / Default:	Measured
Source of data:	CDEC-SIC databases
Value(s) of monitored parameter:	Please refer to emission factor calculation spreadsheets for Quilleco 2011, 2012 and 2013
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	Hourly
Calculation method (if applicable):	Determined from CDEC-SIC databases
QA/QC procedures:	Data was obtained from official CDEC-SIC databases
Purpose of data:	Calculation of baseline emissions
Additional comment:	

Data / Parameter:	**B_i**
Unit:	MWh
Description:	Electric energy of the i^{th} plant on the margin during hour "h"
Measured/ Calculated / Default:	Measured
Source of data:	CDEC-SIC databases

Value(s) of monitored parameter:	Please refer to emission factor calculation spreadsheets for Quilleco 2011, 2012 and 2013
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	Hourly
Calculation method (if applicable):	N/A the parameter is not calculated. Determined from CDEC-SIC databases
QA/QC procedures:	Data was obtained from official CDEC-SIC databases
Purpose of data:	Calculation of baseline emissions
Additional comment:	

Data / Parameter:	**$EF_{BM,y}$**
Unit:	tCO_2e/MWh
Description:	Build Margin Emission Factor of the grid for the year "y"
Measured/ Calculated / Default:	Calculated
Source of data:	Calculated based on formula **f5** of this monitoring report based on CNE Node Price Report and IPCC manual
Value(s) of monitored parameter:	Please refer to emission factor calculation spreadsheets for Quilleco 2011, 2012 and 2013
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	Calculated based on formula **f5** of this monitoring report using CDEC-SIC databases and AM0026 procedures
QA/QC procedures:	Automatic calculation using CDEC-SIC and official databases and CNE Node Price report values
Purpose of data:	Calculation of baseline emissions
Additional comment:	

Data / Parameter:	**$EF_{BM,i}$**
Unit:	tCO_2e/MWh
Description:	Emission Factor for the i^{th} plant in the Build Margin Cohort for the year "y"
Measured/ Calculated / Default:	Calculated
Source of data:	Calculated based on formula **f6** of this monitoring report, based on CNE Node Price Report, IPCC manual, CDEC-SIC databases.
Value(s) of monitored parameter:	Please refer to emission factor calculation spreadsheets for Quilleco 2011, 2012 and 2013
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	Calculated from CDEC-SIC databases and AM0026 procedures.
QA/QC procedures:	Official data was used
Purpose of data:	Calculation of baseline emissions

Additional comment:	

Data / Parameter:	**Gen $_{BM,i}$**
Unit:	MWh
Description:	Energy generation of the i^{th} plan on the Build Margin cohort
Measured/ Calculated / Default:	Estimated
Source of data:	CDEC-SIC databases (for ex-post calculation)
Value(s) of monitored parameter:	Please refer to emission factor calculation spreadsheets for Quilleco 2011, 2012 and 2013
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	Determined from CDEC-SIC databases
QA/QC procedures:	Automatic calculation through a revised worksheet using official CDEC-SIC databases
Purpose of data:	Calculation of baseline emissions
Additional comment:	

Data / Parameter:	**Plant name**
Unit:	Text
Description:	Plant name. Identification of power sources
Measured/ Calculated / Default:	Estimated
Source of data:	CDEC-SIC databases
Value(s) of monitored parameter:	Please refer to emission factor calculation spreadsheets for Quilleco 2011, 2012 and 2013
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	As new power plants are available in the system
Calculation method (if applicable):	Determined from CDEC-SIC databases
QA/QC procedures:	Modify, if a new plant is available in the system
Purpose of data:	Calculation of baseline emissions
Additional comment:	

Data / Parameter:	**CEF_i**
Unit:	TC per ton of fuel or TJ
Description:	Carbon emission factor of fuel used in the i^{th} plant of the Build Margin cohort
Measured/ Calculated / Default:	Calculated
Source of data:	Estimated based on official data form CNE node price reports and IPCC default values

Value(s) of monitored parameter:	Please refer to emission factor calculation spreadsheets for Quilleco 2011, 2012 and 2013
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	Determined from IPCCC guidelines
QA/QC procedures:	Official data was used
Purpose of data:	Calculation of baseline emissions
Additional comment:	

Data / Parameter:	**$Oxid_i$**
Unit:	%
Description:	Fraction of fuel oxidized on combustion
Measured/ Calculated / Default:	Estimated
Source of data:	2006 IPCC Guidelines
Value(s) of monitored parameter:	Please refer to emission factor calculation spreadsheets for Quilleco 2011, 2012 and 2013
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	As required
Calculation method (if applicable):	Determined from 2006 IPCC Guidelines
QA/QC procedures:	Official data was used
Purpose of data:	Calculation of baseline emissions
Additional comment:	

Data / Parameter:	**$SFC_{BM,i}$**
Unit:	ton of fuel /MWh or TJ of fuel /MWh
Description:	Specific fuel consumption of the i^{th} electricity generation plant
Measured/ Calculated / Default:	Estimated
Source of data:	CNE Node Price Report and CDEC-SIC
Value(s) of monitored parameter:	Please refer to emission factor calculation spreadsheets for Quilleco 2011, 2012 and 2013
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	Yearly or twice a year
Calculation method (if applicable):	Determined from 2006 IPCC Guidelines and official data form CNE Node Price Reports
QA/QC procedures:	Internal validation check was performed contrasting historical data for existing plants. For new plants, validation should be accomplished through fuel type normal emission factors for similar plants.
Purpose of data:	Calculation of baseline emissions

Additional comment:	

Data / Parameter:	w_{BM}
Unit:	%
Description:	Weight for Build Margin emission factor
Measured/ Calculated / Default:	Default
Source of data:	AM0026 default value = 50%
Value(s) of monitored parameter:	50%
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	N/A the parameter is not calculated
QA/QC procedures:	Official data was used
Purpose of data:	Calculation of baseline emissions
Additional comment:	

Data / Parameter:	w_{OM}
Unit:	%
Description:	Weight for Operating Margin emission factor
Measured/ Calculated / Default:	Default
Source of data:	AM0026 default value = 50%
Value(s) of monitored parameter:	50%
Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	N/A the parameter is not calculated
QA/QC procedures:	Official data was used
Purpose of data:	Calculation of baseline emissions
Additional comment:	

Data / Parameter:	**Changes in the regulatory framework that could affect the methodology**
Unit:	Text
Description:	Changes in the regulatory framework that could affect the methodology
Measured/ Calculated / Default:	N/A
Source of data:	Official Gazette
Value(s) of monitored parameter:	N/A. There has not been any change in the regulatory framework during the monitoring period.

Monitoring equipment:	N/A
Measuring/ Reading/ Recording frequency:	As required
Calculation method (if applicable):	N/A
QA/QC procedures:	Official data was used
Purpose of data:	Calculation of baseline emissions Calculation of project emissions Calculation of leakage
Additional comment:	

D.3. Implementation of sampling plan

>>N/A

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

>> The Central Interconnected System (SIC) is coordinated by an independent entity called Economic Load Dispatch Centre (CDEC-SIC). The CDEC-SIC is responsible for optimal operation of the system based on the principle of lowest marginal costs.

The outcome is the hourly dispatch program and marginal cost for each power unit. The CDEC must coordinate in real time the dispatch at minimum cost of the power units according to the weekly programs. The weekly priority program Excel sheet contains a daily dispatch program which has three hour blocks: from hour 0 to 8, from 9 to 18, and from 19 to 24.

The CDEC-SIC publishes daily reports of the actual operation of the SIC, including the hourly generation for each power unit. This information is provided by CDEC-SIC and is available through its website at a subscription fee.

In addition, CDEC-SIC publishes an Annual Report with fuel consumption of the mayor power units. On the other hand, the National Energy Commission (CNE) publishes every six months the Node Price Report, with the specific fuel consumption of most of the power units and the indicative expansion plan of the system. The information is publicly available at www.cne.cl.

Project emission reductions are calculated as a combined margin emission factor (CM), consisting of the weighted average of an operating margin (OM) and a build margin (BM), following AM0026 (v.2) approved methodology.

The OM emission factor from the project activity depends on the actual power generation data from the SIC. The dispatch data, obtained from the Economic Load Dispatch Centre (CDEC-SIC), conclusively indicates the type of generation displaced by the addition of Quilleco in the SIC generation mix. The monitoring and verification plan for the project uses the data provided by CDEC-SIC.

The BM emission factor is determined as option (i) in AM0026 v2.

The calculation of the project emissions reduction requires gathering and analyzing a considerable quantity of data for the estimation of the emission factor.

The amount of analyzed and processed data, and the complex procedures to be followed, do not allow a simple and expedite emission factor estimation. Then, in order to make the emissions reduction estimation accessible and efficient, the Project Participant has scheduled a Mathematical Tool for the Emissions Factor Calculation in Microsoft Office Excel. This Mathematical Tool permits qualified personnel to conduct ex-ante and ex-post emissions factor estimations based on available data.

In general terms, the procedure executed by the Emission Factor Calculation Mathematical Tool consider the following stages:

1. Data Acquisition
2. Operational Margin Emission Factor Calculation
3. Building Margin Emission Factor Calculation
4. Combined Margin Emission Factor Calculation

The first stage of the procedure consists on gathering the required information for the emissions factor estimation. The data to be gathered for every period is the energy generated and general data of all power plants of the system, the dispatch priority, fuel consumptions and information associated to the different fossil fuels used. This information is uploaded in the Mathematical Tool and its sources verified prior to its use.

The second, third and four stage of the estimation use the information previously uploaded, following the estimation procedures stated in the approved baseline and monitoring methodology AM0026 v2.

Finally, and using the Mathematical Tool, the emissions reductions associated to the operation of the project activity are calculated.

The following steps represent a description of the emissions reduction estimation associated to the project, which are applied in the Mathematical Tool with Microsoft Office Excel.

Operating Margin calculation

The operating margin emission factor is calculated as follows:

$$EF_{OM,y} = \frac{\sum_{h=1}^{H} EF_{j,h} \bullet Generation_{j,h}}{\sum_{h=1}^{H} Generation_{j,h}} \quad \textbf{(f1)}$$

Where,

$EF_{j,h}$	Operating margin Emission factor for proposed CDM project 'j' for hour 'h', expressed in tCO_2/MWh,
$Generation_{j,h}$	Generation of proposed CDM project 'j' during hour 'h', expressed in MWh,
H	Total number of hours of the year 'y'.

The emission factor for any hour 'h' for a CDM project 'j' in system is estimated as weighted average of emission factor of the identified marginal plant(s) that would have supplied electricity to the grid in absence of the jth CDM plant. The emission factor is estimated as follows:

$$EF_{j,h} = \sum_{i=1}^{M} D(j,i) \bullet d_i \Big/ \sum D(j,i) \quad \textbf{(f2)}$$

Where,

D(j,i) Energy displacement of the marginal plant 'i' due to the proposed CDM project 'j', expressed in MWh,

d_i Emission factor of the marginal plant 'i', expressed in tCO_2/MWh,

M M is the total number of marginal plants that would be dispatched if the system is operated without the N CDM projects.

Energy displacement of the marginal plant 'i' due to the proposed CDM project 'j', is calculated as follows:

$$D(j,i) = MIN\left\{C_j - \sum_{l=1}^{i-1} D(j,l); (A_i - B_i) - \sum_{k=j+1}^{N} D(k,i)\right\} \quad \textbf{(f3)}$$

Where,

Ai Maximum energy generation of the marginal plant 'i' expressed in MWh/h (equivalent to plant capacity in MW),

Bi Actual Energy generation of the CDM marginal plant 'i' expressed in MWh/h,

Cj Energy generation of the CDM project 'j' expressed in MWh/h,

N Total number of CDM projects in the system,

M Total number of additional marginal plants that should be dispatched if the system is operated without the N CDM projects.

Where,

$D(j,0) = 0$ and $D(N+1,i) = 0$

$D(j,i) = 0$ for all i<m, s.t. $\sum_{i=1}^{m}(A_i - B_i) > \sum_{k=j+1}^{N} C_k$

$D(j,i) = 0$ for all i>m*, s.t. $\sum_{i=1}^{m^*}(A_i - B_i) > \sum_{k=j+1}^{N} C_k + C_j$

d_i, the emission factor for displaced marginal plant, is estimated as follows:

$$d_i = SFC_i \bullet CEF_{OM,i} \bullet Oxid_i \quad \textbf{(f4)}$$

Where,

SFC_i Is the specific fuel consumption of i^{th} marginal power plant, expressed as (ton of fuel or TJ)/MWh,

$CEF_{OM,i}$ Is the CO_2 emission factor of fuel used in i^{th} marginal power plant, expressed as tCO_2/ (ton of fuel or TJ),

$Oxid_i$ Is fraction of carbon in fuel, used in i^{th} marginal plant, oxidized during combustion.

The marginal plant(s) are those power plants listed in the top of the grid dispatch order during hour 'h', required to meet the electricity demand at the hour "h" without the generation of CDM project(s). If no thermal power plants are needed to meet the demand without the CDM projects, then the emission factor of the marginal plant is zero.

The generation of Quilleco power plant is obtained from the metering system which follows a national standard of 0.2% error allowance on a KWh base. Hourly energy data obtained from the metering system is submitted to CDEC-SIC every two hours as for all other generation units of the system.

All the information required for this calculations is obtained from the CDEC-SIC's Official Annual Report, published on years 2010, 2011 and 2012 (with operations statistical data from 2009, 2010 and 2011 respectively), the semi-annual Node Price Report from CNE for April and October of years 2009, 2010 and 2011, the CNE's National Energy Balance for years 2009, 2010 and 2011 and the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Finally, $EF_{OM,2011}$ = 0.62610 tCO_2/MWh

$EF_{OM,2012}$ = 0.68240 tCO_2/MWh

$EF_{OM,2013}$ = 0.40970 tCO_2/MWh

Build Margin calculation

$$EF_{BM} = \frac{\sum_{i=1}^{L} EF_{BM,i} \bullet Gen_{BM,i}}{\sum_{i=1}^{L} Gen_{BM,i}} \qquad \textbf{(f5)}$$

Where,

L — Group of electricity generation plants that compromise 20% of the system generation (in MWh) and that have been built most recently. Power plant capacity additions registered as CDM project activities should be excluded from the sample group ***L***,

$EF_{BM,i}$ — Emission factor of i^{th} electricity generation plant in the build margin, expressed in tCO_2/MWh,

$Gen_{BM,i}$ — Projected generation for the i^{th} electricity generation plant included in the build margin, expressed in MWh.

$$EF_{BM,i} = SFC_{BM,i} \bullet CEF_{BM,i} \bullet Oxid_i \qquad \textbf{(f6)}$$

Where,

$SFC_{BM,i}$ — Specific fuel consumption of the i^{th} electricity generation plant, expressed in ton of fuel /MWh or TJ of fuel/MWh. The data shall be taken from published data of electricity regulatory authority,

$CEF_{BM,i}$ — CO_2 content of fuel used in i^{th} electricity generation plant, expressed as tCO_2/(ton of fuel or TJ of fuel),

$Oxid_i$ — Fuel oxidation factor, expressed as fraction.

Finally,

$EF_{BM,2011}$ = 0.66458 tCO_2/MWh

$EF_{BM,2012}$ = 0.73828 tCO_2/MWh

$EF_{BM,2013}$ = 0.75976 tCO_2/MWh

Combined Emission Factor calculation

The combined emission factor for the proposed Chacabuquito project, according to AM0026 v2.0, is calculated with the weighted average for both the Operating Margin (OM) and the Build Margin (BM) as follows:

$$EF_y = w_{OM} \bullet EF_{OM,y} + w_{BM} \bullet EF_{BM,y} \quad \textbf{(f7)}$$

Where,

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

w_{OM} 0.5 Weight for operating margin emission factor,

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

w_{BM} 0.5 Weight for build margin emission factor.

Parameter	2011	2012	2013
EF_{BM} (tCO_2/MWh)	0.66458	0.73828	0.75976
w_{BM}	0.5	0.5	0.5
$EF_{OM,}$ (tCO_2/MWh)	0.62610	0.68240	0.40970
w_{OM}	0.5	0.5	0.5
EF_{CM} (tCO_2/MWh)	0.64534	0.71034	0.58473

Baseline emissions calculation

The baseline emissions for the project are calculated as follows:

$$BE_y = EF_y * Generation_y \quad \textbf{(f8)}$$

Where,

EF_y Baseline emission factor, in tCO_2/MWh,

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

Following the formula $Generation_y$ = (M1 +M2) – M5

$Generation_{y,2011}$ = 22,174 MWh – 232 MWh = 21,942 MWh

$Generation_{y,2012}$ = 326,551 MWh – 2,882 MWh = 323,669 MWh

$Generation_{y,2013}$ = 297,324 MWh – 2,878 MWh = 294,446 MWh

$$BE_{y,2011} = 0.64534\ tCO_2/MWh * 21,942\ MWh = 14,160\ tCO_2e$$

$$BE_{y,2012} = 0.71034\ tCO_2/MWh * 323,669\ MWh = 229,915\ tCO_2e$$

$$BE_{y,2013} = 0.58473\ tCO_2/MWh * 294,446\ MWh = 172,171\ tCO_2e$$

$$BE_y = 14,160\ tCO_2e + 229,915\ tCO_2e + 172,171\ tCO_2e = 416,246\ tCO_2e$$

For further details on emission reductions calculation please refer to the emission reductions calculation spreadsheet.

E.2. Calculation of project emissions or actual net GHG removals by sinks

>> Since the Quilleco Hydroelectric Project consists of a run-off river power plant without reservoir, there are no Project Emissions (*PEy*).

E.3. Calculation of leakage

>> According to the applied methodology AM0026 version 02 and the registered PDD, leakages are not considered in this project.

E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks

Item	Baseline emissions or baseline net GHG removals by sinks (t CO_2e)	Project emissions or actual net GHG removals by sinks (t CO_2e)	Leakage (t CO_2e)	Emission reductions or net anthropogenic GHG removals by sinks (t CO_2e)
2011	14,160	0	0	14,160
2012	229,915	0	0	229,915
2013	172,171	0	0	172,171
Total	416,246	0	0	416,246

E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (t CO_2e)	358,975	416,246

E.6. Remarks on difference from estimated value in registered PDD

>>Hydroelectric projects are highly dependent to the annual hydrology level, so the annual electricity generation is subject to significant changes from year to year.

The ex-ante energy generation declared in the PDD was of 422,000 MWh/year. Considering that the current monitoring period has 761 days, the proportional ex-ante energy generated should be 879,841 MWh (for the period from 01/12/2011 to 31/12/2013). However, during this period the actual energy generated was 640,057 MWh, which is 27% lower than the ex-ante PDD estimation, due to the poor hydrologic condition faced in the project region during the last four years.

On the other hand, the ex-ante PDD emission factor is 0.408 tCO_2/MWh, which is lower than the emission factor calculated ex-post for years 2011, 2012 and 2013 (0.64534, 0.71034 and 0.58473 tCO_2e/MWh respectively).

This higher carbon intensity of the emission factor is also a consequence of the poor hydrologic conditions reflected on the OM, with part of the hydroelectric power generation being replaced by thermal power plants, and a higher BM than the ex-ante PDD calculation:

EF	Ex-ante calculation (average data from 2002 to 2006)	2011	2012	2013
BM	0.298	0.665	0.738	0.760
OM	0.517	0.626	0.682	0.410
CM	0.408	0.645	0.710	0.585

This increase of the BM is due to the inclusion of new coal and petcoke based power plants with high installed capacities (more than 250 MW) to the electricity system for the subsequent years, such as Santa María (coal), Bocamina 2 (coal) or Campiche (petcoke). Additionally, most of the renewable power plants added to the grid in the last few years were registered as CDM projects, and then its zero emissions energy generation is excluded from the ex-post BM calculation.

Therefore, and even though the project activity produced a lower amount of energy generation than the estimated on the PDD, the increase on the emission factor offset this effect and produced a net increase on the final emission reductions for the whole period.

E.7. Actual emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards

Item	Actual values achieved up to 31 December 2012	Actual values achieved from 1 January 2013 onwards
Emission reductions or GHG removals by sinks (t CO_2e)	244,075	172,171

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Appendix 1. Contact information of project participants and responsible persons/ entities

Project participant and/or responsible person/ entity	Responsible person/ entity for completing the CDM-MR-FORM
Organization name	Colbún S.A.
Street/P.O. Box	Avenida Apoquindo 4775, 11th Floor
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Document information

Version	*Date*	*Description*
04.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from *F-CDM-MR* to *CDM-MR-FORM*; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net anthropogenic GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	28 May 2010	EB 54, Annex 34. Initial adoption.

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