

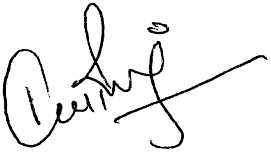


**Validation report form for renewal of crediting period for
CDM project activities
(Version 02.0)**

Complete this form in accordance with the instructions attached at the end of this form.

BASIC INFORMATION

Title and UNFCCC reference number of the project activity	Chacabuquito Hydroelectric Power Project UNFCCC ref #: 1052
Number and duration of the next crediting period	3 rd crediting period 04/11/2018 to 03/11/2025 (both days included)
Version number of the validation report for RCP	01
Completion date of the validation report for RCP	11/09/2018
Version number of PDD to which this report applies	2.0
Project participants	Colbun S.A.; Government of Sweden - Swedish Energy Agency; GDF Suez; Electrabel S. A.; Netherlands' Ministry of Infrastructure and the Environment (IenM); Netherlands' Ministry of Economic Affairs, Agriculture and Innovation (EL&I); Deutsche Bank AG; Government of Norway - Ministry of Foreign Affairs; Norsk Hydro ASA; Statoil ASA; Government of Canada - Ministry of Foreign Affairs and International Trade (withdrawn); Government of Finland - Ministry of Foreign Affairs; Fortum Corporation; Chubu Electric Power Co., Inc. (withdrawn); The Chugoku Electric Power Co., Inc. (withdrawn); Japan International Cooperation Agency (JICA); Kyushu Electric Power Co., Inc.; MIT Carbon Fund Co., Ltd. (MIT) (withdrawn); Mitsubishi Corporation (withdrawn); Shikoku Electric Power Co., Inc.; Tohoku Electric Power Co. Inc.; The Tokyo Electric Power Co., Inc; Mitsui & Co., Ltd (withdrawn).
Host Party	Chile
Applied methodologies and standardized baselines	AM0026: Methodology for zero-emissions grid-connected electricity generation from renewable sources in Chile or in countries with merit order based dispatch grid --- Version 3.0
Mandatory sectoral scopes linked to the applied methodologies	Sectoral Scope 1 (Energy Industries - Renewable Sources)
Conditional sectoral scopes linked to the applied methodologies	N/A
Estimated amount of annual average GHG emission reductions or GHG	86,905 tCO ₂ e

removals by sinks in the next crediting period	
Name and UNFCCC reference number of the DOE	Earthood Private Services Limited (ESPL) (ref # E-0066)
Name, position and signature of the approver of the validation report for RCP	 Dr. Kaviraj Singh Managing Director

SECTION A. Executive summary**Brief summary of the project activity**

The project activity consists on the installation of a run-of-river hydro power plant with effective installed capacity of 28.872 MW (given by the sum of generators' capacity). The turbines installed capacity is 30 MW. The project activity reduces the GHG emission due to generation of clean and renewable energy to be dispatched to the Chilean Power Grid (SIC¹ – Central Interconnected System) displacing the carbon intensive electricity available in the Grid.

Project is located 100km of the capital City Santiago, in the city of Los Andes, V Región of Valparaíso, Chile.

The main equipment of the PA is the following:

Turbines

	Unit	Value
Brand	-	VA Tech Hydro
Quantity	Number	4
Type	-	Francis Horizontal
Serial #s		1956; 1957; 1958; 1959
Nominal Power	MW	7.5 (each) 30 (total)
Head	m	134.48
Flow	m ³ /s	6.25

Generators

	Unit	Value
Brand	-	AVK
Quantity	Number	4
Type	-	Synchronous
Serial #s		8324653A102 8324653A202 8324653B102 8324653B202
Power capacity	kVA	8,020 (each)
Cos ϕ	-	0.9
Power Capacity	MW	7.218 (each) 28.872 (total)

Scope of validation

Colbun S.A. has contracted Earthood Services Private Limited to conduct the renewal of crediting period for the CDM project activity "Chacabuquito Hydroelectric Power Project" for the period from 04/11/2018 to 03/11/2025 (both days included).

¹ From December 2017 the SIC (National Interconnected System) was connected to the SING (Great North Interconnected System) which generated only one system in Chile called SEN (National Electric System)

The validation of the renewal of the crediting period is the independent review of the current characteristics of the project activity.

The scope of the validation is to establish/verify that:

- The project is in accordance with requirements of the CDM Project Standard for Project Activities version 01.0^{/1/}.
- The update of the applied methodology is in accordance with CDM Large-Scale Methodology AM0026 – Methodology for zero-emissions grid-connected electricity generation from renewable sources in Chile or in countries with merit order based dispatch grid – version 3.0^{/2/}
- The validation is in accordance with requirements of CDM methodological tool “Assessment of the validity of the original / current baseline and update of the baseline at the renewal of the crediting period” version 3.0.1^{/3/}

The validation of this crediting period is based on the registered PDD^{/5/}, revised PPD^{/6/} and estimated GHG emission reduction Calculations^{/7/}.

SECTION B. Validation team, technical reviewer and approver

B.1. Validation team member

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)	Involvement in			
						Desk/document review	On-site inspection	Interview(s)	Validation findings
1.	Team Leader	EI	Sebben	Marcelo	ESPL	x	x	x	x
2.	Validator	EI	Sebben	Marcelo	ESPL	x	x	x	x
3	Technical Expert	EI	Sebben	Marcelo	ESPL	x	x	x	x
4	Local Expert	EI	Sebben	Marcelo	ESPL	x			x

B.2. Technical reviewer and approver of the validation report for RCP

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)
1.	Technical reviewer	EI	Cruz	Sergio	ESPL
2.	Expert to TR	EI	Cruz	Sergio	ESPL
3.	Final Approver	IR	Singh	Kaviraj	ESPL

SECTION C. Means of validation

C.1. Desk/document review

The validation of the renewal is performed primarily as a desk review of the documents submitted at various stages of assessments. The review is performed by assessment team using dedicated protocols (checklists). The assessment team cross checks the information provided in the documents (PDD) and information from sources other than those used, if available, and conducts independent background investigations.

ESPL conducted a desk review, as under:

- a. a review of the PDD (as described in registered PDD), the monitoring methodology including applicable tool(s) and, where applicable, the applied standardized baseline, paying particular attention to the frequency of measurements, the quality of metering equipment including calibration requirements, and the quality assurance and quality control procedures
- b. a review of ex ante calculations and assumptions made in determining the GHG data and emission reductions;
- c. 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

A complete list of documents/evidences reviewed is included as Appendix 3.

C.2. On-site inspection

Duration of on-site inspection: 25/06/2018 to 26/06/2018				
No.	Activity performed on-site	Site location	Date	Team member
1.	Opening Meeting: Introduction, scope and objective of work, roles and responsibilities of audit team, resources required, and timetable of the onsite audit including venue for closing meeting and any concerns from PP.	Santiago	25/06/2018	Marcelo Sebben
2.	Project Activity (Technology, Location and Implementation)	Santiago	25/06/2018	Marcelo Sebben
3.	Project boundary and emission sources included in the project boundary.	Santiago	25/06/2018	Marcelo Sebben
4.	Baseline identification	Santiago	25/06/2018	Marcelo Sebben
5.	Parameter fixed Ex-ante and Baseline emissions, Project emissions and Leakage calculation	Santiago	25/06/2018	Marcelo Sebben
6.	Monitoring plan (feasibility of monitoring arrangements described in PDD, QA/QC procedures, responsibility of implementation of monitoring plan, data recording & storage procedures)	Santiago	25/06/2018	Marcelo Sebben
7.	Operational lifetime of the project activity, Start date of the project activity, Crediting period	Santiago	25/06/2018	Marcelo Sebben
8.	Travel to Los Andes and Physical inspection of the site AND Substation connecting the grid	Los Andes	26/06/2018	Marcelo Sebben
9.	Compilation of the findings by Auditor/s (CARs/CLs)	Santiago	26/06/2018	Marcelo Sebben
10.	Closing Meeting: Submission of the audit findings to the client and agreement on the issues raised and agreement on timelines.	Santiago	26/06/2018	Marcelo Sebben

C.3. Interviews

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	Reyes	Paula	Colbún	25/06/2018	Project Description ER calculations	Marcelo Sebben
2.	Mosella	Cristián	Colbún	25/06/2018	Project Description Project History	Marcelo Sebben
3.	Barrales	Patricio	WSP	25/06/2018	EF _{grid} Calculations PDD description	Marcelo Sebben
4.	Farah	Maria Luz	WSP	25/06/2018	EF _{grid} Calculations PDD description	Marcelo Sebben
5.	Alvarado	Marna	Colbún	26/06/2018	Health and Safety; Trainings; Personnel Capacitation;	Marcelo Sebben
6.	Arancibia	Javier	Colbún	26/06/2018	Operation and Maintenance of Power plant	Marcelo Sebben

C.4. Sampling approach

No sampling plan has been used to conduct the validation of the renewal of the crediting period of this project activity.

C.5. Clarification requests (CLs), corrective action requests (CARs) and forward action requests (FARs) raised

Area of validation findings	No. of CL	No. of CAR	No. of FAR
Compliance with PDD form	1		
Application and selection of methodologies and standardized baselines			
Validity of original baseline or its update	1		
Estimated emission reductions or net anthropogenic removals	1	1	
Validity of monitoring plan			
Crediting period			
Project participants			
Post-registration changes			
Others (please specify)			
Total	3	1	

SECTION D. Validation findings**D.1. Compliance with PDD form**

Means of validation	The validation team check whether the PP applied the latest available version of the CDM PDD form. Moreover, the team check whether these forms were filled as per “Instructions for completing the forms” available in the form templates. It has been observed that the PDD has missing information in accordance with instructions for completing the PDD. Thus a CL has been raised.
Findings	CL 1 <i>PDD section A.3. The PDD is not filled as per instructions for completing the PDD form as it does not contain:</i>

	<ol style="list-style-type: none"> 1. A list of the facilities, systems and equipment that will be installed and/or modified by the project activity 2. The arrangement of the facilities, systems and equipment; 3. The monitoring equipment and their location in the systems; 4. For the facilities, systems and equipment that are being modified and/or installed under the project activity, provide information on: <ol style="list-style-type: none"> a. The age and average lifetime of the equipment based on the manufacturer's specifications and industry standards; b. installed capacities, load factors and efficiencies;
Conclusion	The PP has applied the latest template of the PDD. The instructions for completing each form was duly followed and all findings were closed.

D.2. Application and selection of methodologies and standardized baselines

Means of validation	<p>The validation team checked whether the PP applied the latest version of the methodology available. Moreover, all applicability criteria was assessed. The applied methodology is the AM0026: "Methodology for zero-emissions grid-connected electricity generation from renewable sources in Chile or in countries with merit order based dispatch grid" (version 3.0), which is the latest version available.</p> <p>The applicability of this methodology is as follows:</p> <ol style="list-style-type: none"> 1. <i>Projects that are renewable electricity generation projects types Run-of-river hydro power plants and hydro electric power projects with existing reservoirs where the volume of the reservoir is not increased:</i> The PA is a run-of-river hydroelectric plant thus, in accordance with this requirement. 2. <i>Project are new hydro electric power projects with reservoirs having power densities (installed power generation capacity divided by the surface area at the full reservoir level) greater than 4 W/m².</i> The project is run-of-river, thus with no reservoir. 3. <i>Projects that are connected to the interconnected grids of the Republic of Chile and Projects that fulfils all the legal obligations under the Chilean Electricity Regulation.</i> This project is connected to the interconnected grid of the Republic of Chile – SIC and fulfills the national electric regulations. 4. <i>PA does not involve switching from fossil fuels to renewable energy sources at the site of the project activity nor biomass fired power plants/units.</i> Project is a greenfield run-of-river hydro power plant. Thus, it does not involve fuel switching. 5. <i>The methodology is not applicable to project activities that involve switching from fossil fuels to renewable energy at the site of the project activity, and if the baseline is the continued use of fossil fuels at the site.</i> The PA is a run-of-river hydropower plant and it does not involve switching from fossil fuels to renewable energy neither its baseline is the continued use of fossil fuels. <p>PA complies with all applicability conditions of applying tools.</p>
Findings	-
Conclusion	All applicability conditions have been duly reported in the revised PDD and the project activity meets all of them.

D.3. Validity of original baseline or its update

Means of validation	The validation team checked whether the applied baseline is still valid in the update PDD.
----------------------------	--------------------------------------------------------------------------------------------

The baseline scenario is still valid for this next crediting period and it is given by the applied methodology: "Electricity delivered to the grid by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the Combined margin (CM) calculations"

As this process refers to the renewal of crediting period of the PA, the validity of the original baseline or its update was carried out through an assessment as per "Assessment of the validity of the original/ current baseline and update of the baseline at the renewal of the crediting period" as follows:

Step 1: Assess the validity of the current baseline for the next crediting period:

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies

The current baseline scenario complies with all relevant mandatory National/sectoral legislation^{/14/}

Step 1.2: Assess the impact of circumstances

As the baseline scenario identified at the validation of the project activity was the continuation of the current practice without any investment the PP informed that there was no changes in the Market characteristics that affect the Project activity.

The conditions used to determine the baseline emissions in the previous crediting period are still valid. It was not observed the availability of new fuels or raw materials in the power plants connected to the grid, neither significant variation of prices in the power generation.

Step 1.3: Assess whether the continuation of use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested.

The baseline scenario is not the continuation of use of current baseline equipment. The PA consists in the installation of a greenfield hydro power plant where no power plant was installed before. Thus, this step is not applied.

Step 1.4: Assessment of the validity of the data and parameters:

According to the tool for assess the validity of baseline, emission factors and values that were determined only once at the start of crediting period shall be updated. In this case, the project proponents updated the EF_{OM} and consequently the EF_{CM} (EF_{BM} remained fixed for the 3rd crediting period as required by the "tool to calculate the emission factor for an electricity system" v.06.0). The emission factor weights (w_{BM} and w_{OM}) also remained fixed as required by the same tool for the 3rd crediting period. All parameters used to calculate the EF_{BM} were excluded from the fixed parameters (section B.6.2 of the PDD) as this parameter was not calculated for this crediting period.

As the step 1.4 above is applicable, the step 2 was followed.

Step 2: Update the current baseline and the data and parameters

Step 2.1: Update the current baseline

The baseline emissions were updated accounting the revision of the parameters that will remain fixed for the next crediting period.

Step 2.2: Update the data and parameters

	<p>The parameters fixed for the crediting period are described below.</p> <ul style="list-style-type: none"> - $EF_{BM,y}$: Build Margin Emission factor. This value was the same as calculated in the previous crediting period as per “tool to calculate the emission factor for an electricity system” v.06.0, considering that this is the renewal for the 3rd crediting period. - W_{BM}: weight for build margin emission factor: this value was fixed and defined by the “tool to calculate the emission factor for an electricity system” v.06.0 for the 3rd CP. - W_{OM}: weight for operating margin emission factor: this value was fixed and defined by the “tool to calculate the emission factor for an electricity system” v.06.0 for the 3rd CP. - <p>The following findings were raised in this concern</p>
Findings	<p>CL 02:</p> <p><i>PDD section B.4.step 2.1 information was not given as per requirements of the methodological tool “Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period” version 03.0.1.</i></p>
Conclusion	<p>The application of Steps 1.1, 1.2, 1.3 and 1.4 above confirmed that the current baseline emissions as well as data and parameters that are not monitored during the crediting period needed to be updated for the subsequent crediting period. Thus, the steps 2.1 and 2.2 were also applied. So, according to the CDM Tool “Assessment of the validity of the original/current baseline and to update the baseline at the renewal of a crediting period”^{3/} the baseline was updated and it is valid for the next crediting period. And therefore, no impact in the baseline scenario was observed.</p>

D.4. Estimated emission reductions or net anthropogenic removals

Means of validation	<p>All the equations used to calculate the ERs are in accordance with the applied methodology, revised PDD and respective tools</p> <p>The baseline emissions are calculated by the following formula:</p> $BE_y = Generation_y \times EF_y$ <p>Where:</p> <ul style="list-style-type: none"> • BE_y: Baseline emissions in year y; • $Generation_y$: electricity exported to the grid by the proposed CDM project in year y; • EF_y: Baseline emission factor for year y. <p>EF_y corresponds to combined margin emission factor (EF_{CM}) calculated as per equation below:</p> $EF_y = EF_{OM} \cdot w_{OM} + EF_{BM} \cdot w_{BM}$ <p>Where</p> <ul style="list-style-type: none"> • EF_{OM}: operating margin emission factor calculated as per applied methodology AM0026 version 3 • EF_{BM}: build margin emission factor determined in the previous CP and kept fixed for this CP as per “tool to calculate emission factor for an electricity system” • w_{OM} and w_{BM}: operating and build margin weights determined by “Tool to calculate emission factor for an electricity system” <p>No project or leakage emissions are to be accounted for this project activity as per applied methodology.</p>
----------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

CDM-ROF-Form

	<p>So: PE_y and $LE_y = 0$.</p> <p>As the source of the value of the parameter Generation_y was not evidenced, a CL has been raised.</p> <p>Moreover, issues could be observed in the Grid Emission factor calculation, thus a CAR has been raised.</p>															
Findings	<p>CL 3</p> <p><i>It is not clear the source of the value of the parameter Generation_y used in the ER estimations for the CP</i></p> <p>CAR 1</p> <p><i>EF Calculation Excel:</i></p> <p><i>Tab "Fuels data": It is not clear why the NCV of butane gas, propane gas and butane/propane are being a result of a multiplication by the conversion factor of liquid fuels (E21) instead of gaseous fuels (E22)</i></p>															
Conclusion	<p>After the findings resolution the validation team attests that:</p> <ul style="list-style-type: none">- all relevant assumptions and data are listed in the project description, including their references and sources- All data and parameter values used in the project description are considered reasonable in the context of the project- All estimates of the baseline emissions can be replicated using the data and parameter values provided in the project description <p>The quantification of GHG emission reductions were determined in accordance with applied methodology and tools.</p> <p>A summary of BE, PE and LE can be seen below:</p> <table><tr><th>Period</th><th>BE(tCO₂e)</th><th>PE(tCO₂e)</th><th>LE(tCO₂e)</th><th>ERs (tCO₂e)</th></tr><tr><td>yearly</td><td>86,905</td><td>0</td><td>0</td><td>86,905</td></tr><tr><td>Total for the CP (7 years)</td><td>608,335</td><td>0</td><td>0</td><td>608,335</td></tr></table>	Period	BE(tCO ₂ e)	PE(tCO ₂ e)	LE(tCO ₂ e)	ERs (tCO ₂ e)	yearly	86,905	0	0	86,905	Total for the CP (7 years)	608,335	0	0	608,335
Period	BE(tCO ₂ e)	PE(tCO ₂ e)	LE(tCO ₂ e)	ERs (tCO ₂ e)												
yearly	86,905	0	0	86,905												
Total for the CP (7 years)	608,335	0	0	608,335												

D.5. Validity of monitoring plan

Means of validation	<p>The following parameters will be fixed for the whole monitoring period.</p> <ul style="list-style-type: none"> - - $EF_{BM,y}$: Build Margin Emission factor. Value applied: 0.4481 tCO₂e/MWh - W_{BM}: weight for build margin emission factor: 75% - W_{OM}: weight for operating margin emission factor: 25% <p>The following parameters are to be monitored during this 3rd crediting period:</p> <ul style="list-style-type: none"> - EF_{OM}: operating margin emission factor (tCO₂e/MWh): this parameter will be calculated as per applied methodology AM0026 version 3 using the most recent public available data from National Electric Coordinator (from Spanish: Coordinador Electrico Nacional). Values estimated for this renewal used latest available data (2016) - $EF_{j,h}$: Emission factor for the proposed CDM project "j" for hour "h" (tCO₂e/MWh): this parameter will be calculated as per applied methodology AM0026 version 3 using the most recent public available data from National Electric Coordinator (from Spanish: Coordinador Electrico Nacional) . Values estimated for this renewal used latest available data (2016)
----------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

- **Generation_y: Electricity exported to the grid by the proposed CDM project in the year y (MWh):** the parameter will be monitored continuously through the difference of two electricity meters (M2 – M3) in the substation which is the connection point with the National Grid (Substation Totoralillo). The generated electricity will be cross-checked against data provided by National Electric Coordinator who uses data measured by electricity meter M1 located in the Power plant. The meters used are standard and regulated as per national standards ^{/18-f/}. Their calibration is determined by the same regulations and are under control of the PP. For this renewal phase, the estimated value for this parameter was not evidenced, thus a CL has been raised. Refer to CL 3 above.
- **$D_{(j,i)}$: Energy displacement of the marginal plan “i” due to proposed CDM project “j” (MWh):** this parameter will be determined hourly as per applied methodology AM0026 version 3 using the most recent public available data from National Electric Coordinator (from Spanish: Coordinador Electrico Nacional) . Values estimated for this renewal used latest available data (2016)
- **d_j : Emission factor for the electricity displaced $D_{(j,i)}$ (tCO₂e/MWh):** this parameter will be determined hourly as per applied methodology AM0026 version 3 using the most recent public available data from National Electric Coordinator (from Spanish: Coordinador Electrico Nacional) . Values estimated for this renewal used latest available data (2016)
- **M : Number of power plants on the margin that would supply to the grid in the absence of the CDM projects of the system (Number):** this parameter will be determined hourly as per applied methodology AM0026 version 3 using the most recent public available data from National Electric Coordinator (from Spanish: Coordinador Electrico Nacional) . Values estimated for this renewal used latest available data (2016)
- **A_i : Generation capacity of the “i” power plant on the margin during hour h (MWh):** this parameter will be determined hourly as per applied methodology AM0026 version 3 using the most recent public available data from National Electric Coordinator (from Spanish: Coordinador Electrico Nacional) . Values estimated for this renewal used latest available data (2016)
- **B_i : Electricity generated by the “i” power plant on the margin during hour h (MWh):** this parameter will be determined hourly as per applied methodology AM0026 version 3 using the most recent public available data from National Electric Coordinator (from Spanish: Coordinador Electrico Nacional) . Values estimated for this renewal used latest available data (2016)
- **C_j : Electricity generated by the “j” CDM power plant during hour h (MWh):** this parameter will be determined hourly as per applied methodology AM0026 version 3 using the most recent public available data from National Electric Coordinator (from Spanish: Coordinador Electrico Nacional) . Values estimated for this renewal used latest available data (2016)

	<ul style="list-style-type: none"> - SFC_i: Specific fuel consumption per unit of electric energy produced in the “i” marginal plant (TJ/MWh): These values will be obtained from CDEC SIC annual report and CNE node price report as required by the applied methodology. Values estimated for this renewal used latest available data. - NCV_{i,y}: Net calorific value of fossil fuel type “i” in year y (TJ/m³ or TJ/kg): These values will be obtained from CNE annual report and IPCC 2006 as required by the applied methodology. Values estimated for this renewal used latest available data - CEF_{OM,i}: fraction of fuel oxidized on combustion (%) These values will be obtained from IPCC 2006 as required by the applied methodology. - Oxid_i: CO₂ emission factor of fuel used in the “i” marginal plant (tCO₂e/GJ): These values will be obtained from IPCC 2006 as required by the applied methodology. - EF_y: CO₂ emission factor of the displaced energy from the grid (tCO₂e/MWh): this parameter is equivalent to combined margin emission factor (EF_{CM}) and will be calculated as per applied “tool to calculated emission factor for an electricity system. Values estimated for this renewal used latest available data (2016) <p>As the source of the value of the parameter Generation_y was not evidenced, a CL has been raised. Refer to CL 3 above Moreover, as some issues have been found when determining the EF OM, a CAR has been raised. Refer to CAR 1 above</p>
Findings	N/A
Conclusion	<p>All parameters included in the monitoring plan are in accordance with the applied methodology and tools and were updated using the most recent available data.</p> <p>Moreover, the monitoring plan is in accordance with applied methodology and tools and is suitable for this project activity.</p>

D.6. Crediting period

Means of validation	The 2 nd crediting period of the project activity was from 04/11/2011 until 03/11/2018. As the project activity was validated with crediting period type renewable, the next 7 years crediting period will be held from 04/11/2018 – 03/11/2025 (3 rd crediting period).
Findings	N/A
Conclusion	The requirements for renewal of crediting period were made in accordance with PS requirements and applicable methodology and tools.

D.7. Project participants

Means of validation	<p>The project participants assigned to this project activity are:</p> <ul style="list-style-type: none"> - Colbun S.A.; Government of Sweden - Swedish Energy Agency; GDF Suez; Electrabel S. A.; Netherlands' Ministry of Infrastructure and the Environment (IenM); Netherlands' Ministry of Economic Affairs, Agriculture and Innovation (EL&I); Deutsche Bank AG; Government of Norway - Ministry of Foreign Affairs; Norsk Hydro ASA; Statoil ASA; Government of Canada - Ministry of Foreign Affairs and International
----------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

	Trade (withdrawn); Government of Finland - Ministry of Foreign Affairs; Fortum Corporation; Chubu Electric Power Co. (withdrawn), Inc.; The Chugoku Electric Power Co. (withdrawn), Inc.; Japan International Cooperation Agency (JICA); Kyushu Electric Power Co., Inc.; MIT Carbon Fund Co., Ltd. (MIT) (withdrawn); Mitsubishi Corporation (withdrawn); Shikoku Electric Power Co., Inc.; Tohoku Electric Power Co. Inc.; The Tokyo Electric Power Co., Inc; Mitsui & Co., Ltd (withdrawn). The PPs were verified in the UNFCCC website ^{/23/} as well as each Authorization.
Findings	N/A
Conclusion	The PPs were correctly described in the revised version of the PDD.

D.8. Post-registration changes

Type of post-registration changes (PRCs)	Confirmation (Y/N)	Validation report for PRCs	
		Version	Completion date
Temporary deviations from the registered monitoring plan, applied methodologies or applied standardized baselines	N		
Corrections	N		
Change to the start date of the crediting period of the project activity	N		
Inclusion of a monitoring plan	N		
Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools	N		
Changes to the project design	N		
Changes specific to afforestation and reforestation project activities	N		

SECTION E. Internal quality control

The draft validation of renewal report that is prepared by the validation team is reviewed by an independent technical review team (one or more members) to confirm if the internal procedures established and implemented by ESPL were duly complied with and such opinion/conclusion is reached in an objective manner that complies with the applicable CDM rules/requirements.

The technical review team is collectively required to possess the technical expertise of all the technical area/sectoral scope to which the project activity is related. All members of technical review team are independent of the validation team.

During the technical review process, additional findings may be identified or the closed out findings may be opened, which needs to be satisfactorily resolved before the request for renewal is submitted to UNFCCC. The independent technical reviewer may either approve the report as such or reject/return the same in such case providing the comments/findings/issues that needs to be resolved by the validation team. The decision taken by the technical reviewer is final and is authorized on behalf of ESPL.

SECTION F. Validation opinion

Earthood Services Private Limited, contracted by Colbun S.A., has performed the independent validation of the renewal of the crediting period for the CDM project activity "Chacabuquito Hydroelectric Power Project" – UNFCCC ref #: 1052 – in Chile, for the 3rd crediting period from 04/11/2018 to 03/11/2025 (including both days) as reported in the Project Design (PDD). Colbun S.A. is responsible for the collection of data in accordance with the monitoring plan and the reporting of GHG emissions reductions from the project activity. WSP is the consultancy responsible for calculation of grid Emission Factor and PDD description.

ESPL commenced the validation of the renewal of the crediting period based on the following documents:

- baseline and monitoring methodology AM0026 – version 3.0,
- CDM Project Standard for Project Activities v.1.0,
- CDM Validation and Verification Standard for Project Activities v.1.0,
- methodological tool “Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period” version 03.0.1,
- Monitoring plan contained in the revised PDD.

ESPL’s validation of the renewal of crediting period approach is based on the understanding of the risks associated with reporting of estimated GHG emission data and the controls in place to mitigate these. ESPL planned and performed the validation of the renewal of the crediting period by obtaining evidence and other information and explanations that ESPL considered necessary to give reasonable assurance that reported information and estimated GHG are fairly stated.

The verification team confirms that:

- the project activity was found completely implemented as per the description given in the revised PDD;
- the actual operation conforms to the description in the revised PDD;
- the project complied with the renewal of crediting period criteria for project set out in CDM Project Standard for project activities version 1.0 and CDM VVS for PA version 1.0; and
- the project is likely to achieve the following estimated GHG emissions reductions during the 7 years’ 3rd crediting period

Estimated GHG emissions **86,905 tCO₂e/year** and a total **608,335 tCO₂e** for the whole 7 years’ 3rd crediting period are likely to occur without material misstatement.

Appendix 1. Abbreviations

Abbreviations	Full texts
AM	Approved Methodology
BE	Baseline Emission
CAR	Corrective Action Request
CDEC-SIC	Economic Dispatch Center (from Spanish Centro de Despacho Económico de Carga)
CDM	Clean Development Mechanism
CL	Clarification Request
CNE	National Electric Coordinator (from Spanish Coordinador Electrico nacional)
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
CONAMA	Environmental National Commission – DNA of Chile - “Comisión Nacional del Medio Ambiente” – (now: Environmental Ministry)
CP	Crediting Period
DNHA	Do-No-Harm Assessment
DOE	Designated Operational Entity
ESPL	Earthood Services Private Limited
FAR	Forward Action Request
GHG	Greenhouse Gas
GSC/GSP	Global Stakeholder Consultation Process
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
KP	Kyoto Protocol
kW	kilo Watt
kWh	kilo Watt hour
MoV	Means of Validation
MP	Monitoring Plan
MW	Mega Watt
MWh	Mega Watt hour
NIS	National Interconnected System of Nicaragua
PA	Project Activity
PCP	Project Cycle Procedure
PDD	Project Design Document
PE	Project Emission
PP	Project Participant
PS	Project Standard
SD	Sustainable Development
SEA	Environmental Evaluation Service – “Servicio de Evaluación Ambiental”
SEC	Superintendence of Electricity and Fuels - “Superintendencia de Electricidad y Combustibles”
SEIA	Environmental Impact Assessment System - “Sistema de Evaluación del Impacto Ambiental”
SEN	National Electric System
SIC	Central Interconnected System – “Sistema Interconectado Central”
SING	Great North Interconnected System
tCO ₂ e	Tonnes of Carbon dioxide equivalent
UNFCCC	United Nations Framework Convention on Climate Change
VT	Validation Team
VVS	Validation and Verification Standard

Appendix 2. Competence of team members and technical reviewers

Competence Statement			
Name	Marcelo Sebben		
Country	Brazil		
Education	M.Sc. (Sustainable Energy System) B. Eng. (Chemical Engineering)		
Experience	12.5 Years		
Field	Chemical process industry, CDM, Energy, Climate Change		
Approved Roles			
Team Leader	Yes		
Validator	Yes		
Verifier	Yes		
Methodology Expert	Yes (ACM0001, ACM0002, ACM0006, AM0065, AMS ID)		
Local expert	Brazil, Chile, Honduras		
Financial Expert	Yes		
Technical Reviewer	Yes		
TA Expert	Yes (TA 1.1, 1.2, 5.1, 13.1)		
Reviewed by	Abhishek Mahawar	Date	01/03/2018
Approved by	Ashok Kumar Gautam	Date	01/03/2018

Competence Statement			
Name	Sergio Bonanno Cruz		
Country	Brazil		
Education	Post Graduate Diploma in Environment		
Experience	25 Years		
Field	Environmental Law, CDM, Energy, Climate Change		
Approved Roles			
Team Leader	Yes		
Validator	Yes		
Verifier	Yes		
Methodology Expert	Yes (ACM0001, ACM0002, AM0026, ACM0006, AMS ID)		
Local expert	Brazil, Chile		
Financial Expert	Yes		
Technical Reviewer	Yes		
TA Expert	Yes (TA 1.2, 13.1)		
Reviewed by	Abhishek Mahawar	Date	01/03/2018
Approved by	Ashok Kumar Gautam	Date	01/03/2018

Appendix 3. Documents reviewed or referenced

No.	Author	Title	References to the document	Provider
1.	UNFCCC	CDM Project Standard for Project Activities	Version 01.0	Other
2.	UNFCCC	Methodology: AM0026: Methodology for zero-emissions grid-connected electricity generation from renewable sources in Chile or in countries with merit order based dispatch grid	version 03.0	Other
3.	UNFCCC	CDM methodological tool "Assessment of the validity of the original / current baseline and update of the baseline at the renewal of the crediting period"	version 3.0.1	Other
4.	UNFCCC	"Tool to calculate the emission factor for an electric system	Version 06.0	Other
5.	PP	Registered PDD "Chacabuquito Hydroelectric Power Project"	v.5: 21/04/2011	Other
6.	PP	Revised PDD "Chacabuquito Hydroelectric Power Project"	v.1: 13/02/2018 (published) v.1: 30/07/2018 v.2.0: 05/09/2018 (final)	PP
7.	PP	Estimated GHG Emission reductions excel spreadsheet	v.1: 13/02/2018 v.2: 30/07/2018 v.3: 06/09/2018	PP
8.	PP - WSP	EF calculation Spreadsheet	v.1: 13/02/2018 v.2: 06/09/2018	PP
9.	PP	Evidence of parameter Generation – PDD from 1 st crediting period	version 3.4 from 03/12/2010	PP
10.	CDEC SIC	a. Generation per plant – daily spreadsheets called OPddmmyy.xls b. Generation start date of each plant – spreadsheet centrales_4.xlsx c. Fossil Fuel consumption per plant d. Merit order plants by costs – data is determined every 8 hours and is provided by CDEC-SIC		
11.	National Energy Commission (CNE)	CNE web site Yearbook Operation Statistics access route: Datos de interes/anuarios 2005-2015(free access)	https://www.cne.cl/wp-content/uploads/2016/07/AnuarioCNE2015_vFinal-Castellano.pdf	PP
12.	National Energy Commission (CNE)	National Energy Balance from 2015.	http://dataset.cne.cl/Energia Abierta/Reportes/Minenergia/Reporte%20BNE%202015.pdf/	PP
13.	Environmental Ministry – Climate Change Office	Environmental Ministry – Climate Change Office (DNA of Chile)	http://www.mma.gob.cl/1257/w3-channel.html	PP

14.	National Congress of Chile	<u>List of applicable laws:</u> a. Chilean Law 19,940, which regulates the transport system of electric energy, published on 2004-03-13. b. Chilean Law 19,300, Environment Act., 2007/03/27; c. Complementary Chilean Law 20.417, regulates and modifies aspects Law 19,300; d. Supreme Decree N°327 which corresponds to the "Regulation of the General Law of Electric Services", 1998/09/10 e. Law DFL-4; DFL-4/20018, 2007/02/05 – Electrical Service Law. f. Chilean Official Law NCh 2542.Of2001 – Alternating current static watt-hour meters for active energy - "Medidores estaticos de energia activa para corriente alterna (0.2 S y 0.5 S)", by INN Chile, 2001.	http://www.leychile.cl/Consulta	PP
15.	National Commission of Environment	Water Grant to Hidrelectrica Guarda Vieja S.A.	08/07/1993	
16.	Ministry of Public Work	Construction approval of Chacabuquito Hydro Electric Power plant	29/11/1996	Other
17.	Ministry of Economy, Promotion and Reconstruction of Chile.	Decree 396 - Electric Grant for Construction of Hydro Power Plant Chacabuquito	23/07/1999	Other
18.	Environmental Ministry – Climate Change Office (DNA of Chile)	<u>Validating Letter</u> Letter from Environmental Ministry – Climate Change Office (DNA of Chile) stating the merging of Hidrelectrica Guarda Vieja S.A. and Colbun S.A and authorizing Colbun S.A. to act as Project Participant	18/03/2016	PP
19.	PP	Meter Diagram Chacabuquito		Other
20.	PP	<u>Internal Procedures</u> a. PO.17 Verification and Change of electricity meters under CDM (Verificacion y Recambio de Medidores de Energia) b. PO.18 Information recording from electricity meters for the CDM Project (Captura de Información desde Medidores de Energía.)	Version 3 from Oct/2017 Version 4 from Jan/2018	
21.	AVK SEG VA Tech Hydro	a. Technical manual of Generators b. Operation and Maintenance Manual of Turbines	Dec/2001 Jan/2002	Other
22.	PP	a. Pictures from generators plates b. Pictures from turbines plates c. Pictures from electric diagram		Other
23.	UNFCCC	CDM UNFCCC website	http://cdm.unfccc.int	Other

CDM-RCPV-FORM

24.	IPCC	IPCC publications	www.ipcc-nggip.iges.or.jp	Other
25.	PP	Evidence which states that the LPG is a gas fuel	http://glpchile.cl/el-glp/caracteristicas-del-glp	

Appendix 4. Clarification requests, corrective action requests and forward action requests

Table 1. CL from this validation

CL ID	01	Section no.	D.1	Date : 26/06/2018
Description of CL				
<p><i>PDD section A.3.</i> <i>The PDD is not filled as per instructions for completing the PDD form as it does not contain:</i></p> <ol style="list-style-type: none"> <i>1. A list of the facilities, systems and equipment that will be installed and/or modified by the project activity</i> <i>2. The arrangement of the facilities, systems and equipment;</i> <i>3. The monitoring equipment and their location in the systems</i> <i>4. For the facilities, systems and equipment that are being modified and/or installed under the project activity, provide information on:</i> <ol style="list-style-type: none"> <i>a. The age and average lifetime of the equipment based on the manufacturer's specifications and industry standards;</i> <i>b. installed capacities, load factors and efficiencies.</i> 				
Project participant response				Date : 26/07/2018
<i>The PDD section A.3 was redacted in order to meet the described instructions.</i>				
Documentation provided by project participant				
<i>The CL was developed in the PDD, along with attached evidence pictures and certificates.</i> <i>PDD version 1 from 30/07/2018</i>				
DOE assessment				Date: 02/08/2018
The information was duly included in the PDD, section A.3 as required by the instructions for completing the PDD form.				
CL is closed				

CL ID	02	Section no.	D.3	Date : 26/06/2018
Description of CL				
<i>PDD section B.4.step 2.1 information was not given as per requirements of the methodological tool "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" version 03.0.1.</i>				
Project participant response				Date : 26/07/2018
<i>PDD section B.4 step 2.1 was redacted considering the baseline emissions update, according to the methodology requirements</i>				
Documentation provided by project participant				
<i>PDD version 1 from 30/07/2018</i>				
DOE assessment				Date: 02/08/2018
The information was duly included in the PDD, as required by the Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" version 03.0.1. Baseline emissions were updated for the third crediting period.				
CL is closed				

CL ID	03	Section no.	D.4	Date : 26/06/2018
Description of CL				
<i>It is not clear the source of the value of the parameter Generation_y used in the ER estimations for the CP</i>				
Project participant response				Date : 26/07/2018

<p>The Generation parameter value was calculated according to the Monitoring report 01 Jul 2002 – 01 May 2007, whose data was obtained from CDEC-SIC, the official electric coordinator of the grid. The value is an approximate average of the yearly generation during the reported period. As the value is a 5-year average, it is more representative of the project activity generation capacity, since between 2014 and 2016 a severe drought made the yearly generation significantly lower; because of that, a more recent average would not be representative of the power plant actual generation capacity.</p>	
Documentation provided by project participant	
PDD from 1 st CP version 3.4 dated on 03/12/2010.	
DOE assessment	Date: 02/08/2018
<p>The source of the parameter Generation_y used for estimate the Baseline emissions for the next crediting period is now clear and it is considered representative by the Validation team as it takes a long period with stable operation regime and it was the same as used in the previous crediting period. It is important to point out that this value is just used for the estimation of BE once the parameter is monitored throughout the crediting period.</p>	
CL is closed	

Table 2. CAR from this validation

CAR ID	01	Section no.	D.4	Date : 21/08/2018
Description of CAR				
<p>EF Calculation Excel: Tab "Fuels data": It is not clear why the NCV of butane gas, propane gas and butane/propane are being a result of a multiplication by the conversion factor of liquid fuels (E21) instead of gaseous fuels (E22)</p>				
Project participant response				Date : 05/09/2018
<p>The conversion factor of butane gas, propane gas and butane/propane was corrected to the corresponding gaseous fuels factor (E22). Consequently, the Hourly OM Data, EF OM 2016 Part 1, EF OM 2016 Part 2 and EF Calc 2016 Chacabucito (3^o Period) spreadsheets were updated.</p> <p>Additionally, the LPG conversion factor value was also changed to the gaseous fuel factor, because in Chile this is also a gaseous fuel, which is transported as liquid but used in its gaseous form. The fuel consumption is also reported as gas.</p>				
Documentation provided by project participant				
<p>The evidence is available in the EF calculation spreadsheets. The following link shows the LPG characteristics as described above (in Spanish): http://glpchile.cl/el-glp/caracteristicas-del-glp</p>				
DOE assessment				Date: 11/09/2018
<p>It was observed in the EF calculations that now the NCV from butane, propane and LPG were calculated using conversion factor from gaseous fuels which is considered consistent by the validation team. The LPG is a gas fuel which is liquefied for transportation purposes^{25/}.</p>				
CAR is closed				

Table 3. FAR from this validation

N/A

- - - -

Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
02.0	31 October 2017	Revision to align with the requirements of the “CDM validation and verification standard for project activities” (version 01.0).
01.0	23 March 2015	Initial publication.
Decision Class: Regulatory		
Document Type: Form		
Business Function: Renewal of crediting period		
Keywords: crediting period, project activities, validation report		