Project design document form

(Version 11.0)

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

BASIC INFORMATION	
Title of the project activity	Chacayes Hydroelectric Project, Chile
Scale of the project activity	☒ Large-scale ☐ Small-scale
Version number of the PDD	5.0
Completion date of the PDD	29/05/2020
Project participants	Pacific Hydro Chacayes S.A. (PHCSA)
Host Party	Chile
Applied methodologies and standardized baselines	ACM0002: Grid-connected electricity generation from renewable sources --- Version 20.0
Sectoral scopes	1: Energy industries (renewable - / non-renewable sources)
Estimated amount of annual average GHG emission reductions	234,271

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

The Chacayes Hydroelectric Project (hereafter, “the Chacayes Project”) is a run-of-river hydro electric power scheme being developed on the Cachapoal River within the Alto Cachapoal basin in Chile. The proposed project activity is being developed by Pacific Hydro Chacayes S.A. (“PHCSA”), a subsidiary of Pacific Hydro Chile S.A. (“PHC”). In May 2009 Astaldi SpA acquired 27% of PHCSA. In March 2017 PHC bought back the 27% of the share owned by Astaldi SpA, maintaining the 100% of PHCSA share. The purpose of the proposed project activity is to utilise the hydrological resources of the Cachapoal and the Cipreses Rivers to generate approximately 560,457 MWh of electricity (net) per annum which will be exported to the Sistema Eléctrico Nacional (“SEN grid”), the Chilean main electricity grid.

Prior to the implementation of the proposed project activity the electricity that will be supplied by the proposed project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of other new generation sources. The baseline scenario is the same as the scenario existing prior to the implementation of the proposed project activity. In the project scenario, the electricity generated from the Chacayes Project will displace this more emission-intensive grid sourced electricity and will therefore result in a reduction in greenhouse gas (GHG) emissions of approximately 281,084 tonnes CO_2e per annum.

Contribution to sustainable development

Since the introduction of imported natural gas into Chile from Argentina in 1994, the majority of grid capacity additions have been combined cycle natural gas plants. However, in 2004 Argentina restricted natural gas exports to Chile and subsequent gas restrictions have forced many of these plants to reduce generation and use diesel where conditions and environmental restrictions permit this to occur. As a result of this the Chilean Government is actively seeking alternative forms of energy to stabilise supply and meet the rapid growth in demand of between 350-400 MW per annum[1]. However, it is predicted that system expansion will come mostly from thermal energy[2]. This project will therefore provide additional renewable energy capacity to the grid.

In addition to increasing renewable capacity on the SEN grid, the proposed project activity will contribute strongly to the environmental, social and economic wellbeing of Chile, in the following ways:

The proposed project activity will contribute to the social welfare of Chile’s 6th Region, where local employment opportunities are limited and infrastructure is poor. PHCSA has taken significant steps to assist local and regional inhabitants to obtain direct employment through provision of training courses and imposing conditions onto the EPC contractor in regards to giving preference to hiring local staff.

The electricity to be generated by the proposed project activity will reduce the carbon intensity of the SEN grid by reducing the emission of greenhouse gases on a per MWh basis across the entire system.

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[1] *October 2009 CNE Node Price Fixation Report, Comisión Nacional de Energia*

[2] *April 2007 CNE Node Price Fixation Report, Comisión Nacional de Energia, table 14.7, page 71*

The proposed project activity will result in a reduction in air borne pollutants, such as oxides of nitrogen, oxides of sulphur, carbon monoxide and particulates, by reducing the combustion of fossil fuels.

The project will assist in increasing energy security in Chile by reducing Chile's dependence on imported fossil fuels.

PHCSA has created a community fund called "Creciendo Juntos" ("Growing Together") to sponsor projects within the locality of the project including projects in education, health and projects aimed at improving the welfare of the local community.

As part of the proposed project activity new access roads will be built and improvements to existing roads, such as widening of a bridge, will be included. These roads will improve access to the remote region where the proposed project activity is located.

A.2. Location of project activity

Host Party: Chile

Region: 6th Administrative Region

Town: Coya

City: Rancagua

The proposed project activity is located in the Cachapoal Valley, approximately 10 km upstream of the town of Coya on the northern bank of the Cachapoal River. Coya town is approximately 30 km east of the city of Rancagua, which is the major city of Chile's 6th Region. Rancagua is located on the Pan American Highway (Ruta 5) approximately 80 km south of Santiago.

The proposed project activity can be accessed using the Termas de Cauquenes road to avoid project traffic travelling through Coya. From the Pangal River crossing, a new road was constructed on the northern bank of the Cachapoal River as part of the proposed project activity to provide access to the project site. The proposed project activity lies between elevations of 1,110 m a.s.l. and 929 m a.s.l. The Geographical coordinates of the power house are Latitude 34°16'31.54"S, Longitude 70°27'8.76"W. The location of the proposed project activity is shown in Figure A1.

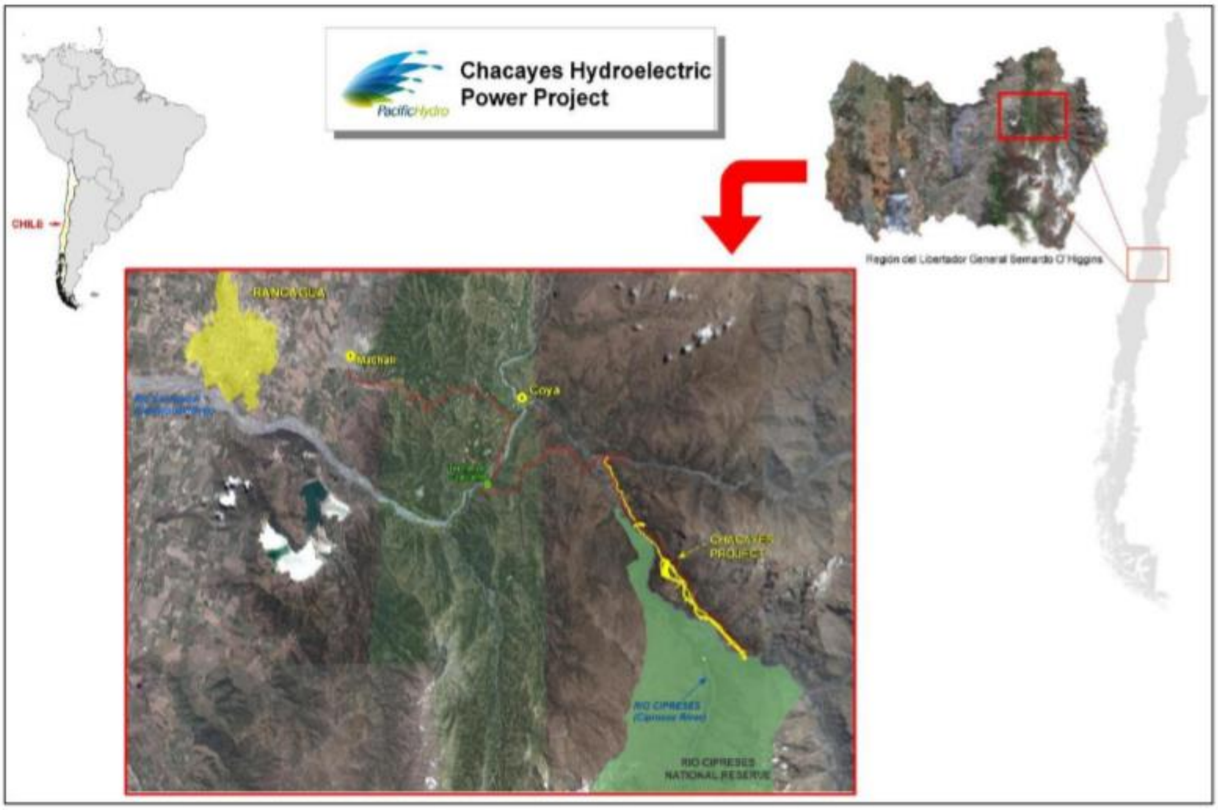

Figure A1 – Location of proposed project activity

A.3. Technologies/measures

The proposed project activity is a run-of river hydroelectric power plant with an installed capacity of 113.36 MW (56.68 MW x 2 turbines) and an expected annual net generation of approximately 560,457 MWh of electricity per annum[3]. The purpose of the proposed project activity is to utilize the waters of the Cipreses and Cachapoal Rivers to generate hydro-electricity for export to the SEN grid.

The baseline scenario is the same as the scenario existing prior to the implementation of the proposed project activity. In the project scenario, the electricity generated from the Chacayes Project will displace this more emission-intensive grid sourced electricity and will therefore result in a reduction in greenhouse gas (GHG) emissions.

Water will be diverted from the Cipreses River through an intake (1) via a tunnel and short canal (2), to the Cachapoal River, where it will be discharged immediately upstream of the Chacayes intake (3). At this point the water, which is the combination of the Cachapoal and Cipreses rivers, will pass through a desander and a water conveyance system comprising of open canal, two free flow tunnels and two culverts (4) into the Chupallal regulation pond (5). The pond has a surface area of 180,179 m^2 and provides up to 8 hours storage. Water discharged from the pond enters a 2.6 km pressure tunnel (6) which delivers the water to the Chacayes powerhouse (7). A surge shaft will control pressure variations from operation and shut down of the turbines. The powerhouse will be located above ground and will house two vertical Francis turbines coupled with generators. Part of the turbined water will be discharged through an aqueduct to feed the existing Coya project canal and the remainder spilled back into the Cachapoal River.

[3] *Figures sourced from the Engineer, Procurement and Construction Turnkey Contract soft signed with signed with Astaldi Fe Grande on 9th October 2008.*

The main power transformers will be located adjacent to the power house from where electricity will be exported to the grid via a new 220 kV transmission line approximately 17 km in length to the Maitenes substation, and from there through existing transmission lines to the connection to the SEN at Sauzal substation.

Figures A2 and A3 below provide further detail of the project schematic and physical layouts. The specifications of key proposed equipment are contained in Table A1.

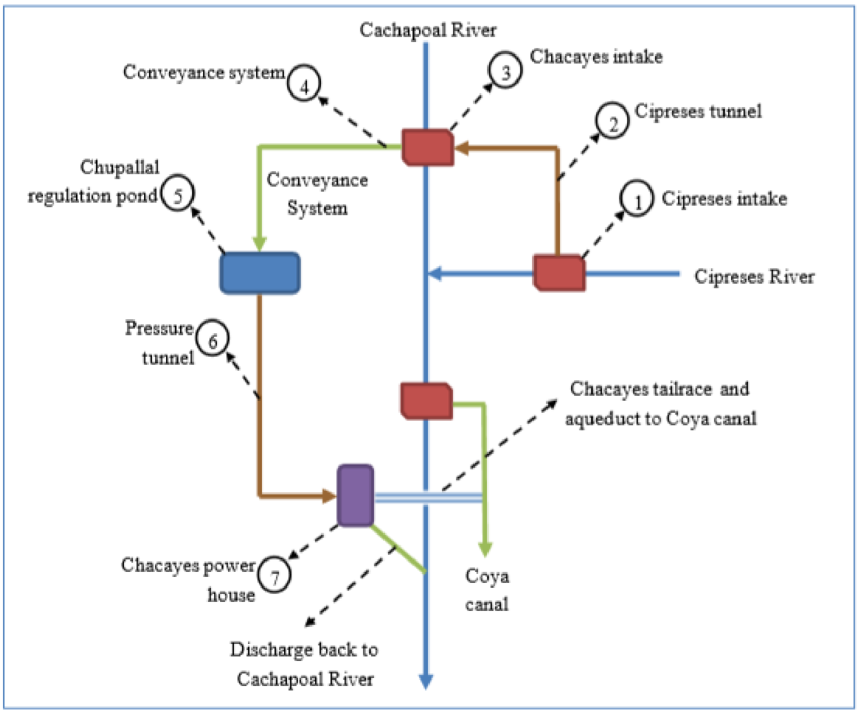

Figure A2– Schematic layout of the proposed project activity

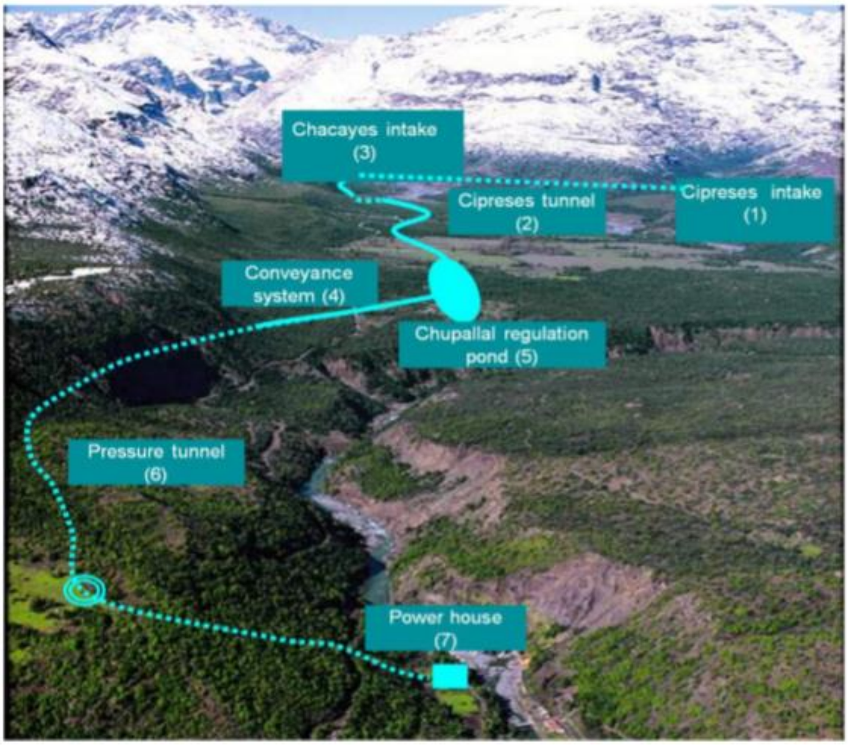

Figure A3 – Physical layout of the proposed Project Activity

Table A1 – Specifications of key proposed equipment

Category	Item	Specification[4]
Turbine	Type of turbine	Francis type, vertical shaft
	Number of generating units	2
	Rated capacity of each unit	56.68 MW
	Gross Head	181m
	Rated Flow	72.5m3/s
	Rated Speed	375 rpm
	Technical Lifetime	25 years
	Manufacturer	Andritz Hydro
	Location manufactured (domestic or imported)	Imported
Generator	Generator Type	Three-phase synchronous generator
	Rated capacity of each unit	65,600 kVA
	Power Factor	0.9
	Frequency	50Hz
	Technical Lifetime	25 years
	Manufacturer	Andritz Hydro
	Location manufactured (domestic or imported)	Imported
Net Capacity	Minimum Continuous Rating Electrical Output at metering point	110.8 MW, at 0.9 power factor

A.4. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Chile (host)	Pacific Hydro Chacayes S.A. (PHCSA)	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

A.5. Public funding of project activity

There is no public funding from Annex I Parties involved in the proposed project activity.

[4] *Figures sourced from the Engineer, Procurement and Construction Turnkey Contract soft signed with signed with Astaldi Fe Grande on 9th October 2008.*

A.6. History of project activity

Chacayes Hydroelectric Project was registered as CDM project on 26/07/2012 (Project 6848). The present PDD is an updated version of the registered project activity with the intention to seek the renewal from the first to the second crediting period.

Considering the above mentioned, and the instructions for completing this form (CDM-PDD FORM), the Project Participants would like to

1. Confirm that:
    a. The proposed CDM project activity is neither registered as a CDM project activity nor included as a component project activity (CPA) in a registered CDM programme of activities (PoA);
    b. The proposed CDM project activity is not a project activity that has been deregistered.
2. Declare that:
    a. The proposed CDM project activity was not a CPA that has been excluded from a registered CDM PoA;
    b. A registered CDM project activity or a CPA under a registered CDM PoA whose crediting period has or has not expired (hereinafter referred to as former project) does not exist in the same geographical location as the proposed CDM project activity.

A.7. Debundling

Not applicable. This is a large-scale project activity.

SECTION B. Application of methodologies and standardized baselines

B.1. References to methodologies and standardized baselines

Approved consolidated baseline and monitoring methodology ACM0002 [5]: Grid-connected electricity generation from renewable sources --- Version 20.0.

In accordance with ACM0002 (Version 20.0) the following tools were used:

- TOOL07[6]: "Tool to calculate the emission factor for an electricity system", Version 7.0 (EB 100 annex 4).
- TOOL 01[7]: "Tool for the demonstration and assessment of additionality", Version 5.2.1
- TOOL 11[8]: "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 (EB 66 annex 47).

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[5] ACM0002: https://cdm.unfccc.int/methodologies/DB/XP2LKUSA61DKUQC0PIWPGWDN8ED5PG

[6] TOOL07: https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf

[7] TOOL01: https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.1.pdf

B.2. Applicability of methodologies and standardized baselines

The choice of baseline methodology ACM0002 (Version 20.0) is justified for the proposed project activity as it satisfies the required applicability criteria. Table below demonstrate how the applicability conditions of the selected methodology and tools are met by the project activity:

Table B1 – Methodology applicability criteria to the project activity

ACM0002 (version 20.0) applicability criteria	ACM0002 (version 20.0) applicability to the project activity	Documentation that has been used for the justification
1. This methodology is applicable to grid-connected renewable energy power generation project activities that: (a) Install a Greenfield power plant; (b) Involve a capacity addition to (an) existing plant(s); (c) Involve a retrofit of (an) existing operating plants/units; (d) Involve a rehabilitation of (an) existing plant(s)/unit(s); (e) Involve a replacement of (an) existing plant(s)/unit(s).	It is a grid-connected renewable power generation project: run of river hydro power plant.	Environmental Impact Declaration (DIA) approved by the Libertador General Bernardo O'Higgins region environmental commission (COREMA), published on SEA Chile[9].
2. The methodology is applicable under the following conditions: (a) The project activity may include renewable energy power plant/unit of one of the following types: hydro power plant/unit with or without reservoir, wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit; (b) In the case of capacity additions, retrofits, rehabilitations or replacements (except for wind, solar, wave or tidal power capacity addition projects) the existing plant/unit started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion, retrofit, or	(a) The project activity includes a hydro power plant/unit. (b) Not applicable. It is not a capacity addition, retrofit or replacement of an existing power plant.	DIA. Approval by COREMA, published on SEA Chile[9].

[8] TOOL 11: https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-11-v3.0.1.pdf

[9] Environmental Impact Declaration: https://seia.sea.gob.cl/expediente/ficha/fichaPrincipal.php?modo=ficha&id_expediente=7600206

rehabilitation of the plant/unit has been undertaken between the start of this minimum historical reference period and the implementation of the project activity		
3. In case of hydro power plants, one of the following conditions shall apply: (a) The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or (b) The project activity is implemented in existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and the power density, calculated using equation (7), is greater than 4 W/m2; or (c) The project activity results in new single or multiple reservoirs and the power density, calculated using equation (7), is greater than 4 W/m2; or (d) The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (7), is lower than or equal to 4 W/m2, all of the following conditions shall apply: (i) The power density calculated using the total installed capacity of the integrated project, as per equation (8), is greater than 4 W/m2; (ii) Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity; (iii) Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m2 shall be: a. Lower than or equal to 15 MW; and b. Less than 10 per cent of the total installed capacity of integrated hydro power project.	Condition c) applies to this project: The project activity results in new single or multiple reservoirs and the power density is greater than 4 W/m^2.	DIA. Approval by COREMA, published on SEA Chile[9]. Please see PD calculation on page 28 below.
4. In the case of integrated hydro power projects, project proponent shall:	Not applicable. This project doesn´t	Not applicable.

(a) Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or (b) Provide an analysis of the water balance covering the water fed to power units, with all possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different seasons to optimize the water flow at the inlet of power units. Therefore, this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum of five years prior to the implementation of the CDM project activity.	integrate different hydro power project.	
5. The methodology is not applicable to: (a) Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; (b) Biomass fired power plants/units.	Not applicable. The project activity doesn´t involve the use of fossil fuels or Biomass fired.	Not applicable.
6. In the case of retrofits, rehabilitations, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, that is to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance".	Not applicable.	Not applicable.
7. In addition, the applicability conditions included in the tools referred to below apply.	The project activity meets the applicability conditions included in the tools referred in the methodology.	See tables below (Table B2).

Table B2 – Tools applicability criteria to the project activity

TOOL 07: "Calculate the emission factor for an electricity system" (Version 7.0) applicability criteria	**Tool applicability to the project activity**	**Documentation that has been used for the justification**
This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects).	The present project activity substitutes grid electricity by supplying clean and renewable electricity to a grid.	DIA. Approval by COREMA, published on SEA Chile[9].
Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off-grid power plants.	The emission factor for the project activity electricity system is calculated for grid power plants only.	Chile Electricity System Emission Factor 2019 CDM Chacayes v4.0 calculator attached to this PDD.
In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country.	The project activity electricity system is located exclusively in Chile.	The project location [10] can be verified on SEA Chile, or in DIA[9], approval by COREMA.
Under this tool, the value applied to the CO[2] emission factor of biofuels is zero.	The CO_2 emission factor of biofuels power plants connected to the grid is considered zero.	Chile Electricity System Emission Factor 2019 CDM Chacayes v4.0 calculator attached to this PDD.

TOOL 01: "Tool for the demonstration and assessment of additionality" (Version 5.2.1) applicability criteria	**Tool applicability to the project activity**	**Documentation that has been used for the justification**
"This document provides for a step-wise approach to demonstrate and assess additionality. These Steps include: • Identification of alternatives to the project activity; • Investment analysis to determine that the proposed project activity is either: 1) not the most economically or financially attractive, 2) not economically or financially	The project activity has followed the step-wise approach of the tool as it illustrated in section B.5.	This PDD. The additionality section has not been modified with respect to the original PDD. According to paragraphs 280 of *CDM Project Standard for Project Activities Version 02.0*, is not required to reassess the additionality of the

[10] https://seia.sea.gob.cl/mapa/visualizacion/PuntoRepresentativo/index.php?idExpediente=2191072

feasible; • Barriers analysis; and • Common practice analysis. Based on the information about activities similar to the proposed project activity, the common practice analysis is to complement and reinforce the investment and/or barriers analysis. The Steps are summarized in the flow-chart on page 2 of this document."		project activity nor update the section of the PDD relating to additionality for renewal crediting period.
The document provides a general framework for demonstrating and assessing additionality and is applicable to a wide range of project types. Some project types may require adjustments to this general framework.	The present project applied the tool and did not required adjustments.	
This tool does not replace the need for the baseline methodology to provide a step-wise approach to identify the baseline scenario. Project participants that propose new baseline methodologies shall ensure consistency between the determination of additionality of a project activity and the determination of a baseline scenario. Project participants can also use the "Tool for identification of baseline scenario and demonstration of additionality", which provides a procedure for baseline scenario identification as well as additionality demonstration.	ACM0002 provides the baseline scenario of the present hydroelectric project.	

B.3. Project boundary, sources and greenhouse gases (GHGs)

According to ACM0002 Version 20.0, the spatial extent of the project boundary includes the project power plant/unit and all power plants/units connected physically to the electricity system that the CDM project power plant is connected to. Thus, the boundary of the project activity is the electricity system where the project activity is connected to.

Since the end of 2017, the national system called "Sistema Eléctrico Nacional" (SEN) is the relevant electricity system, which considers the interconnection of former "Sistema Interconectado Central" (SIC) grid and former "Sistema Interconectado del Norte Grande" (SING) grid.

Considering this, all GHG emissions generated by the power plants of this electricity system are accounted as part of the baseline emissions.

Table B3 – Sources of gases in the project boundary

Source		GHG	Included?	Justification/Explanation
Baseline	CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity.	CO_2	Yes	In accordance with ACM0002, the baseline should only include CO2 fossil fuel fired power that is displaced due to the project activity.
		CH_4	No	
		N_2O	No	
Project activity	For hydro power plants, emissions of CH_4 from the reservoir.	CO_2	No	Minor emission source
		CH_4	No	The project is a new hydro-electric project with a power density far greater than 10 W/m2. Therefore in accordance with ACM0002 no project emissions need to be accounted for.
		N_2O	No	Minor emission source

B.4. Establishment and description of baseline scenario

ACM0002 "Grid-connected electricity generation from renewable sources" Version 20.0 identifies two options for defining the baseline scenario, dependent on whether the project activity is a new project or a modification or retrofit of an existing generation facility.

Since the proposed project activity does not involve the modification or retrofit of any existing electricity generation facilities, the baseline scenario is defined as: "Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources".

The baseline scenario is calculated as a combined margin (CM), result of a weighted average of the operating margin (OM) and build margin (BM) factors calculated using steps specified in the "Tool to calculate the emission factor for an electricity system" (Version 07.0) which are outlined in detail in Section B6.

The baseline scenario for the CDM project first crediting period (30/07/2012 – 29/07/2019) was considering the Chilean SIC grid. As above stated, by the end of 2017, the SIC grid was interconnected with the SING grid to create the National Electricity System (SEN), which represents 99% of the installed capacity of the country, covering from Arica, in the most northern region in the Chile, to Chiloé. The baseline for the second crediting period will therefore consider the Chilean SEN grid.

The ex-ante emission reduction calculation considers the emission factor according to the "Tool to calculate the emission factor for an electricity system"; the methodological choice is described in section B.6.1 (Annex 4).

For the renewal of the crediting period and particularly with regards to the baseline, section 10 of the CDM Project Standard for Project Activities, Version 02.0 establishes:

> *"282. The project participants shall demonstrate the validity of the original baseline or update it in accordance with paragraphs 283−286 below.*
>
> *283. To demonstrate the validity of the original baseline or its update, the project participants are not required to reassess the baseline scenario. Instead, the project participants shall assess the GHG emission reductions or net anthropogenic GHG removals that would have resulted from that scenario.*
>
> *284. The project participants shall assess and incorporate the impact of national and/or sectoral policies and circumstances, existing at the time of requesting renewal of crediting period, on the current baseline GHG emissions, without reassessing the baseline scenario.*
>
> *285. The requirements contained in paragraph 284 above are not applicable to a registered CDM project activity applying the valid version of an applicable approved standardized baseline that standardizes baseline scenario in accordance with paragraph 281 above.*
>
> *286. If data and parameters used for determining the original baseline, that were determined ex ante and not monitored during the crediting period, are no longer valid, the project participants shall update such data and parameters in accordance with the "Methodological tool: Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period"."*

Thus, to demonstrate the validity of the updated baseline (above presented) an analysis following 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) is presented below.

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.

According to the 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)", "if the current baseline complies with all relevant mandatory national and/or sectoral policies which have come into effect after the submission of the project activity for validation or the submission of the previous request for renewal of the crediting period and are applicable at the time of requesting renewal of the crediting period, go to Step 1.2".

There are no new national and/or sectoral policies that have come into effect after the submission of the project for the first validation that are applicable to the project activity. The baseline complies with the national environmental and electricity policies:

- Law of general bases of the environment, created in 1994[11].
- General Law of electric services, created in 2007[12].

Therefore, at the time of requesting renewal of the crediting period all relevant mandatory national and/or sectoral policies are the same as those that were applicable at the time of submitting the project for validation and the current baseline complies with them.

Step 1.2: Assess the impact of circumstances

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[11] https://www.leychile.cl/Navegar?idNorma=30667

[12] https://www.leychile.cl/Navegar?idNorma=258171

According to the tool, "in the situation where the baseline scenario identified at the validation of the project activity was the continuation of the current practice without any investment, an assessment of the changes in market characteristics is required for the renewal of the crediting period".

The circumstances existing at the time of requesting renewal of the crediting period are similar to those that prevailed at the time of submitting the project activity to validation. The market characteristics for the electricity sector are still the same than described in the original baseline scenario. I.e.: the planning authority (CNE) is still the same as originally described and the private sector is still the responsible actor in electricity generation, distribution and transmission market; the applicable Chilean regulations do not mandate a specific type or technology for electricity generation projects connected to the grid.

Therefore, there have not been relevant changes to the original circumstances in the market that could affect the applicability of the original baseline scenario.

The conditions used to determine the baseline emissions in the previous crediting period are still valid, as baseline emissions depend on the grid connected power plants operation.

Step 1.3: Assess whether the continuation of the use of current baseline equipment is the most likely scenario for the crediting period for which the renewal is requested.

According to the tool, "this sub-step should only be applied if the baseline scenario identified at the validation of the project activity was the continuation of use of the current equipment(s) without any investment and, the projects proponents or third party (or parties) would undertake an investment later due, for example, to the end of the technical lifetime of the equipment(s) before the end of the crediting period or the availability of a new technology".

This sub-step is not applicable since the baseline scenario identified at the validation of the project has not been modified and the baseline didn't consider the use of any existing equipment by the project participant, because in the absence of the project activity the energy generated would have been generated by the operation of grid-connected power plants and by the addition of new generation sources to the grid.

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

According to the tool, in this step it should be assessed "whether data and parameters that were only determined at the start of the crediting period and not monitored during the crediting period are still valid or whether they should be updated".

For the second crediting period the CO2 emission factor of the electricity system (which is relevant for the baseline emissions determination) is calculated according to the latest version of the "Tool to calculate the emission factor for an electricity system" and its calculation includes IPCC default values and local relevant data and parameters.

Thus, data and parameters that were only determined at the start of the crediting period and not monitored during the crediting period need to be updated for the second crediting period.

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

Step 2.1: Update the current baseline

According to the tool, in this step it should be updated "the current baseline emissions for the subsequent crediting period, without reassessing the baseline scenario, based on the latest approved version of the methodology applicable to the project activity. The procedure should be applied in the context of the sectoral policies and circumstances that are applicable at the time of request for renewal of the crediting period".

Since the original baseline is still in compliance with the current relevant mandatory national and/or sectoral policies of Chile and there are no new circumstances which may impact the validity of the project activity baseline, this step is not applied.

Step 2.2: Update the data and parameters

According to the tool "if the application of Step 1.4 showed that the data and/or parameters that were only determined at the start of the crediting period and not monitored during the crediting period are not valid anymore, project participants should update all applicable data and parameters, following the guidance in Step 1.4."

As mentioned in Step 1.4, the emission factor of the electricity system has been updated, considering the latest IPCC default values and local relevant data and parameters. The updated values of data and parameters are described in Sections B.6.2 and B.6.3 below.

Conclusion regarding the assessment of the validity of the original baseline scenario

In accordance with the procedures for renewal of the crediting period of a registered CDM project activity, the original baseline, as updated in accordance with step 2.2 of the Tool in section B.6, remains valid.

B.5. Demonstration of additionality

In accordance with ACM0002, the "Tool for the demonstration and assessment of additionality" (Version 5.2.1) was used to demonstrate the additionality of the proposed project activity. The step-wise assessment is outlined below.

Prior consideration of the CDM is demonstrated based on "Guidelines on the Demonstration and Assessment of Prior Consideration of The CDM" (Version 04; 15th July 2011).

CDM Prior Consideration

Demonstration of awareness of CDM consideration prior to project activity start date, and that the benefits of the CDM were a decisive factor in the decision to proceed with the project

The CDM was a key consideration in Pacific Hydro's[13] initial decision to invest in hydroelectric projects in Chile. In October 2002, PHC commissioned an independent study of hydroelectric opportunities in Chile which specified the importance of carbon credit revenues through the CDM framework to support investment in hydroelectric projects in the country.

PHC has considered the CDM since the inception of the project. In June 2007 PHCSA presented the EIA for the Chacayes Hydroelectric Project to CONAMA, the authority responsible for reviewing and approving projects of this nature. In this application PHCSA declared that they would be seeking to register the project under the CDM framework established in the Kyoto Protocol.

On 31st July 2008 the Pacific Hydro board evaluated the total costs of the proposed project activity and a decision was made to proceed with advanced works and pre-sanction EPC activities. The contracts approved involved significant works associated with the construction of the proposed project activity and the date is considered the project start date as defined in the "Glossary of CDM Terms".

[13] Pacific Hydro Pty Ltd, an Australian company, owns 100% of Pacific Hydro Chile S.A. (PHC), which has been investing in the Chacayes project through its subsidiary Pacific Hydro Chacayes S.A. (PHCSA).

Demonstration that continuing and real actions were taken to secure CDM status for the project in parallel with its implementation

In June 2007 PHCSA presented the EIA for the Chacayes Hydroelectric Project to CONAMA, the authority responsible for reviewing and approving projects of this nature. In the application PHCSA declared that they would be seeking to register the project under the CDM framework established in the Kyoto Protocol.

An initial draft of the PDD was completed in February 2008 and following this PHC sent request for proposals to a number of DOEs in July 2008 for validation services.

In November 2009 PHCSA engaged Perenia Pty Ltd ("Perenia") to finalise the PDD.

A summary of the key events in the development of the proposed project activity as a CDM project are provided in Table B4.

Table B4 – Summary of key events in the development of the Chacayes project as CDM project

Milestone	Date
Report on feasibility of registration of run-of –river projects in Chile, which refers to the importance of carbon credit revenue through the CDM	7th October 2002
Receipt of a specialist consultant report commissioned to analyse carbon credit revenue from Pacific Hydro's potential hydropower investments	August 2004
Project optimisation report on potential projects on the Alto Cachapoal River by Knight Piésold Consulting	26th April 2006
Signature of the PPA with Chilectra	2nd May 2007
Declaration of intent to present for CDM approval within environmental impact assessment (EIA) application to CONAMA	4th June 2007
First draft of PDD completed by PHCSA	18th March 2008
Memorandum of Understanding signed with Astaldi Fe Grande for the EPC contract	16th May 2008
"Chacayes Revenue Assessment" report prepared by Synex Ingenieros Consultores (Synex Engineering Consultants) for Pacific Hydro	29th May 2008
Proposals sought from DOEs for Validation	10th July 2008
EIA approved by CONAMA	10th July 2008
Pacific Hydro board approves advanced works and pre-sanction EPC activities for the Chacayes project (Project Start Date)	31st July 2008
Perenia requested to review PDD	4th October 2008
EPC Contract soft signed with Astaldi Fe Grande, subject to conditions	9th October 2008
Pacific Hydro board approves notice to proceed for EPC contract of proposed project activity	19th May 2009
Notice to proceed given to EPC Contractor – Astaldi Fe Grande	20th May 2009
Engagement of Perenia to prepare final version of PDD for validation	29th October 2009

Letter of Intent to seek CDM status of the proposed project activity submitted to the UNFCCC Secretaria	8th March 2010
Letter of Intent to seek CDM status of the proposed project activity submitted to the Chilean DNA	8th March 2010
Confirmation of receipt of Letter of Intent to seek CDM status of the proposed project activity received from the Chilean DNA	25th March 2010
Confirmation of receipt of Letter of Intent to seek CDM status of the proposed project activity received from the UNFCCC Secretariat	30th March 2010
Date of agreement signature with DOE for validation services	18th June 2010
Date PDD was web hosted for Global Stakeholder Consultation	21st July 2010
Date of letter of approval received from Chilean DNA	22nd September 2011
Date of commissioning and start of operations Unit 1 Unit 2	 26th August 2011 23rd September 2011

The above events clearly demonstrate that PHCSA seriously considered the CDM in the decision to implement the project and that continuous and real actions were taken to register the project in parallel with its implementation.

The determination of project scenario additionality is done using the “Tool for the demonstration and assessment of additionality”, which applies the following steps:

Demonstration and assessment of additionality

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a: Define alternatives to the project activity:

As the project activity is the implementation of a new grid-connected renewable power plant, and is not a capacity addition, retrofit or replacement of existing grid-connected renewable power plant/unit, the baseline scenario, according to the methodology ACM0002, is the following:

Electricity delivered to the grid by the project activity 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 described in the “Tool to calculate the emission factor for an electricity system”.

Sub-step 1b: Consistency with mandatory laws and regulations:

The baseline is in compliance with all mandatory applicable legal and regulatory requirements for electricity generation in Chile.

Step 2: Investment Analysis

Sub-step 2a: Appropriate Analysis method

The “Tool for the demonstration and assessment of additionality” provides three options for performing the investment analysis:

Option I: simple cost analysis

Option II: investment comparison analysis

Option III: benchmark analysis

As the proposed project activity will receive revenue from the sale of electricity, in addition to the CER revenue, simple cost analysis (Option I) is not applicable.

As outlined under Step 1 above, the only viable alternative to the proposed project activity is the supply of electricity from the SIC. As per the "Guidelines on the Assessment of Investment Analysis" (Version 05; 15th July 2011): "*if the alternative to the project activity is the supply of electricity from the grid, this is not considered an investment and a benchmark analysis is considered appropriate.*" Therefore the option chosen to demonstrate additionality is a benchmark analysis (Option III).

Sub-step 2b: Option III. Apply benchmark analysis

The financial indicator chosen for the purpose of the benchmark analysis is the proposed project activity's post-tax project Internal Rate of Return (IRR). The selected benchmark is the Weighted Average Cost of Capital (WACC) as at 31st July 2008, the investment decision date of the proposed project activity. The use of a WACC as a benchmark is appropriate for comparison with a project IRR as stipulated in the "Guidance on the Assessment of Investment Analysis" (Version 05; EB 62) which states "*Local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR*".

The WACC is calculated as follows:

$$r = Wd \times Kd \times (1-T) + We \times Ke$$

Where:

r = WACC

Wd = Percentage of debt financing

We = Percentage of equity financing

Kd = Average cost of debt

Ke = Average cost of levered equity

T = Applicable corporate tax rate

The proposed capital structure of the project is 54% debt and 46% equity and therefore Wd=54% and We=46% respectively[14]. The tax rate in Chile applicable to the project equals 17%[15].

As of the investment decision date, 31st July 2008, the average cost of debt (Kd) for Chilean projects, denominated in USD, is 7.08%. This is calculated based upon a conservative debt financing average margin of 1.77%7 on top of a base lending rate of 5.31%[16].

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[14] Draft Pacific Hydro Information Memorandum 31 July 2008

[15] http://www.sii.cl/aprenda_sobre_impuestos/impuestos/imp_directos.htm

[16] Banco Chile de Central average lending rate, foreign trade (in US dollars) July 2008 http://si3.bcentral.cl/Siete/secure/cuadros/arboles.aspx

The expected return on equity in Chile is taken to equal 10.30% (default value for Energy Industries) specified in the "Guidance on the Assessment of Investment Analysis". The project entity is levered and therefore the expected cost of equity given the project entity's capital structure is calculated according to the following equation[17]:

$$ROEL = ROEU + D/E \times (1\text{-}T) \times (ROEU\text{-}RF), \text{ where Ke} = ROEL$$

Where:

ROEL = Expected return on equity, due to a leveraged capital structure

ROEU = Expected return on equity, default value of 10.3%

D/E = Wd / We

T = Tax rate, which is equal to 17%

RF = Risk free rate, default value of 3%

Ke therefore equals 17.4%.

The WACC is therefore:

r = Wd x Kd x (1-T) + We x Ke

= 54% x 7.08% x (1-17%) + 46% x 17.4%

= 3.2% + 8.0%

= 11.2%

The benchmark approach applied is the same as what any third party investor in a similar economic situation in the Host Country would apply as a benchmark for a similar investment, and assumes that any third party may undertake the same project activity with default rates and similar capital structure available. The benchmark level for the project activity is determined as 11.2%.

Sub-step 2c: Calculation and comparison of financial indicators.

The project IRR of the proposed project activity without the additional revenue from the sale of CERs is 7.4% which is lower than the nominated benchmark.

Key financial inputs utilized to calculate the project IRR are contained in Table B5. The complete financial model (provided with the PDD) includes justification of all of the parameters used, references and assumptions made. All information in the financial model was available at the date of the investment decision.

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[17] http://pages.stern.nyu.edu/~igiddy/capstr.htm

Table B5 – Key Financial Inputs

Assumption	Value	Unit	Source
Projected Generation			
Approximate annual average electricity generation (net)[18]	543.231	GWh/y	Synex Study 29/5/2008
Electricity Generation Revenue			
Generation revenue from Spot	7,810	USD'000 /y	Synex Study 29/5/2008
Generation revenue from PPA	34,739	USD'000 /y	Synex Study 29/5/2008
Capacity Revenue	3,566	USD'000 /y	Synex Study 29/5/2008
Total average revenue from sale of electricity	**46,115**	USD'000 /y	Synex Study 29/5/2008
Capital Costs			
EPC Contract	269,000	USD '000s	Pacific Hydro Board Meeting 31/7/2008 (Breakdown and supporting documents provided to DOE for validation)
Advanced Works	40,000	USD '000s	
Development	14,100	USD '000s	
Water Rights	11,000	USD '000s	
Commercial/Legal Costs	9,500	USD '000s	
Land & Easements	1,600	USD '000s	
Insurance	5,000	USD '000s	
Project Management	19,300	USD '000s	
Transmission	25,000	USD '000s	
Total Project Contingency	33,400	USD '000s	
Total project cost	**427,900**	USD '000s	
Annual Fixed Operating Costs			
Hydro O&M	2,242	USD '000s	Expert opinion of PHC based on quotations for similar hydropower project (PHC's La Confluencia HEP) in

[18] A value of 543.231GWh/y is applied for the financial modal as the value available at the time of investment decision. The annual electricity generation value was revised in May 2009 after a technical re-assessment to approximately 560.457 GWh/y. The 3% variation is addressed by the sensitivity analysis.

Assumption	Value	Unit	Source
			Chile
Transmission Infrastructure Maintenance	250	USD '000s	Expert opinion based upon transmission line unit costs from a third party 'TransBosch' for 'Coya & Pangal Transmission Lines' (Coyal and Pangal are hydropower projects owned and operated by PHC)
Insurance	953	USD '000s	External quotation received for insurance for PHC's Coya and Pangal HEPs
Overheads And Contingency	300	USD '000s	Determined based upon expert opinion - Finance (100k), legal (50k), office (50k) and contingencies (100k)
Municipal Taxes	184	USD '000s	Expert opinion for Chacayes based on PHC's Coya and Pangal HEPs values
Transmission Charges (Injection And Additional Tolls)	380,000 USD/y + 1 USD/MWh/y	-	Synex Study 29/5/2008
Taxes & Depreciation			
Corporate Tax Rate	17	%	http://www.sii.cl/aprenda_sobre_impuestos/impuestos/imp_directos.htm
Depreciation	8	Years	PWC Tax Review
Project life	25	Years	Letter from turbine manufacturer Andritz Hydro
Fair value at end of 25 years	0	USD	Zero as assets fully devalued in line with accounting regulations, and investment analysis period is equal to technical lifetime, in line with paragraph 3 and 4 of "*Guidelines on the assessment of Investment Analysis'*
Construction period	25.8	Months	Memorandum of Understanding with EPC Contractor

Notes to the Financial Inputs

Assessment Period

The project IRR has been calculated based on the expected 25 year operating life of the hydro-mechanical and electrical equipment. These are the most significant capital cost items for the proposed project activity.

Energy Generation and Revenue

The project activity earns revenue from three streams, primarily from sales of electricity to the spot market, sales of electricity through Power Purchase Agreements (PPAs), and a fraction of it from

the Firm Capacity available to the SIC grid. The spot market prices and corresponding PPA prices cannot be determined based on historical or PPA prices received by similar plants.

Pacific Hydro contracted Synex Ingenieros Consultores (Synex Consulting Engineers, "Synex")[19] to prepare a dispatch and market analysis in order to forecast revenues of the project. This report is also used for the purpose of submission to financiers as an independent report. Synex is a leading third-party independent Chilean consulting firm specialising in electricity markets, including in the provision of electricity market demand and price forecasting. In the early nineteen eighties the founders of Synex played a key role in the Chilean National Energy Commission by developing the energy sector market oriented reform and privatisation process. As such, Synex has extensive knowledge of and experience within the Chilean electricity market and its policies.

To determine electricity prices, which includes both spot prices and long-term prices for supply contracts, generation expansion and fuel prices projections in the SIC were projected. This because in competitive power markets long- term equilibrium prices tend to reflect the unit costs (capital plus operating costs) of the power projects that are developed by the investors, while the spot prices reflect the short run marginal cost for meeting the hourly demand. Future spot prices were calculated by Synex using a mathematical dispatch models that simulate the optimal dispatch of the system both in the short and in the long-run. Market prices for supply contracts was established on the basis of the expected spot prices and also on the basis of the development costs of the power plants that will be added to the system. The model applied an optimization-simulation concept known as "stochastic dual dynamic programming" to calculate spot prices in several nodes of the systems.

Electricity prices are modelled against Chacayes annual generation variability corresponding to the inflows of the 1951-2006 period, where based upon hydrological conditions, the project is expected to operate at high plant load factors between November and March due to snow and glacier melt[20]. The project generation profile differs significantly from the majority of hydro generation plants in Chile that rely on rainfall and for which January to May are typically the driest months. Firm capacity is calculated in accordance with regulations ("Reglamento de Transferecias de Potencia entre Empresas Generadoras Establecidas en la Ley General de Servicios Eléctricos", Decreto Supremo Nº 62) and modelled by Synex.

Annual Fixed Operating Costs

The annual fixed operating costs were determined by the expert opinion of PHC's engineering and valuation team, based upon quotations from third-parties for similar projects owned and operated by PHC and adjusted where required for the proposed project activity.

Sub-step 2d: Sensitivity analysis.

A sensitivity analysis has been performed to show that the investment analysis is robust to reasonable variations in critical assumptions. As per the "Guidance on the Assessment of Investment Analysis" (Version 05; 15th July 2011), the sensitivity analysis has been performed on variables that constitute more than 20% of either total project costs or total project revenues. The variables are the total project cost, annual electricity generation, electricity tariff and the operation and maintenance costs associated with the hydro turbines. Variations in these parameters, and the corresponding project IRR, are shown in Table B6 below.

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[19] http://www.synex.cl

[20] "*Chacayes Hydroelectric Project Hydrology Report*", October 2007, and "*Chacayes Hydroelectric Project Power and Energy Report*", February 2008, prepared by Acres International Limited.

Table B6 - Value at which each sensitivity scenario hits the nominated benchmark

Variable	Current Value	Value for IRR to reach benchmark	Variation (%)	Comment
Project Cost	US$ 427,900	US$ 308,527	-27.9%	PHCSA sought proposals from three EPC contractors prior to the decision to proceed with the development of the proposed project activity. The proposal received from Astaldi was the lowest cost and therefore a reduction in EPC cost of 27.9% is not possible.
Energy output per year (GWh p.a.)	543.231 GWh	763.024 GWh	+40.5%	The hydrological study used to develop the design of the proposed project activity was based on 55 years of hydrological data. During the development of the proposed project activity several different designs were considered in order to identify the design that would maximize energy utilization. The project design therefore represents the optimum design solution based on long term hydrological data, and as such an average increase in generation of over 40.5% over the life of the project activity is considered exceedingly unlikely.
Hydro O&M costs	US$ 2,234,000 p.a.	NA	100%	With zero cost operation and maintenance the project IRR would be 7.7%, and does not reach the benchmark
Spot energy tariff, and PPA energy tariff (US$/MWh)	73.18 US$/MWh (Average spot price)	98.18 US$/MWh (Average spot price)	+38.0%	The projected electricity spot electricity tariff (and corresponding PPA tariff as a fraction of spot price) was calculated by an independent expert, Synex. When generating their electricity price calculation Synex made an in depth study of the factors that will affect the electricity price in Chile, including changes in demand and supply (including expected new generation assets to be added) and changes in fuel costs. Given the expertise of Synex and the detail this study it can be considered extremely unlikely that the electricity tariff will consistently be more than 38% higher than the value computed over the entire lifetime of the project in order for the IRR to achieve the benchmark

Step 3: Barrier analysis

The benchmark analysis clearly demonstrates that the proposed project activity is unlikely to be considered as a financially attractive course of action. As such, Step 3 – Barrier Analysis is not required.

Step 4: Common practice analysis

Sub-step 4a: Analysis of other activities similar to the proposed project activity

Step 4 of the "Tool for the Demonstration and Assessment of Additionality" requires project proponents to undertake an analysis of the extent to which the proposed project type (e.g. technology or practice) has already diffused in the relevant sector and region. This requires the identification of projects that are operational and are similar to the proposed project activity. The "Tool for the demonstration and assessment of additionality" states that:

> *"Projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc. Other CDM project activities (registered project activities and project activities which have been published on the UNFCCC website for global stakeholder consultation as part of the validation process) are not to be included in this analysis."*

Table B7 lists all the hydropower plants connected to the Chilean electricity grid commissioned over the last 25 years, including small scale plants. Projects are considered similar if they are categorized as runof-river hydropower projects, do not have large reservoirs, and of similar scale (approximately ≥ 50MW). Of these projects only four[21] have been constructed without the benefit of the CDM that could be considered broadly comparable to the proposed project activity in that they are pure run of river hydroelectric plants of similar size to the Chacayes project:

178 MW Alfalfal Hydroelectric Project

74 MW Aconcagua Hydroelectric Project

49 MW Mampil Hydroelectric Project

85.6 MW Peuchen Hydroelectric Project

Table B7 – List of run of river hydropower projects constructed over the last twenty five years[22]

Name of Project	Installed Capacity (MW)	Year of completion	Associated with Large Reservoirs	Comparable
Doña Hilda	0.0004	2010	No	No
Dongo	6	2010	No	No
Juncalito	1.47	2010	No	No
Los Corrales	0.0008	2010	No	No
Mariposas	6	2010	No	No
Pehui	1.1	2009	No	No
Trufultruful	0.0005	2009	No	No
Coya	10.8	2008	No	No

21 https://www.cdec-sic.cl/datos/anuario2011_ing.pdf

22 CDEC – SIC, 2010. Operation Statistics 2001/2010 (Chapter 2, Page 31), https://www.cdecsic.cl/datos/anuario2011_ing.pdf

Name of Project	Installed Capacity (MW)	Year of completion	Associated with Large Reservoirs	Comparable
Chiburgo	19.4	2007	No	No
El Rincón	0.00028	2007	No	No
Eyzaguirre	2.1	2007	No	No
Palmucho	32	2007	No	No
Mampil	**49**	2000	No	**Yes**
Peuchén	**85.6**	2000	No	**Yes**
Rucúe	178.4	1998	Yes - large reservoir (Laja)	No
Loma Alta	40	1997	Yes - large reservoir (Maule Invernada Reservoir)	No
Puntilla	22	1997	No	No
San Ignacio	37	1996	No	No
Capullo	11	1995	No	No
Aconcagua	**74**	1993-Ublanco; 1994-Ujuncal	No	**Yes**
Curillinque	89	1993	Yes - large reservoir (Maule Invernada Reservoir)	No
Alfalfal	**178**	1991	No	**Yes**

Most of these projects were commissioned over 10 years ago in a regulatory framework and investment climate considerably different to the current situation. In particular the investment decision to develop those projects was undertaken prior to the introduction of Articulo 99bis, a change in electricity laws that came into force in June 1999 following a severe drought in 1998/99 that resulted in significant changes to the contractual obligations of hydroelectricity generators.[23]

Articulo 99bis basically removed severe drought as a force majeure event for meeting contractual obligations in PPAs entered into between hydroelectric generators and third parties. As such hydroelectric projects have to be able to internally cover any delivery obligations, seek supply from third parties, or provide from the spot under extreme drought situations. The latter is potentially catastrophic financially, as system prices during rationing of gas and dry season can rise up to 250-415 USD/MWh. This dramatically changes the financial evaluation of run of river projects in particular, which have no reservoirs to provide water for generation when river flows are low.

Sub-step 4b: Discuss any similar options that are occurring:

No similar projects have been identified in sub-step 4a. There have been no run of river plants invested in since the introduction of 99b is that have not been undertaken without the benefit of CDM registration.

[23] Ley Nº19613, Artículo 2, Inciso 2 (http://www.leychile.cl/LocalFS_leyes_planas/norma137421.html)

Additionality Conclusion:

As demonstrated above, the proposed project activity is not prevailing practice and cannot be considered a financially attractive investment. As such, the proposed project activity is considered to be additional.

B.6. Estimation of emission reductions

B.6.1. Explanation of methodological choices

In accordance with ACM0002 (Version 20.0), the emission reductions attributable to the proposed project activity during any given year (y) are calculated as the difference between the Baseline Emissions (BEy) and the Project Emissions (PEy) in that year.

This section outlines the step-wise methodology used to determine these parameters. Detailed data used in these calculations is provided in Annex 4, where you can find the steps.

Project Emissions

As per methodology ACM0002 Version 20.0 the project emissions are calculated using the following formula:

$$PEy = PE_{FF,y} + PE_{GP,y} + PE_{HP,y}$$

Where:

PE_y = Project emissions in year y (tCO_2e/y)

$PE_{FF,y}$ = Project emissions from fossil fuel consumption in year y (tCO_2/y)

$PE_{GP,y}$ = Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year y (tCO_2e/y)

$PE_{HP,y}$ = Project emissions from reservoirs of hydro power plants in year y (tCO_2e/y)

Project emissions from fossil fuel consumption

According to the methodology, the use of fossil fuels for the back up or emergency purposes (e.g. diesel generators) can be neglected. The project does not include any back-up generation and will therefore not involve the combustion of any fossil fuels. On this basis $PE_{FF,y} = 0$.

Project emissions from the operation of geothermal power plants

The proposed project activity is not a geothermal power plant. On this basis $PE_{GP,y} = 0$.

Project emissions from water reservoirs of hydro power plants

The proposed project activity is a run-of-river hydropower plant that utilises an off river regulation pond to regulate the flow of water. This pond is not a water storage pond and is not considered to be

a reservoir. However, to confirm that no project emissions need to be accounted for, the power density of the pond is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}}$$

Where:

PD = Power density of the project activity, in W/m^2

Cap_{PJ} = Installed capacity of the hydro plant after the implementation of the project activity

Cap_{BL} = Installed capacity of the hydro plant before the implementation of the project activity (W). For new hydro plants this is zero.

A_{PJ} = Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m^2).

A_{BL} = Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m^2). For new reservoir this value is zero, which is the case for the Project activity.

Where the value of PD is greater than 10 W/m^2 then Project emissions (PE) is considered to equal zero. The proposed project activity has an installed capacity of 113.36 MW and a pond surface area of 180,179 m^2 which equates to a power density of 629 W/m^2.

On this basis $PE_{HP,y}$ = 0.

Total Project emissions

For the proposed project activity: PEy = 0.

Baseline emissions

Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are calculated as follows:

$$BE_{,y} = EG_{,PJ,y} \times EF_{grid,CM,y}$$

Where:

BE_y = Baseline emissions in year y (tCO_2/year);

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/year);

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the version 07.0 of “TOOL07: Tool to calculate the emission factor for an electricity system” (tCO_2/MWh).

If the project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity then:

$$EG_{PJ,y} = EG_{facility,y}$$

Where:

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/year);

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/year).

ACM0002, specifies that the combined margin CO_2 emission factor for grid connected power generation (EFgrid,CM,y) should be calculated in accordance with the latest approved version of the “Tool to calculate the emission factor for an electricity system” (Version 07.0).

Leakage

According to the ACM0002 version 20.0: “No other leakage emissions are considered. The emissions potentially arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, transport etc.) are neglected.”

Emission reductions

Emission reductions attributable to the project are calculated as follows:

$$ERy = BEy - PEy$$

Where:

ER_y = Emission reductions in year *y* (t CO2e/y);

BE_y = Baseline emissions in year *y* (t CO2e/y);

PE_y = Project emissions in year *y* (t CO2/y).

As no project emissions were identified for this project:

$$ER_y = BE_y.$$

Then,

$ER_y = EG,_{facility,y} \text{ x } EF_{grid,CM,y}$

Where:

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/year).

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the version 07.0 of “TOOL07: Tool to calculate the emission factor for an electricity system” (tCO_2/MWh).

B.6.2. Data and parameters fixed ex ante

Data/Parameter	$EG_{m,y}$
Data unit	MWh
Description	Net electricity generated and delivered to the grid by power plant / unit m in year y
Source of data	National Commission of Energy and National Electric Coordinator
Value(s) applied	See details in Chile Electricity System Emission Factor 2019 CDM Chacayes v4.0 calculator attached.
Choice of data or measurement methods and procedures	Values have been adopted as they refer to national official data. This is in line with the "Tool to calculate the emission factor for an electricity system" version 07.0"
Purpose of data	Calculation of baseline emissions
Additional comment	Data from years 2017, 2018 and 2019 was considered.

Data/Parameter	$FC_{i,m,y}$, $FC_{i,y}$
Data unit	Mass or volume unit
Description	Amount of fossil fuel type i consumed by power plant / unit m (or in the project electricity system in case of FCi,y) in year y.
Source of data	National Commission of Energy (2019) and National Electric Coordinator and Economic Dispatch Center of the Central Interconnected System statistics yearbook are used. If a power plant was not available in it, the latest available CNE node price report was used, as it contains specific fuel consumption (amount of fuel per generation unit) for each power plant.
Value(s) applied	See details in Chile Electricity System Emission Factor 2019 CDM Chacayes v4.0 calculator attached.
Choice of data or measurement methods and procedures	Values have been adopted as they refer to national official data. This is in line with the "Tool to calculate the emission factor for an electricity system" version 07.0"
Purpose of data	Calculation of baseline emissions
Additional comment	Data from years 2017, 2018 and 2019 was considered.

Data/Parameter	$\eta_{m,y}$
Data unit	%
Description	Average net energy conversion efficiency of power unit m in year y
Source of data	Table 2, Appendix of Tool 9: "Determining the baseline efficiency of thermal or electric energy generation systems Version 02.0".
Value(s) applied	See details in Chile Electricity System Emission Factor 2019 CDM Chacayes v4.0 calculator attached.
Choice of data or measurement methods and procedures	Table 2, Appendix of Tool 9: "Determining the baseline efficiency of thermal or electric energy generation systems Version 02.0" values were used, as neither (a) manufacturer's specifications nor (b) utility, dispatch center or official records were available.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data/Parameter	$NCV_{i,y}$
Data unit	GJ / ton or m^3
Description	Net calorific value (energy content) of fossil fuel type *i* in year *y*
Source of data	National Energy Balance 2018; Chilean Ministry of Energy
Value(s) applied	Coal: 27.82 Diesel: 43.33 Natural gas: 0.04 Fuel Oil Nº6: 41.74 Petcoke: 27.82 LPG: 45.57 IFO-180: 41.76 IFO-380: 41.77 Propane: 45.57
Choice of data or measurement methods and procedures	Values have been adopted as they refer to national official data (national average default values). This is in line with the "Tool to calculate the emission factor for an electricity system" version 07.0".
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data/Parameter	$EF_{CO2,i,y}$ and $EF_{CO2,m,i,y}$
Data unit	tCO_2/TJ
Description	CO_2 emission factor of fossil fuel type *i* used in power unit m in year *y*
Source of data	2006 IPCC Guidelines on National GHG Inventories.
Value(s) applied	Coal: 87.3 Diesel: 72.6 Natural gas: 54.3 Fuel Oil Nº6: 75.5 Petcoke: 82.9 LPG: 61.6 IFO-180: 75.5 IFO-380: 75.5 Propane: 61.6
Choice of data or measurement methods and procedures	Default values used from IPCC 2006 Guidelines for national greenhouse gas inventories. V2_2_Ch1_Introduction, Table 1.4.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data/Parameter	$EF_{grid, OM,y}$
Data unit	tCO_2 / MWh
Description	Operating Margin CO_2 emission factor of the grid connected power generation in year y calculated using the "Tool to calculate the emission factor for an electricity system" version 07.0.
Source of data	CNE, SIC, SING and SEN
Value(s) applied	0.798 tCO2/MWh
Choice of data or measurement methods and procedures	The Operating Margin emission factor is calculated ex-ante based on data vintage 2017, 2018 and 2019.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data/Parameter	$EF_{grid, BM,y}$
Data unit	tCO_2 / MWh
Description	Build margin CO_2 emission factor of the grid connected power generation in year y calculated using the "Tool to calculate the emission factor for an electricity system" version 07.0.
Source of data	CNE, SIC, SING and SEN
Value(s) applied	0.292 tCO_2/MWh
Choice of data or measurement methods and procedures	The Build Margin emission factor is calculated ex-ante based on 2019 data.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data/Parameter	$EF_{grid, CM,y}$
Data unit	tCO_2 / MWh
Description	Combined margin CO_2 emission factor of the grid connected power generation in year y calculated using the "Tool to calculate the emission factor for an electricity system" version 07.0.
Source of data	CNE, SIC, SING and SEN
Value(s) applied	0.418 tCO2/MWh
Choice of data or measurement methods and procedures	Calculated as described in section B.6.1. (Annex 4)
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data/Parameter	A_{BL}
Data unit	m^2
Description	Area of the single or multiple reservoirs measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m2). For new reservoirs, this value is zero
Source of data	For new hydro power plants, this value is zero.
Value(s) applied	Zero. The project is a Greenfield activity
Choice of data or measurement methods and procedures	-
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data/Parameter	Cap_{BL}
Data unit	W
Description	Installed capacity of the hydro power plant before the implementation of the project activity.
Source of data	For new hydro power plants, this value is zero.
Value(s) applied	Zero. The project is a Greenfield activity
Choice of data or measurement methods and procedures	-
Purpose of data	Calculation of baseline emissions
Additional comment	-

B.6.3. Ex ante calculation of emission reductions

As outline in section B.6.1:

$$ER_y = BE_y – PE_y – LE_y$$

Where:

PEy = 0 and LEy = 0, so:

$$ER_y = BE_y$$

The baseline emissions are calculated using the following formula:

$$BE_y = EG_{PJ,y} * EF_{grid,CM,y} = ER_y$$

Where:

$EG_{PJ,y} = EG_{facility,y}$

Then:

$$\mathbf{ERy = EG_{facility,y} * EF_{grid,CM,y}}$$

Table B8 – Emission Reduction Calculations

Description	Parameter	Unit	Value
Simple OM Emission Factor	$EF_{grid,OM,y}$	tCO_2e/MWh	0.798
BM Emission Factor	$EF_{grid,BM,y}$	tCO_2e/MWh	0.292
CM Emission Factor	$EF_{grid,CM,y}$	tCO_2e/MWh	0.418
Net Electricity supplied to the grid by Project	$EG_{facility,y}$	MWh	560,457
Emissions Reduction	$\mathbf{ER_y}$	$\mathbf{tCO_2e}$	**234,271**

B.6.4. Summary of ex ante estimates of emission reductions

The summary of emission reductions over the first crediting period are shown in Table B9.

Table B9 – Ex-ante estimation of emission reductions

Year*	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
30/07/2019 – 29/07/2020	234,271	0	0	234,271
30/07/2020 – 29/07/2021	234,271	0	0	234,271
30/07/2021 – 29/07/2022	234,271	0	0	234,271
30/07/2022 – 29/07/2023	234,271	0	0	234,271
30/07/2023 – 29/07/2024	234,271	0	0	234,271
30/07/2024 – 29/07/2025	234,271	0	0	234,271
30/07/2025 – 29/07/2026	234,271	0	0	234,271
Total	1,639,897	0	0	1,639,897
Total number of crediting years	7 years			
Annual average over the crediting period	234,271	0	0	234,271

**Crediting period specified in section C.3.2.*

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data/Parameter	$EG_{facility,y}$
Data unit	MWh/year
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in the year *y*
Source of data	Electricity Meter(s)
Value(s) applied	560,457
Measurement methods and procedures	Electricity will be measured continuously by the installed electricity metering system consisting of calibrated electricity meter(s). Meters will be calibrated as stated in B.7.2. Collected data will be recorded continuously by the installed SCADA system and data will be archived electronically and retained for 2 years following the end of the crediting period. The net energy generated and supplied to the grid by the project activity, excluding internal power consumption, will be directly measured at metering point M5 and M6, and metering point M1 and M2 remain as a backup meters.
Monitoring frequency	Continuous (hourly) measurements and monthly recording.
QA/QC procedures	Meter quality is governed by the Chilean Technical Standards and the meters are required to have a maximum error of 0.2% under Chilean law. This data is utilised by CEN for determining the energy balance between generators. Generation data of the Project will be cross checked versus CNE and CEN records to ensure data reliability.
Purpose of data	Calculation of project baseline emissions.
Additional comment	-

Data/Parameter	$Cap_{,PJ}$
Data unit	W
Description	Installed capacity of the project activity after the implementation of the project activity
Source of data	Project Site
Value(s) applied	113,348,000 W

<table>
<tr><td>Measurement methods and procedures</td><td>Determined based on manufacturer's specifications and/or nameplates and/or recognized standards
<table>
<tr><td>Item</td><td>Description</td><td>Capacity</td><td>Source</td></tr>
<tr><td>Turbine</td><td>Rated capacity of each unit</td><td>56.68 MW</td><td>Nameplate</td></tr>
<tr><td>Generator</td><td>Rated capacity of each unit</td><td>65,600 kVA</td><td>Nameplate</td></tr>
<tr><td>Net Capacity</td><td>Minimum Continuous Rating Electrical Output at metering point (rated plant electrical output)</td><td>110.8 MW, at 0.9 power factor</td><td>Manufacturer's specification</td></tr>
</table>
</td></tr>
<tr><td>Monitoring frequency</td><td>Once at the beginning of each crediting period.</td></tr>
<tr><td>QA/QC procedures</td><td>-</td></tr>
<tr><td>Purpose of data</td><td>Calculation of project baseline emissions.</td></tr>
<tr><td>Additional comment</td><td>110.8MW is the "rated plant electrical output measured at revenue metering points, with both turbines operating at a net head of 168.6m and each discharging 36.35 m3/s, and both units generating at rated voltage, frequency and indicated power factor", defined in Schedule F "Performance Guarantee" of the EPC Contract.</td></tr>
</table>

Data/Parameter	$A_{,PJ}$
Data unit	m^2
Description	Area of the single reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full.
Source of data	Project Site
Value(s) applied	180,179
Measurement methods and procedures	Measured using topographical surveys, maps, satellite pictures or other suitable means. Assessed annually.
Monitoring frequency	Once at the beginning of each crediting period.
QA/QC procedures	-
Purpose of data	Calculation of project baseline emissions.
Additional comment	As power density is approximately 629 W/m^2 (>>10W/m^2), $PE_{HP,y} = 0$.

B.7.2. Sampling plan

Not applicable.

B.7.3. Other elements of monitoring plan

The purpose of the monitoring plan is to ensure that the required data is monitored, recorded and stored appropriately to enable the calculation of the emission reductions achieved by the proposed project activity. The data that is required to be monitored is described in detail in Section B.7.1.

***Operational and Management Structure*[24]**

The operation and maintenance of the Chacayes project is proposed to be undertaken in accordance with the management structure indicated in Figure B2. Responsibility for collection, verification and processing of information related to the CDM, including quantification of emission reductions, will be allocated within this structure to ensure quality and accuracy of all data utilised and results obtained.

Specific CDM monitoring responsibilities are provided below in Table B10.

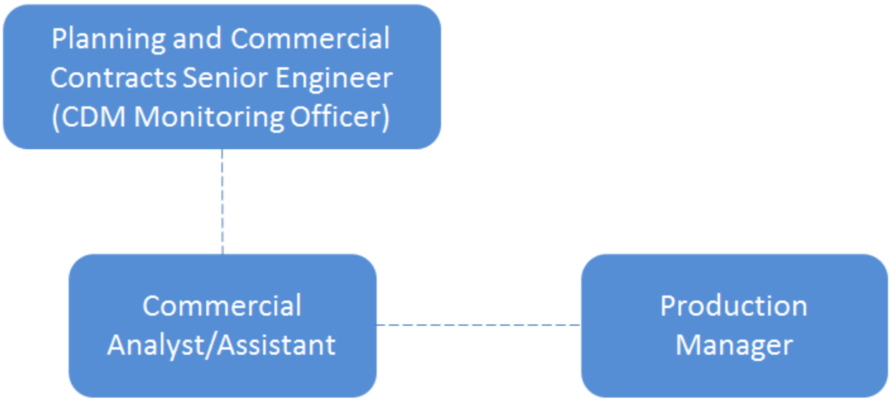

Figure B2 – Organizational structure for CDM project

Table B10 – CDM monitoring responsibilities

Position	Outline of CDM Monitoring Responsibilities	Reporting
Planning and Commercial Contracts Senior Engineer (CDM Monitoring Officer)	• Ensures on going compliance with the CDM monitoring plan. • Manages the CDM requirements. • Supervises meter calibration requirements and preparation of the Meter Calibration Report. • Reviews and approves quarterly Metered Net Electricity Generation reports. • Oversees the collection, recording and storage of data. • Calculates Emission Reductions. • Prepares the CDM Monitoring Report.	Reports to Commercial Manager
Commercial	• Download invoice reports (records for sold	Reports to the CDM

[24] Organizational and management structure may be subject to change.

Analyst/Assistant	electricity) from the CEN • Responsible for verification of monthly generation notices received from CEN and verification of these with data collected from meters. • Prepares the Net Electricity Generation report for CDM purposes. • Send reports to the CDM Monitoring Officers and CEN	Monitoring Officer (for CDM purposes only) and the Market Operation and Regulation Manager
Production Manager	• Responsible for carrying out meter calibration. • Collect data from meters • Elaborate report of the monthly electricity generation. • Send report to the Commercial Analyst/Assistant	Reports to Operations Manager

<u>Proposed Monitoring Provisions</u>

Training

All persons that are involved in the CDM monitoring will receive appropriate training. The training will provide an overview of the CDM and will cover all elements of the monitoring plan in detail.

A record of all training undertaken will be included within the *CDM Monitoring Report* for each monitoring period.

Metering Points:

The net energy generated and supplied to the grid by the project activity, excluding internal power consumption, will be directly measured at metering point M5 and M6 located at Sauzal Substation (grid interconnection point), and metering points M1 and M2 remain as a backup meters, as indicated in Figure B3. Data will be continuously measured by the meter points of interconnection with the SEN system. Net electricity is monitored continuously and automatically transmitted to the CEN Dispatch Centre and the powerhouse control room, where is it electronically stored.

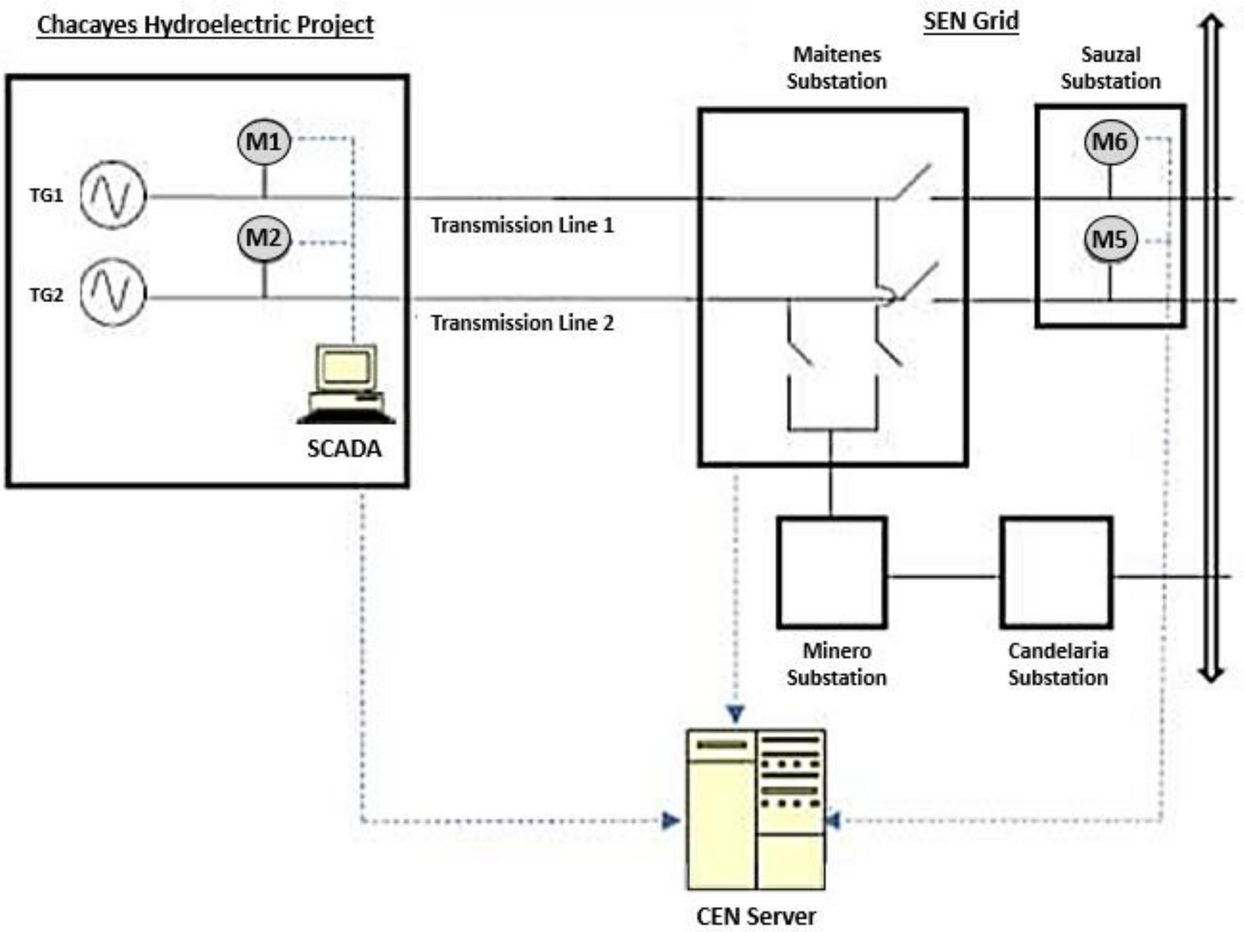

Figure B3 – Proposed location of energy meters

Data Collection Method:

In the case that electricity is injected via Sauzal Substation, the M5 and M6 are the main meters, and M1 and M2 are the backup meters. Data from M5 and M6 is collected by an operator and the net electricity generation is calculated using a fixed value, according to the meter´s manual. Data is sent to the Commercial Department of PHCSA, and it is also sent to the CEN for invoices purposes.

Data is reported on a monthly basis, measured by hour.

In the case that electricity is injected via Candelaria Substation, the electricity will be measured by meters M1 and M2 and transmission losses to Candelaria Substation (estimated by a third party) will be applied to the monitored values in order to obtain the Net electricity generation.

A Metered Net Electricity Generation Report outlining net electricity generated and other relevant parameters is prepared monthly. The results from this report were used to prepare the CDM Monitoring Report for this monitoring period.

Data Cross-Checks and Verification:

Grid connected generation projects are obliged to have communications systems with 100% redundancy, for transmission of all metered information to the CEN server. As electricity generation data is stored by both the CEN and the project activity.

In the case that electricity is injected via Sauzal Substation, the electricity generation data collected by the main meters M5 and M6 is cross checked against the invoice reports (records for sold electricity) from CEN.

In the case that electricity is injected via Candelaria Substation, the electricity will be measured by meters M1 and M2 and transmission losses to Candelaria Substation (estimated by a third party) will be applied to the monitored values. This value will be cross checked against the invoice reports (records for sold electricity) from CEN.

Standards and Calibration of Meters:

Grid connected generation projects are obliged under the Technical Standards to install metering that has 0.2% accuracy, which is extremely high precision equipment. The electricity meters will be recalibrated at least in accordance with regulatory requirements, which frequency depends on the age of the meter.

The last verifications were issued as detailed in the following table:

Meter	Type	Serial Number	Location	Date (dd/mm/yyyy)
M1	ION 8650	MW-1512A806-02	Chacayes Powerhouse (Line 1)	17/03/2016
M2	ION 8650	MW-1512A807-02	Chacayes Powerhouse (Line 2)	18/03/2016
M5	ION 8650	MW-1602A216-02	Sauzal Substation (Line 2)	01/08/2016
M6	ION 8650	MW-1602A217-02	Sauzal Substation (Line 1)	29/07/2016

On project commissioning a *Meter Calibration Report* will be prepared. Details of ongoing calibrations will be included in the *CDM Monitoring Report* for each monitoring period.

Procedures for Meter Failure:

In the event that the electricity main meters M5 and M6 are found to be faulty they will be repaired or replaced and the data from the secondary meter, M1 and M2, will be used in its place and the transmission losses to Sauzal Substation will be applied to the monitored values. In these instances an *Emergency Report: Meter Failure* will be prepared to describe the details of the meter failure and the application of the emergency management procedure.

For this monitoring period there was not a meter failure event.

Emission Reductions:

Emission reductions will be calculated using the project and baseline emission data, and the methodology described in section B.6.1 above. Emission reductions occurring as a result of the proposed project activity will be calculated by the CDM Monitoring Officer and included in the *CDM Monitoring Report* for each monitoring period.

Updating the Baseline Emission Factor:

The baseline emission factor will be updated at the end of each crediting period in accordance with ACM0002 and the methodology stipulated in B6.1. A *Baseline Emission Factor Report* summarizing this information will be prepared at the end of each crediting period by the CDM Monitoring Officer.

Emergency Preparedness

The project has the necessary provisions for emergency preparedness to deal with any unforeseen events such as fire or an electrical blackout. These provisions include a detailed management plan that requires all staff and local residents to comply with in case of an emergency.

Reporting

A template for all monitoring reports will be developed by the CDM Monitoring Officer, to ensure that the data is reported consistently and can be compared across each reporting period. The CDM Monitoring Officer will review all reports and perform cross checks of data against invoice reports (records for sold electricity). Any irregularities will be investigated as described below in "Review of Reports and Treatment of Uncertainty". A summary of the monitoring reports is contained in the Table B11.

Table B11 – Monitoring reports

Report	Frequency
Meter Calibration Report	At project commissioning.
Metered Net Electricity Generation	Monthly
CDM Monitoring Report including the following sections: • Net electricity generated, auxiliary loads and losses over the monitoring period • Emission Reductions	End of each monitoring period
Emergency Report: Meter Failure	As required
Baseline Emission Factor	End of each crediting period

Review of Reports and Treatment of Uncertainty

When reviewing monitoring reports, the CDM Monitoring Officer will examine the report for data anomalies and compare the report with previous periods for consistency.

If any discrepancies or errors are found they will be investigated and corrected. Any corrective actions which are taken to resolve identified discrepancies will be recorded in an appendix to the relevant report. If the corrective actions result in any adjustments to monitoring data, the relevant report will be revised after the adjustments have been made.

Record Storage

Data from the metering and SCADA system is stored electronically.

A paper copy of all documentation will be stored in a secure area at the Chacayes site. Copies of all reports will also be held in electronic form and backed up on a quarterly basis. Any documents which are archived will be kept until two years after last issuance of CERs.

The documents that will be stored include:

- Manufacturer's test certificates and Meter Calibration Report
- Quarterly report of Metered Net Electricity Generation
- CDM Monitoring Report (including records of training and emission reduction calculations)

SECTION C. Start date, crediting period type and duration

C.1. Start date of project activity

31/07/2008, which corresponds with the decision was made to proceed with advanced works and pre-sanction EPC activities by the Pacific Hydro Board.

C.2. Expected operational lifetime of project activity

25 years

C.3. Crediting period of project activity

C.3.1. Type of crediting period

Renewable. This is the second crediting period of the project activity.

C.3.2. Start date of crediting period

30/07/2019

C.3.3. Duration of crediting period

7 years until 29/07/2026

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

The proposed project activity complies with the relevant regulations in regard to Environment Impact Assessment (EIA). The EIA follows the regulations for EIA System established in the Chilean Constitution, Article 8, and Law 19300 (Environmental Basic Law) as well as by the Supreme Decree N 95/2001, Regulation for the Environmental Impact Assessment System (SEIA).

Under this framework all electricity generating projects larger than 3MW are required to be approved under the SEIA framework. Under the SEIA the impacts are evaluated under either an Environmental Impact Study (EIA) or an Environmental Impact Declaration (DIA). The former is a much more thorough and exhaustive study, also requiring public participation in the review of the project.

In June 2007, the Chacayes Project EIA was presented to the Chilean National Environmental Commission (CONAMA), for review and approval. The EIA was approved by COREMA in July 2008.

The EIA analyses a wide range of environmental and social impacts related to physical, flora and fauna, human, cultural, archaeological and landscape impacts during the construction and operation of the proposed project activity. It also assesses a number of corrective measures and establishes the guidelines of an Environmental Management Plan (EMP) to deal with the impacts identified. This plan addresses the significant and moderate impacts providing measures for their mitigation, restoration or compensation.

D.2. Environmental impact assessment

There were no significant negative impacts identified during the construction stage. The majority of negative impacts during this stage correspond to moderate and low impacts (land forms and natural resources, biotic environments and human environment). Three positive impacts were identified in this stage, all relating to the improvement to human environment and social-economic development of the District of Machali, where the project is located.

In the operation stage, one significant negative impact was identified. This is related to the change of aquatic habitat as a result of changes in the hydraulic flow. As the flow of water will be diverted to the tunnel, the water flowing through the river bed will be reduced during dry times (winter). This could potentially impact the habitat of three species of fish and one species of duck. There are two positive impacts identified with effects on the social-economic development of the District of Machali. The project will allow the generation of clean energy for the region displacing electricity generated from fossil fuel-based power plants.

The EMP specifies environmental variables that are required to be monitored and specific mitigation measures. Table D1 and D2 outlines these monitoring requirements and mitigation measures during the construction and operational phases respectively that will be implemented PHCSA.

Table D1 – Monitoring requirements and mitigation measures during construction

Variable	Monitoring Requirement	Mitigation Measure
Water quality	Monitoring of water according to standards.	Control of discharges into the river.
Air quality	Control of emissions.	Control of speed of vehicles and trucks and the transportation of materials.
Noise	Monitoring according to standards.	Acoustic protection of noisy machinery. Implementation of noise buffer zones.
Soil	Eleven points identified as dangerous for landslides will be monitored	Recovery of excavated soil. Restrictions on excavation in areas vulnerable to landslides.
Fauna	Monitoring of birds, particularly the species of duck whose habitat maybe affected by the operation of the proposed project activity.	Recovery of animal species if a population is affected by construction in accordance with a plan to be agreed with the Comisión Regional de Medio Ambiente (COREMA). Development of plans for rescue of species affected by the construction vehicles and activities.

Table D2 – Monitoring requirements and mitigation measures during operation

Variable	Monitoring Requirement	Mitigation Measure
Water	Monitoring of an ecological flow to ensure a: Minimum depth of water of 20 cm Minimum oxygen content of 8mg/l Maximum temperature of water of 22ºC Minimum speed of flow of 0.15 m/s	Discharge of an ecological flow to enable a minimum flow of: 2 m3/s for the Cachapoal River; and 1.3 m3/s for the Cipreses River.
Flora	Monitoring of vegetation in the vicinity of the proposed project activity.	Reforestation of areas affected by construction.
Fauna	Monitoring of birds and fish in the vicinity of the proposed project activity.	Recovery of animal species if a population is affected by construction in accordance with a plan to be agreed with the Comisión Regional de Medio Ambiente (COREMA).

The EMP also specifies that the following detailed environmental plans are developed and implemented:

- Mitigation, Restoration and Compensation Measures Plan,
- Accidents Risk Prevention and Control Plan,
- Waste Management Plan,
- Environmental Monitoring Plan
- Community Relation Plan
- Environmental Training Plan.

SECTION E. Local stakeholder consultation

E.1. Modalities for local stakeholder consultation

The proposed project activity has been presented to the public on a number of occasions. These include:

- Project information sessions: Information sessions were held by PHCSA to introduce the proposed project activity to the local communities.
- Formal Public Presentation of Project: These public sessions were held as part of the formal EIA evaluation process, immediately after the presentation of the EIA for approval to the authorities. CONAMA formally undertook this process with the assistance of the project developer.
- Information sessions and workshops: PHCSA undertook a number of workshops with the local Junta de Vigilancia, which is the representative council of irrigators. These were aimed at ensuring the needs of the irrigators were met and a full understanding of the project, its impacts, and the opportunities that would be created for the communities were communicated. A cooperation agreement with the Junta de Vigilancia was signed on 22th November 2007.

Table E1 summarises the public consultation process undertaken by the PHCSA. Only the workshops held in conjunction with the presentation of the EIA in June 2007 were obligatory under

Chilean law, with all other consultation undertaken as part of a commitment by PHCSA to involve stakeholders throughout the development of the proposed project activity. Details of participants and all comments received were recorded at all these meetings by PHCSA.

PHCSA placed an advertisement in the local newspaper (El Rancaguino) on the 18th July 2007 to inform local stakeholders of the potential development of hydropower projects in the Alto Cachapoal valley, including the proposed project activity. Specific details regarding the proposed project activity were provided and the location of where the local stakeholders could access the EIA also specified, with local stakeholders also invited to read the EIA.

Table E1 – Stakeholder Communication Activities

Date	Activity	Responsible	Stakeholder or place	Participants
October 2006	Information Session	PHCSA	Chacayes	15
October 2006	Information Session	PHCSA	Llanos de Chacayes	20
November 2006	Environmental Show-Rancagua- Pacific Hydro Stand presenting projects in the Alto Cachapoal Valley.	CONAMA VI Region	Rancagua square	NA
November 2006	Interviews with local communities and residents	PHCSA	Machalí, Coya y Chacayes.	15
December 2006	Initial presentation of the project to stakeholders	PHCSA	Local community leaders-Coya	60
May 2007	Presentation of baseline and results of field studies for EIA	PHCSA	Termas de Cauquenes, Río Loco, Los Cipreses, Errázuriz, Bellavista, Perales, El Alamo, Chacayes.	53
June 2007	Formal Public Presentation of EIA.	CONAMA VI Region	Termas de Cauquenes, Río Loco, Los Cipreses, Errázuriz, Bellavista, Perales, El Alamo, Chacayes.	50
October 2008	Workshops (7) about baseline, Project and field studies undertaken.	PHCSA	Community Council: Termas de Cauquenes, Río Loco, Los Cipreses, Errázuriz, Bellavista, Perales, El Alamo, Chacayes	152
November 2007	Workshop wth Junta de Vigilancia	PHCSA	Council of irrigators and farmers	35

E.2. Summary of comments received

The main comments raised during public consultation regarding the proposed project activity together are summarised below:

- Opportunities for local residents to work on the proposed project activity, including formal training.
- Concerns over increased traffic and then need for dust control, traffic control to avoid accidents on main access roads, the protection of houses beside the f-Fundo Perales road, and maintenance of roads.

- Concern over interaction of large numbers of workers with local community.
- Concern over protection of the Valley's environment and landscape recovery.

E.3. Consideration of comments received

The information of how PHCSA responded to the public consultation comments are summarised in Table E2.

Table E2 – Comments and Actions Taken

Comments received	How due account was taken of any comments received
Opportunities for local residents to work on the proposed project activity, including formal training.	PHCSA provided professional training sessions in environment, health and safety and workplace practices. A total of 240 people attended these courses between the 12th November and the 14th December, 2007 for a total of 20 hours. PHCSA worked with the Coya Workers Protection Committee to facilitate and coordinate local workers obtain work contracts with companies contracted by PHCSA to undertake preliminary works, studies and road upgrades. Up to 133 workers from the local area were awarded work contracts between January and May 2008 through this joint effort.
Concerns over increased traffic and then need for dust control, traffic control to avoid accidents on main access roads, the protection of houses beside the Coya- Fundo Perales road, and maintenance of roads.	In order to avoid projects traffic through Coya, the Termas de Cauquenes road will be used and traffic control and road signs will be installed, dust will be controlled through use spraying of roads and maintenance. Undertaking of traffic impact study on houses between entry to Coya Township and the Chacayes Bridge.
Concern over interaction of large numbers of workers with local community.	Creation of a policy regarding the impact and behaviour of workers to ensure that the peace and social framework of the community in the Cachapoal valley is maintained. Appointment of a Community Affairs manager by PHCSA based in Coya to facilitate communication and manage issues as they arise regarding the proposed project activity and the community. Establishment of public noticeboards to keep the community up to date with project activities. Creation of a Community Relations Plan and a Community Social Policy Monitoring and Compliance Plan. Establishment of a social and community fund program to assist in creation of new activities and businesses within the community.
Concern over protection of the Valley's environment and landscape recovery.	Development and implementation of an Environmental Management Plan and Environmental Monitoring Plan which were both formally approved by COREMA in the EIA.

SECTION F. Approval and authorization

The Letter of Approval / Authorization of the Host Country (Chile) was issued on 22nd September 2011 by the DNA (Ministry of Environment of Chile) to the following Authorized Participants: "Pacific Hydro Chacayes S.A".

Appendix 1. Contact information of project participants

Organization name	Pacific Hydro Chacayes S.A.
Country	Chile
Address	Isidora Goyenechea 2915, piso 8, Las Condes, Santiago, Chile 7550092 Santiago Chile
Telephone	+56 2 2519 4200
Fax	+56 2 2519 4240
E-mail	cerchacayes@pacifichydro.cl
Website	www.pacifichydro.cl
Contact person	Jose Luis Pastrian

Organization name	Pacific Hydro Chacayes S.A.
Country	Chile
Address	Isidora Goyenechea 2915, piso 8, Las Condes, Santiago, Chile 7550092 Santiago Chile
Telephone	+56 2 2519 4200
Fax	+56 2 2519 4240
E-mail	cerchacayes@pacifichydro.cl
Website	www.pacifichydro.cl
Contact person	Luis Arqueros

Appendix 2. Affirmation regarding public funding

This section has been left blank intentionally.

Appendix 3. Applicability of methodologies and standardized baselines

This section has been left blank intentionally.

Appendix 4. Further background information on ex ante calculation of emission reductions

CO2 emission factor for an electricity system determination

The Combined margin CO2 emission factor for grid connected power generation in year *y* calculated using the version 07.0 of “TOOL07: Tool to calculate the emission factor for an electricity system” (tCO2/MWh).

Calculations for this combined margin were based on public data from official sources.

According to the tool the steps are as follow:

STEP 1. Identify the relevant electric power systems

The determination of the relevant electricity system was made following the Option 2, considering the dispatch area covered by the responsible dispatch centre for each year of the ex-ante emission factor calculation requirements. In this regard, since in November 21th, 2017, the SIC grid was connected to the SING grid, creating a new electricity system called SEN, which considers a single dispatch area coordinated by the National Electricity Coordinator (CEN); thus, the relevant electricity system is the SEN[25].

As the “Tool to calculate the emission factor for an electricity system” requires an annual based emission factor calculation, and the interconnection occurred during 2017, therefore the relevant electricity system is SIC for 2015, 2016 and 2017, SING for November and December 2017, and SEN for 2018 and 2019, as shown in the spreadsheet LCMR of Chile Electricity System Emission Factor 2019 CDM Chacayes v4.0.

The systems include the project site and the geographical extent of each grid and all electricity generation plants that are connected to these grids at the relevant years. The selection of these grids as the appropriate electric power system is in accordance with “Tool to calculate the emission factor for an electricity system” (Version 07.0).

There are no electricity transfers from other connected electricity systems to the project electricity system (electricity imports) nor electricity transfers to connected electricity systems (electricity exports).

STEP 2. Choose whether to include off-grid power plants in the project electricity system (optional)

Option I of this step is chosen, meaning only grid power plants are included in the calculation.

[25] Creation of the SEN. Resolution N°668; 28/11/2017: https://www.leychile.cl/Navegar?idNorma=1111361&idParte

STEP 3. Select a method to determine the operating margin (OM)

The method chosen to calculate the operating margin emission factor ($EF_{grid,OM,y}$) is the Simple OM (option a), given that low-cost/must-run resources constitute less than 50 per cent of total grid generation (excluding electricity generated by off-grid power plants) in average of the five most recent years determined by using approach 1 (Paragraph 40 (a) (i), Approach (1)) of the Tool 07 Version 07.0, as described below:

$$\text{Share}_{LCMR} = \text{average}\left[\frac{EG_{LCMR_{y-4}}}{total_{y-4}}, \ldots, \frac{EG_{LCMR_y}}{total_y}\right]$$

Where:

Share_{LCMR} = Share of the low cost/must run resources (per cent)

EG_{LCMRy} = Electricity generation supplied to the project electricity system by the low cost/must run resources in year y (MWh)

$total_y$ = Total electricity generation supplied to the project electricity system in year y (MWh)

y = The most recent year for which data is available

The below tables illustrate the results:

Table Annex 4.1 – Electricity generation by power plant/fuel type (MGh)[26]

Year	Hydro	Coal	Diesel	Natural gas	Solar	Wind	Geo-thermal	Biomass	TOTAL
2015	23,805.45	14,283.27	1,058.02	8,464.16	1,058.02	1,587.03	-	2,645.05	52,901.00
2016	19,405.80	17,249.60	539.05	10,241.95	1,617.15	2,156.20	-	2,695.25	53,905.00
2017	21,443.90	17,376.28	689.90	10,233.32	2,530.54	2,850.42	-	2,195.76	58,418.00
2018	22,692.30	29.,499.99	756.41	11,346.15	5,294.87	3,782.05	-	2,269.23	75,641.00
2019	21,587.52	27,891.8	445.76	13,882.24	6,049.60	4,712.32	-	1,783.04	76,416.00

Year	EG_LCMR	% LCMR
2015	29,095.55	55%
2016	25,874.40	48%
2017	29,020.62	50%
2018	34,038.45	45%
2019	34,132.48	45%
Share_{LCMR} (5 years average)		**48%**

Therefore, since the Share LCMR < 50% the method chosen to calculate the Operating Margin is the Simple OM.

[26] 2015-2016 based on SIC system, 2017 based on SIC January to December and SING system November to December, and 2018-2019 based on SEN system.

For further information, please refer to the Chile Electricity System Emission Factor 2019 CDM Chacayes v4.0 calculator attached.

Regarding data vintage, ex ante option was chosen, according to Option a) of paragraph 42 of the Tool 07 Version 07.0. Thus, OM is determined using a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation. Data from 2017 to 2019 is the most recent data available.

STEP 4. Calculate the operating margin emission factor according to the selected method

Simple OM

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (t CO_2/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units. The simple OM is calculated by following Option A of the Tool 07 Version 07.0, based on the net electricity generation and a CO_2 emission factor of each power unit, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

Where:

$EF_{grid,OMsimple,y}$ = Simple operating margin CO_2 emission factor in year y (t CO_2/MWh).

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh).

$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (t CO_2/MWh).

m = All power units serving the grid in year y except low-cost/must-run power units.

y = The relevant year as per the data vintage chosen in Step 3.

Determination of $EF_{EL,m,y}$

The emission factor of each power unit m has been determined as follows:

- **Option A1:** for most of the power units m data on fuel consumption and electricity generation is available. Thus, the emission factor (EFEL,m,y) is determined as follows:

$$EF_{EL,m,y} = \frac{\sum_i FC_{i,m,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_{m,y}}$$

Where:

$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2/MWh);

$FC_{i,m,y}$ = Amount of fossil fuel type i consumed by power unit m in year *y* (Mass or volume unit);

$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type i in year *y* (GJ/mass or volume unit);

$EF_{CO2,i,y}$ = CO_2 emission factor of fossil fuel type i in year *y* (tCO_2/GJ);

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year *y* (MWh);

m = All power units serving the grid in year y except low-cost/must-run power units;

i = All fossil fuel types combusted in power unit m in year *y*;

y = The relevant year as per the data vintage chosen in Step 3.

- **Option A2:** for a few power units m only data on electricity generation and the fuel types used is available, the emission factor is determined based on the CO_2 emission factor of the fuel type used and the efficiency of the power unit, as follows data on fuel consumption and electricity generation is available. Thus, the emission factor ($EF_{EL,m,y}$) is determined as follows:

$$EF_{EL,m,y} = \frac{EF_{co2,m,i,y} \times 3.6}{\eta_{m,y}}$$

Where:

$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2/MWh).

$EF_{CO2,m,i,y}$ = Average CO_2 emission factor of fuel type *i* used in power unit m in year *y* (tCO_2/GJ).

$\eta_{m,y}$ = Average net energy conversion efficiency of power unit m in year *y* (ratio).

m = All power units serving the grid in year *y* except low-cost/must-run power units.

y = The relevant year as per the data vintage chosen in Step 3.

Where several fuel types are used in the power unit, the fuel type with the lowest CO_2 emission factor for $EF_{CO2,m,i,y}$ is used (Option A3).

Determination of EGm,y

For grid power plants, $EG_{m,y\ i}$ has been determined as per the provisions in the monitoring tables (paragraph 51 (Tool 07)).

Based on the above calculations and data available, the simple OM emission factor has been calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (t CO_2/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units in 2017, 2018 and 2019.

The result of the three-year (2017, 2018 and 2019) average operating margin emission factor, calculated as a full-generation-weighted average of the emission factors, has been:

$$\mathbf{EF_{grid,OM\ simple,2017\text{-}2019} = 0.798\ tCO_2/MWh}$$

Please refer to the Chile Electricity System Emission Factor 2019 CDM Chacayes v4.0 calculator attached for detailed information on data (official national statistics) and calculations.

STEP 5. Calculate the build margin (BM) emission factor

In terms of vintage of data Option 1 has been chosen. Thus, according to the tool Version 07.0: "For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. This option does not require monitoring the emission factor during the crediting period."

The sample group of power units *m* used to calculate the build margin has been determined according to the stepwise of the tool as: the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and no more than 10 years ago, and that comprise 20 per cent of the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}), as it comprises the larger annual electricity generation (SET_{sample}).

A power unit is considered to have been built at the date when it started to supply electricity to the grid.

As above mentioned, power plants registered as CDM project activities were excluded from sample group *m*. No power units built more than 10 years from the most recent information available on units at the time of submission of the request for renewal of the crediting period were identified within the sample group. Thus, no other plants have been excluded from the group.

Capacity additions from retrofits of power plants were not included in the calculation of the build margin emission factor.

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units *m* during the most recent year *y* for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year *y* (tCO_2/MWh);

$EG_{m,y}$ = Net electricity generated and delivered to the grid by power unit m in year *y* (MWh);

$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year *y* (tCO_2/MWh);

m = Power units included in the build margin;

y = Most recent historical year for which power generation data is available.

According to TOOL 07 "Tool to calculate the emission factor for an electricity system" (Version 07.0) the following procedures must be followed:

a) The five set of latest power units (excluding CDM) supplying to the grid ($SET_{5\text{-units}}$) has been determined and calculated the generation of each power plants:

Set of latest five power units (excluding CDM) that supply to the grid ($SET_{5\text{-units}}$) represent 20,207 MWh: 0.03% of the total generation.

b) The units that comprise at least 20% of the system generation, excluding CDM registered projects ($SET_{\geq 20\%}$):

Units that comprise at least 20% of the system generation, excluding CDM registered projects ($SET_{\geq 20\%}$) represent 16,079,631 MWh (16,079 GWh).

The power units in the larger annual generation ($AEG_{SET\geq 20\%}$) sample have been supplying electricity to the grid less than 10 years ago, with the earliest power unit built in 2012.

Hence, the build margin is calculated using SETsample = $AEG_{SET-\geq 20\%}$.

The CO_2 emission factor of each power unit *m* ($EF_{EL,m,y}$) was determined as per the guidance in Step 4 (a) for the simple OM, using option A1 or A2 (as described for the simple OM above), using for *y* the most recent historical year for which power generation data is available (2019) and using for *m* the power units included in the build margin.

Based on the above calculations and data from 2019 (the latest year available), the result of the build margin emissions factor, calculated as the generation-weighted average emission factor (tCO_2/MWh) of all power units *m*, has been:

$$\mathbf{EF_{grid,BM} = 0.292\ tCO_2/MWh}$$

Please refer to Chile Electricity System Emission Factor 2019 CDM Chacayes v4.0 calculator attached for detailed information and calculations.

STEP 6. Calculate the combined margin emissions factor

The combined margin emission factor is calculated as the weighted average of the CM:

$$EF_{grid,CM,y} = EF_{grid,OM},y \text{ x } W_{OM} + EF_{grid,BM,y} \text{ x } W_{BM}$$

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year *y* (tCO_2/MWh);

$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year *y* (tCO_2/MWh);

W_{OM} = Weighting of operating margin emission factor (%);

W_{BM} = Weighting of build margin emission factor (%).

The default weights for hydroelectric power projects for the first second period has been applied: $W_{OM} = 0.25$ and $W_{BM} = 0.75$

So the Combined Margin (CM) for the year 2017 to 2019 in calculated:

$$\mathbf{EF_{grid,CM} = 0.798 * 0.25 + 0.292 * 0.75 = 0.418\ tCO2/MWh}$$

For detailed information and calculations, please refer to Chile Electricity System Emission Factor 2019 CDM Chacayes v4.0 calculator attached.

Appendix 5. Further background information on monitoring plan

This section has been left blank intentionally.

Appendix 6. Summary report of comments received from local stakeholders

This section has been left blank intentionally.

Appendix 7. Summary of post-registration changes

A correction has been requested in order to correct two typos included in the technical description of the registered PDD:

1. The maximum capacity of the project is 113.36 MW (56.68 MW x 2 turbines) instead of 110.8 MW, as it was mentioned in some sections of the registered PDD.

   110.8 MW, is the rated plant electrical output measured at revenue metering points, with both turbines operating at a net head of 168.6m and each discharging 36.35 m3/s, and both units generating at rated voltage, frequency and indicated power factor", defined in Schedule F "Performance Guarantee" of the EPC Contract.

   However the maximum rated power of each turbine installed in the project is 56.68 MW, and therefore the installed capacity is 56.68 MW x 2 turbines = 113.36 MW.

   The project implementation has not changed from the beginning of the project, there are not changes in the project capacity but the original PDD registered did not explain clearly the difference between the installed capacity (113.36 MW) and the rated capacity with a load factor of 0.9 which is 110.8 MW according to the feasibility study.

2. The pond surface area value, has been updated to the most recent data measured by the PP. The original value included in the registered PDD was 180.000 m^2 and the new value included in the PDD is 180,179 m^2 according to the last measure carried out by the PPs.

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Document information

Version	*Date*	*Description*
11.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); • Make editorial improvements.
10.1	28 June 2017	Revision to make editorial improvement.
10.0	7 June 2017	Revision to: • Improve consistency with the "CDM project standard for project activities" and with the PoA-DD and CPA-DD forms; • Make editorial improvement.
09.0	24 May 2017	Revision to: • Ensure consistency with the "CDM project standard for project activities" (CDM-EB93-A04-STAN) (version 01.0); • Incorporate the "Project design document form for small-scale CDM project activities" (CDM-SSC-PDD-FORM); • Make editorial improvement.
08.0	22 July 2016	EB 90, Annex 1 Revision to include provisions related to automatically additional project activities.
07.0	15 April 2016	Revision to ensure consistency with the "Standard: Applicability of sectoral scopes" (CDM-EB88-A04-STAN) (version 01.0).
06.0	9 March 2015	Revision to: • Include provisions related to statement on erroneous inclusion of a CPA; • Include provisions related to delayed submission of a monitoring plan; • Provisions related to local stakeholder consultation; • Provisions related to the Host Party; • Make editorial improvement.
05.0	25 June 2014	Revision to: • Include the Attachment: Instructions for filling out the project design document form for CDM project activities (these instructions supersede the "Guidelines for completing the project design document form" (Version 01.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for the application of the methodology (ies) to the project activity in B.7.4 and Appendix 1; • Change the reference number from F-CDM-PDD to CDM-PDD-FORM; • Make editorial improvement.

Version	*Date*	*Description*
04.1	11 April 2012	Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b.
04.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the project design document form for CDM project activities" (EB 66, Annex 8).
03.0	26 July 2006	EB 25, Annex 15
02.0	14 June 2004	EB 14, Annex 06b
01.0	03 August 2002	EB 05, Paragraph 12 Initial adoption.

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