Small-scale renewable energy projects in Chile

Name of the project	*Small-scale renewable energy projects in Chile*
Project holder	*Natural Assets SpA*
Account holder	*Cristian Mosella*
Legal representative	*Cristian Mosella*
Project holder's contact information	*cmosella@energylab.cl* *+56 9 8828 7578* *Fidel Oteiza 1941, of. 504, Providencia.*
Other project participants	*Parque Solar Quetena S.A.*
Version	*1.0*
Date	*17/09/2025*
Project type	*Renewable Energy*

Grouped project	*The project corresponds to a grouped project*
Applied Methodology (ies)	*AMS-I.D "Grid connected renewable electricity generation" Version 18.0*
Project location (City, Region, Country)	*The project is located in Chile.* *The initial instances is located in:* *Calama Commune, Antofagasta Region.*
Starting date	23.09.2021
Quantification period of GHG emissions reduction	23.09.2021 to 22.09.2031
Estimated total and average annual GHG emission reduction/removals amount	*The total amount of estimated GHG emissions reductions during the quantification period is 133,868* tCO_2. *The estimated average annual amount of GHG emission reductions is 13,387* tCO_2*/year.*
Sustainable Development Goals	*SDG7* *SDG9* *SDG13*
Special category, related to co-benefits	*The project does not apply to special categories*

Document prepared by Natural Assets SpA

Table of contents

1 Project type and eligibility

1.1 Scope in the BCR Standard

The scope of the BCR Standard is limited to:	
The following greenhouse gases, included in the Kyoto Protocol: Carbon Dioxide (CO_2), Methane (CH_4) and Nitrous Oxide (N_2O).	X
GHG projects using a methodology developed or approved by BioCarbon, applicable to GHG removal activities and REDD+ activities (AFOLU Sector).	
Quantifiable GHG emission reductions and/or removals generated through implementation of GHG removal activities and/or REDD+ activities (AFOLU Sector).	

GHG projects using a methodology developed or approved by BioCarbon, applicable to activities in the energy, transportation and waste sectors.	X
Quantifiable GHG emission reductions generated through implementation of activities in the energy, transportation and waste sectors.	X

This project is eligible under the scope of the BCR Standard as it generates electricity through Non-Conventional Renewable Energies (NCRE) and provides quantifiable Greenhouse Gas (GHG) emission reductions, using the methodology AMS-I.D "Grid connected renewable electricity generation" Version 18.0.

1.2 Project type

Activities in the AFOLU sector, other than REDD+	
REDD+ Activities	
Activities in the energy sector	X
Activities in the transportation sector	
Activities related to Handling and disposing of waste	

1.3 Project scale

This is a grouped project that contains only renewable energy instances that have an output capacity up to 15 MW each (or an appropriate equivalent), which means only Type I Small-Scale project activities as stated in the Glossary of CDM terms.

2 General description of the project

By now, the Chilean electricity market consists of three main unconnected electricity networks. From north to south, the networks are as follows: National Electric System (SEN, for its acronym in Spanish), Electric System of Aysén (SEA, for its acronym in Spanish), and Electric System of Magallanes (SEM, for its acronym in Spanish). Each network has particular characteristics concerning size, energy supply/demand, matrix composition, and energy sources, the SEN being the main grid in Chile with an installed capacity of more than 99% of the national total. It is important to know that the SEA and

SEM are systems that exist for regulation purposes and group subsystems that are not connected, so an analysis was carried out to determine if they were considered isolated systems in line with the definition presented in TOOL07 "Tool to calculate the emission factor for an electricity system" Version 7.0 (hereinafter referred to as TOOL07):

"Is an electricity system supplying electricity to household users, and if applicable, industries and commercial areas that are not connected to any other electrical network (e.g., national/regional or interconnected power system) and meet one of the following conditions:

(i) Any grid located in a Least Developed Country (LDC) or small island development State (SIDS) where at least 65 per cent of the power installed capacity is based on fossil fuel sources - solid, liquid or gaseous;

(ii) Any grid where 65 per cent of the power installed capacity is based on liquid fossil fuel sources;

(iii) Any grid with a maximum power installed capacity of 1000 MW and at least 80 per cent of the power installed capacity is based on fossil fuel sources, solid, liquid, or gaseous;"

The following table shows the different systems in Chile and whether they meet the conditions mentioned above:

System	Subsystem	Capacity (MW)	Liquid FF sources (%)	FF sources (%)	Isolated?
SEN		35,584	11.0	32.3	NO
SEA	Aysén	59.7	53.4	53.4	NO
	Cisnes	1.7	82.0	82.0	YES (ii,iii)
	Gral. Carrera	5.1	87.4	87.4	YES (ii,iii)
	Palena	7.4	81.0	81.0	YES (ii,iii)
SEM	P. Arenas	100.8	5.1	88.5	YES (iii)
	P. Natales	14.4	29.4	100	YES (iii)
	P. Williams	2.4	100	100	YES (ii,iii)
	Porvenir	11.1	54.9	100	YES (iii)
Los Lagos	Cochamó	5.9	75.1	75.1	YES (ii)
	Hornopirén	3.8	80.1	80.1	YES (ii,iii)
Isla de Pascua		4.3	100	100	YES (ii,iii)

Table 1: Characteristics of Chilean electric systems

As a result, each system has its own emission factor, whereas this grouped project considers activities located in the SEN and the Aysén subsystem in the SEA.

Data extracted from the National Energy Commission (CNE, for its acronym in Spanish) with information from April 2025, the SEN has an installed capacity of 35,584 MW composed of 48.6% of NCRE (31.1% Solar, 14.2% Wind, 1.7% Hydro, 1.1% Renewable Biomass, 0.2% Geothermic, 0.2% Renewable Biogas) and 51.4% of conventional energies, composed by 32.0% of fossil fuel based energy (10.7% Diesel, 10.6% Natural Gas, 10.5% Carbon, 0.2% Others) and 19.4% non-renewable hydraulic energy (9.9% With Reservoir, 9.4% Run-of-river).

As for the distribution for the Aysén subsystem, it has an installed capacity of 57.9 MW composed of 46.7% of NCRE (5.0% Solar, 3.0% Wind, 38.7% Renewable run-of-river hydro) and 53.3% conventional energies, being composed of 100% Diesel generation.

All these values are determined considering the CNE interpretation of NCRE in its database, which is based on Law 20,257, in which NCREs are redefined, specifically, NCRE hydraulic energy has a maximum capacity of 20,000 kW.

Chile has substantial potential for the development of renewable energy, including unused capacity for hydroelectric energy, high levels of solar radiation for solar energy, unutilized wind power in the Andes mountains (among other prospective areas), great potential for geothermal energy for its high volcanic and tectonic activity, and unutilized tidal power from the country's extensive coastline. The government of Chile has declared that it aims to achieve carbon neutrality by 2050. In this way, local policymakers intend to address global warming by reducing CO_2 emissions from the Chilean energy matrix (among others).

There are some policy instruments in Chile with legal force to promote renewable energy sources, of which the most significant are:

- Law No. 19,940 (13.03.2004), known as "Short Law I"
- Law No. 20,018 (19.05.2005), known as "Short Law II"
- Law No. 20,257 (01.04.2008), modified by Law 20.698, known as "Non-Conventional Energy Sources" (ERNC, by its Spanish acronym)
- Law No. 21,118 (17.11.2018)
- Law No. 21,455 (13.06.2022)

While the Chilean regulatory framework provides incentives for the development of renewable energy, it is important to highlight that none of these pieces of legislation require project developers to invest in renewable energies. Investment decisions continue to face significant financial and market barriers. Therefore, additional revenues from carbon markets are a crucial mechanism to improve the viability of these projects and accelerate Chile's transition toward a cleaner energy matrix, aligned with its carbon neutrality goals.

This grouped project aims to reduce GHG emissions by displacing CO_2 emissions attributable to the generation of electricity which would have otherwise been generated from the operation of fossil fuel-fired power plants connected to the above mentioned systems and will be composed of different instances of renewable energy generation, initially solar power instances but with the possibility to include other kinds of NCREs, like wind, hydro, tidal, wave or geothermal, in the future.

The project does not apply to any special category.

The activities included in this grouped project will contribute at least to the SDGs 7 "Affordable and clean energy", 9 "Industry, innovation and infrastructure", and 13 "Climate action", with the possibility of including future instances that could contribute to SDGs beyond those already mentioned.

The initial instance "Quetena Solar Park" will reduce approximately 13,387 tCO_2/y.

Future instances included under this grouped project could approximately reduce between 3,000 and 15,000 tCO_2/y depending on the technology, size, location, and efficiency.

2.1 GHG project name

Small-scale renewable energy projects in Chile.

2.2 Objectives

The "Small-scale renewable energy projects in Chile" aims to contribute in the following ways:

- Achieve GHG emission reductions by incorporating projects related to the production of non-conventional renewable energy, specifically by means of solar photovoltaic, wind, hydro, tidal, wave, and geothermal energies.
- Support, facilitate, and encourage the development of small grid-connected renewable energy projects in Chile, by helping project developers to overcome local barriers related to development and finance through the inclusion of their activities in this grouped project.
- Contribute to the sustainable development in Chile through environmental, social, economic, and technological benefits, such as the use of renewable energy resources to produce non-conventional renewable energy, generating direct employment and income generation opportunities.

- The higher-level and long-term additional purpose of this grouped project is to strengthen Chile's renewable energy promotion policies by providing a platform that facilitates the transition to a low-carbon economy through the generation of additional financial support for renewable energy via national and international carbon markets.

2.3 Project activities

All the instances under this project use renewable energy technologies, as detailed below. In cases where a specific technology may support future instances, a general description is provided to account for this.

This clean electricity is supplied to the SEN or Aysén subsystem. The facilities are physically connected to the electricity system and may consider the inclusion of energy storage systems to optimize the management and delivery of the generation of electricity to them. The renewable energy instances promoted by this project contribute to the reduction of greenhouse gas emissions by displacing CO_2 emissions attributable to the generation of electricity, which would have otherwise been generated from the operation of fossil fuel-fired power plants, which are considered to be the main source of greenhouse gases.

a. Solar photovoltaic instances:

Instances under this category will include greenfield projects with an installed capacity of no more than 15 MW and capacity addition projects that add no more than 15 MW of new capacity to an existing facility.

A power plant consists of several solar photovoltaic panels. Solar photovoltaic project activities generate electricity by converting solar radiation into electricity using semiconductors that exhibit the photovoltaic effect. Solar photovoltaic project activities consist of an array of solar panels or photovoltaic modules (composed of several cells containing a photovoltaic material) as well as mechanical and electrical connections and means of regulating and/or modifying the electrical output, to be able to export electricity to the national grid. Typically, a solar PV facility (usually named solar PV power plant) includes the following equipment and systems which will allow the generation of electricity and delivery of the electricity to the grid: a) solar modules; b) inverters; c) mounting structures; d) sun trackers (optional); e) power transformer; f) control room and measurement equipment; g) substation and h) transmission line.

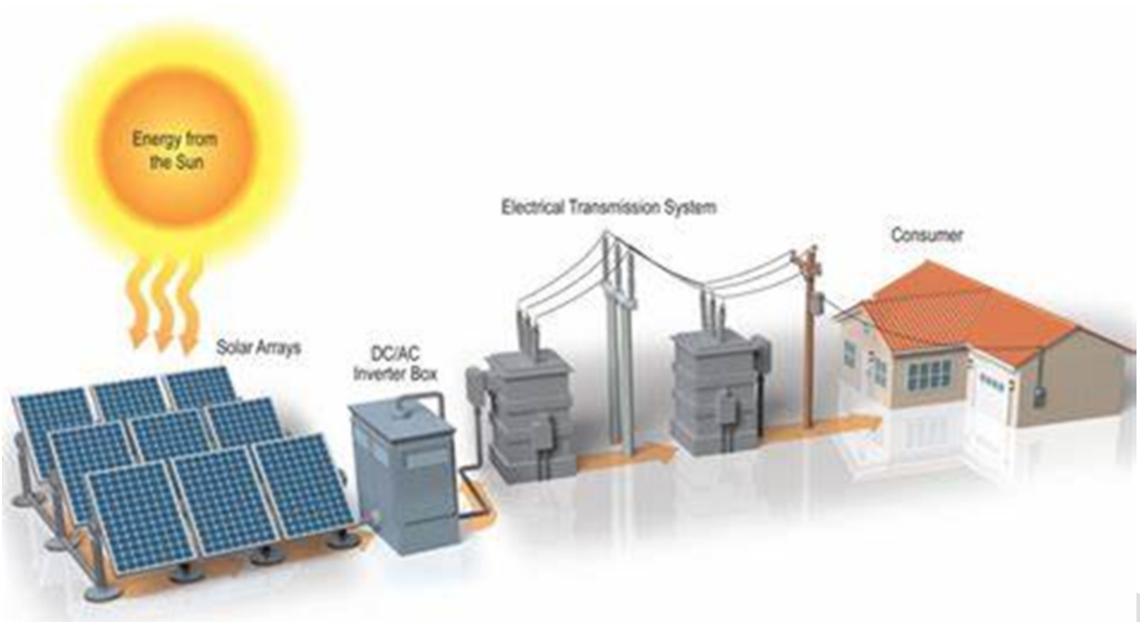

Figure 1: Solar photovoltaic energy[1]

Furthermore, the list of components and their characteristics from the initial instance "Quetena Solar Park" is below.

i. Quetena Solar Park

Quetena Solar Park has an installed capacity of 9.94 MW and is connected to the SEN. The principal components of this instance and their characteristics can be seen in the tables below:

<u>Solar panels</u>

Parameter	Value	
Manufacturer	LONGi Solar	
Model	LR5-72HBD-530M	LR5-72HBD-535M
Dimensions	2,256*1,133*35 mm	
Module Type	Bifacial	
Bifaciality	70±5%	
Module efficiency	20.7%	20.9%
Maximum power (STC)	530 W	535 W
Voltage at maximum power (STC)	41.35 V	41.50 V
Current at maximum power (STC)	12.82 A	12.90 A

[1] https://medium.com/@solar.dao/how-energy-travels-what-happens-with-pv-solar-power-16a047dbe87e

Quantity installed	6,216	12,432
Compliance	IEC 61215, IEC 61730, UL 61730, ISO 9001:2015, ISO 14001: 2015, TS62941, ISO 45001: 2018	

Table 2: Characteristics of solar panels in Quetena Solar Park

Inverters

Parameter	Value
Manufacturer	Sungrow Power Supply Co., Ltd.
Model	SG3125HV-30
Dimensions	6,058*2,896*2,438 mm
Max PV input voltage	1,500 V
Max PV input current	3,997 A
AC output power	3,125 kVA @ 50 °C / 3,437 kVA @ 45 °C
Power factor at nominal power	>0.99
Efficiency (Max. / Euro.)	99.0% / 98.7%
Quantity installed	3
Compliance	CE, IEC 62109, IEC 61727, IEC 62116, IEC 62271-202, IEC 62271-200, IEC 60076

Table 3: Characteristics of inverters in Quetena Solar Park

Electricity meter

Parameter	Value
Manufacturer	Schneider Electric
Model	ION7400
Dimensions	98*112*78.5 mm
Sampling rate	256 samples/cycle
Memory capacity	512 MB
Measurement current	50-10000 mA
Measurement voltage	57-400 V AC 42-69 Hz between phase and neutral 100-690 V AC 42-69 Hz between phases
Measurement accuracy	Current +/- 0.1% Voltage +/- 0.1% Active energy +/- 0.2%
Accuracy class	IEC 62053-22 Class 0.2S Active energy ANSI C12.20 Class 0.2 Active energy IEC 61557-12 Class 0.2 Active energy
Quantity installed	1 unit
Compliance	IEC 62053-22, IEC 62052-11, IEC 62053-24, IEC 61557-12, IEC 61326-1, IEEE 1588, IEC 62586

Table 4: Characteristics of the electricity meter in Quetena Solar Park

As per studies carried out before the implementation of this instance, an annual generation objective was selected at 26,667 MWh, and it was demonstrated to be possible under the conditions at the zone of implementation.

b. Wind instances:

Instances under this category will include greenfield projects with an installed capacity of no more than 15 MW and capacity addition projects that add no more than 15 MW of new capacity to an existing facility.

A wind power plant consists of several wind turbines that convert the kinetic energy of the wind into electrical energy. Wind turbines work on a simple principle: instead of using electricity to make wind—like a fan—wind turbines use wind to make electricity. Wind turns the propeller-like blades of a turbine around a rotor, which spins a generator to create electricity. Typically, a wind power plant includes the following components and systems to generate and deliver electricity to the grid: a) Wind turbine blades; b) Rotor hub; c) Gearbox; d) Generator; e) Power converter; f) Nacelle; g) Cables and wiring; h) Tower; and i) Foundation. Wind turbines can be installed on land or offshore in large bodies of water like oceans and lakes. Offshore wind turbines are typically larger and can capture stronger and more consistent winds.

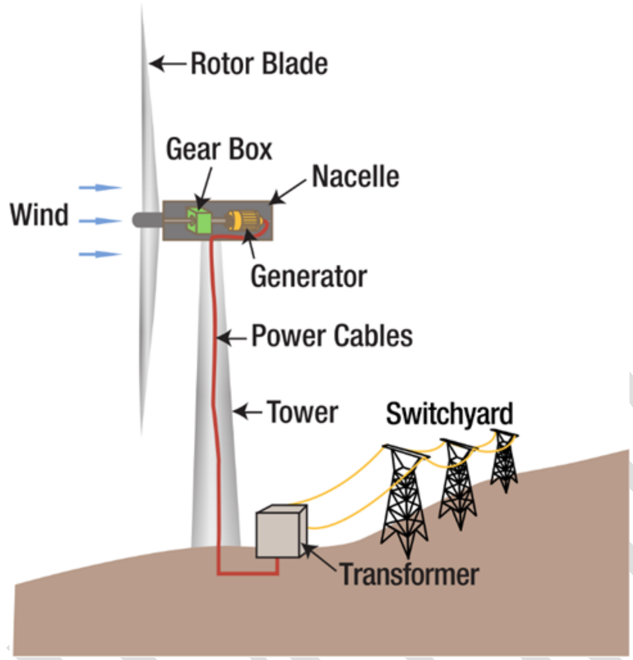

Figure 2: Wind energy[2]

Details related to specific technologies will be provided at the time of inclusion of any future instance related to this type of energy.

c. Small-scale hydro instances:

Instances under this category will include greenfield projects with an installed capacity of no more than 15 MW and capacity addition projects that add no more than 15 MW of new capacity to an existing facility. Instances may include hydro power plants with reservoirs, which will be eligible if the hydro instance has a power density greater than 4 W/m^2.

A power plant consists of one or more hydro turbines using the potential energy of water to generate electricity. These power plants may or may not include a reservoir as per AMS–I.D (V.18.0) para. 5. A typical hydropower plant without a reservoir is a run-of-river (ROR) hydropower plant, which is a type of hydroelectric generation whereby considerably smaller water storage, called "pondage", or none is used to supply a power station (in comparison to typical reservoirs from hydro dam projects). Run-of-river power plants are classified as being with or without pondage. A plant without pondage has no storage and is therefore subjected to seasonal river flows. A plant with pondage can regulate water flow (to a certain extent). ROR projects divert a river's water flow through a pipe and/or tunnel

[2] https://renewableenergypei.wordpress.com/2015/02/02/wind-energy/

leading to electricity-generating turbines. Then the water is returned to the river downstream.

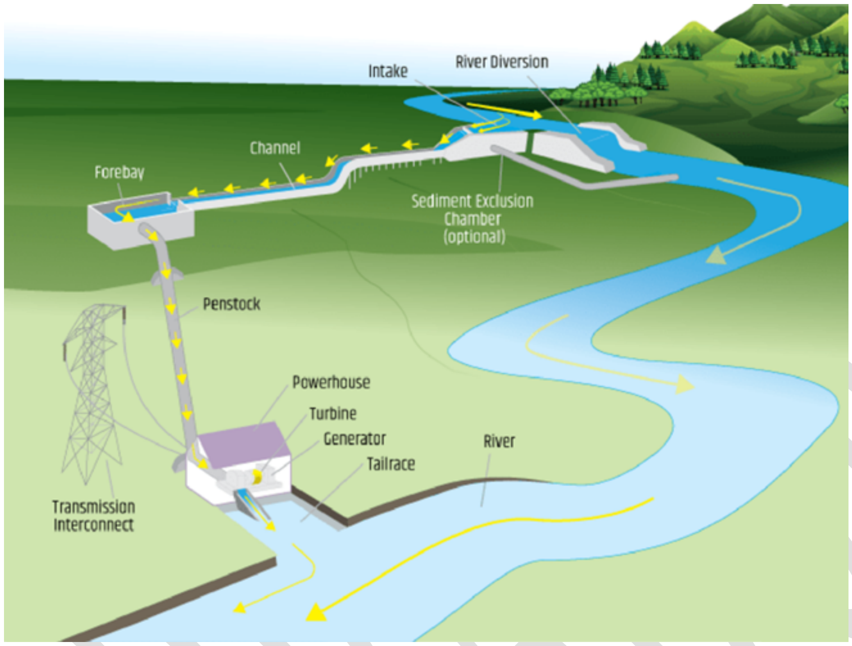

Figure 3: Run-of-river hydro power[3]

A typical hydropower plant with a reservoir is a hydro dam project, which is a type of hydroelectric generation whereby a considerable amount of water is captured or dammed "upstream" from the turbines by building one or more dams that form artificial lakes. The reservoir allows the adjustment of the amount of water passing through the turbines. The amount of water that can be passed through the turbines depends on the volume of water dammed. With a dam, the hydroelectric plant can generate electricity throughout the year, although normally the river is dry for a few months.

[3] https://www.energy.gov/eere/water/types-hydropower-plants

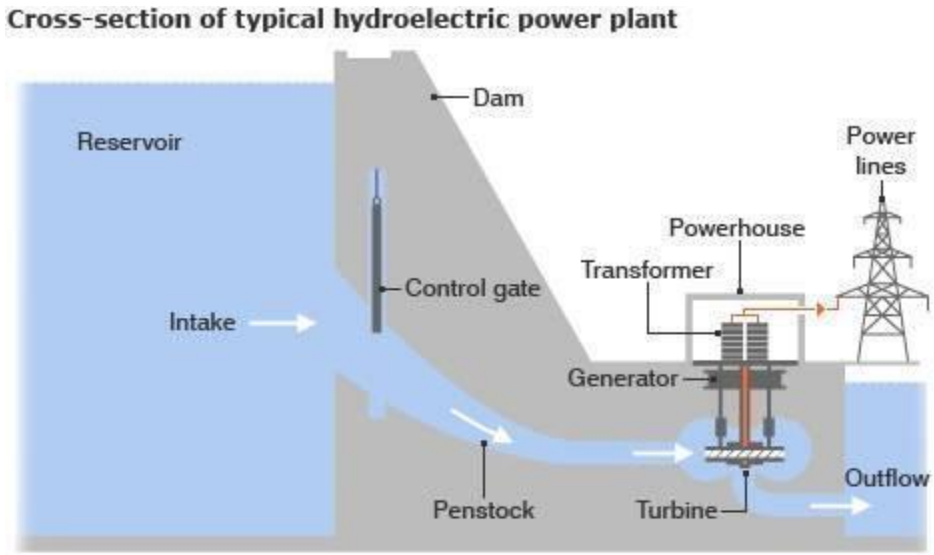

Figure 4: Hydro power with reservoirs[4]

d. <u>Tidal instances</u>:

Instances under this category will include greenfield projects with an installed capacity of no more than 15 MW and capacity addition projects that add no more than 15 MW of new capacity to an existing facility.

A tidal power plant consists of one or more turbines that harness the kinetic and potential energy of tidal movements to generate electricity. These power plants typically operate in coastal areas with significant tidal ranges and can be classified into different types based on their design and functionality. The most used technologies are the following:

A tidal barrage power plant utilizes a dam-like structure built across an estuary or bay. It traps incoming tidal water during high tide and releases it during low tide, driving turbines to generate electricity. The power output is influenced by the difference in water levels between the reservoir and the sea. These systems provide predictable energy but can impact local ecosystems.

[4] https://electricalelectronicsengineering2.blogspot.com/2013/07/cross-section-of-typical-hydro-electric.html

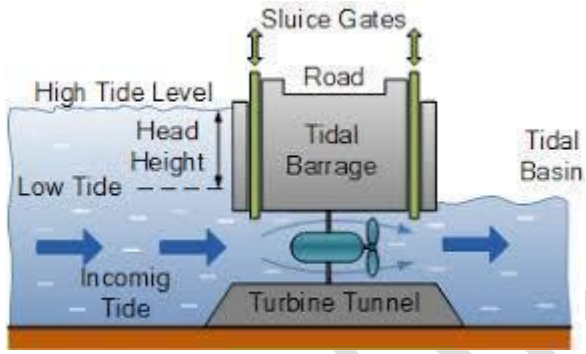

Figure 5: Tidal barrage energy[5]

A tidal stream power plant relies on underwater turbines placed in fast-moving tidal currents. Unlike tidal barrage systems, tidal stream projects do not require large infrastructure or reservoirs. They function similarly to wind turbines, harnessing the continuous movement of water to generate electricity. This approach minimizes environmental disruption while still producing sustainable energy.

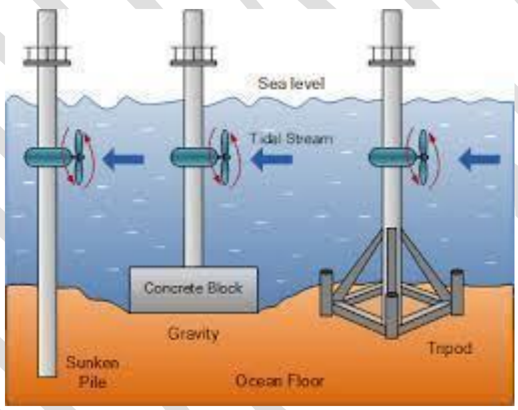

Figure 6: Tidal stream energy[6]

Since tidal patterns are highly predictable, tidal power plants provide reliable renewable energy without dependence on fluctuating weather conditions. Their impact on marine ecosystems varies depending on the type and scale of installation.

e. Wave instances:

[5] https://www.alternative-energy-tutorials.com/tidal-energy/tidal-barrage.html

[6] https://www.alternative-energy-tutorials.com/tidal-energy/tidal-stream.html

Instances under this category will include greenfield projects with an installed capacity of no more than 15 MW and capacity addition projects that add no more than 15 MW of new capacity to an existing facility.

A wave energy power plant harnesses the energy contained in ocean waves to generate electricity. Various technologies and approaches exist to convert wave motion into usable energy, each designed for specific marine environments. The most used technologies are the following:

An oscillating water column (OWC) system uses a partially submerged chamber that allows water to enter and exit with wave movement. This alternating flow displaces air within the chamber, driving a turbine to generate electricity.

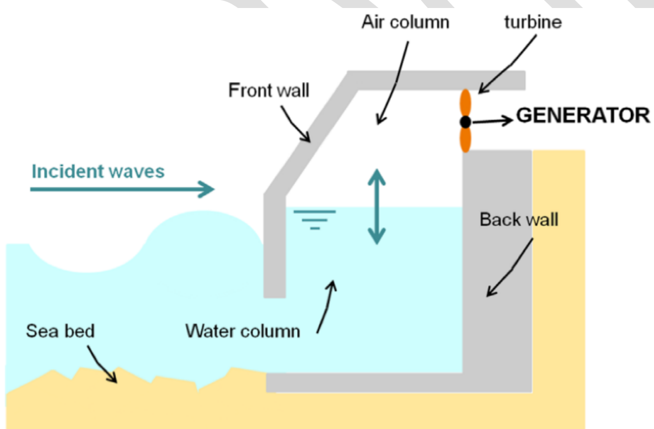

Figure 7: Wave water column energy[7]

A floating buoy or point absorber device utilizes buoys or floating platforms that rise and fall with the waves. The motion is converted into energy using mechanical or hydraulic systems, which are then transformed into electricity.

[7] https://www.mdpi.com/2077-1312/12/2/342

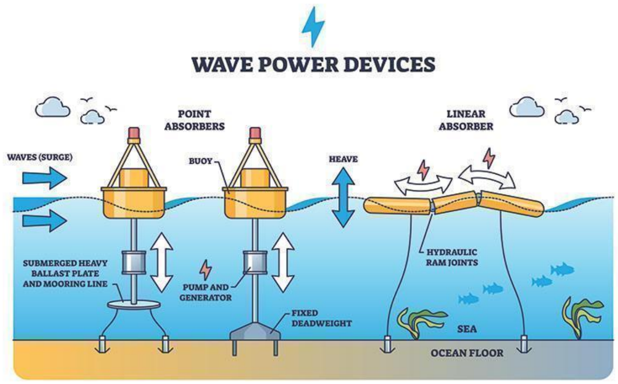

Figure 8: Wave buoy system energy[8]

Wave energy is a renewable source with high potential due to the constant activity of the ocean. Its predictability and continuous generation capacity make it a viable alternative for diversifying the energy matrix without depending on variable weather conditions.

f. Geothermal instances:

A geothermal power plant harnesses heat from the Earth's interior to generate electricity. This renewable energy source utilizes naturally occurring thermal energy from underground reservoirs, typically found in regions with high geothermal activity.

(a) A dry steam power plant extracts steam directly from underground reservoirs, which is used to drive turbines connected to generators. This type is one of the simplest geothermal systems and is effective in locations with high-pressure steam sources.
(b) A flash steam power plant pumps high-temperature water from deep within the Earth's crust. As the water rises, the pressure decreases, causing it to turn into steam, which then powers turbines. After use, the condensed water is reinjected into the reservoir, ensuring a sustainable cycle.
(c) A binary cycle power plant utilizes moderate-temperature geothermal water to heat a secondary fluid with a lower boiling point, such as isobutane or pentane. This fluid vaporizes, spinning the turbine to generate electricity. Binary cycle plants allow geothermal energy to be harnessed in regions with lower-temperature reservoirs.

[8] https://www.fluidpowerworld.com/hydraulics-at-work-in-the-waves/

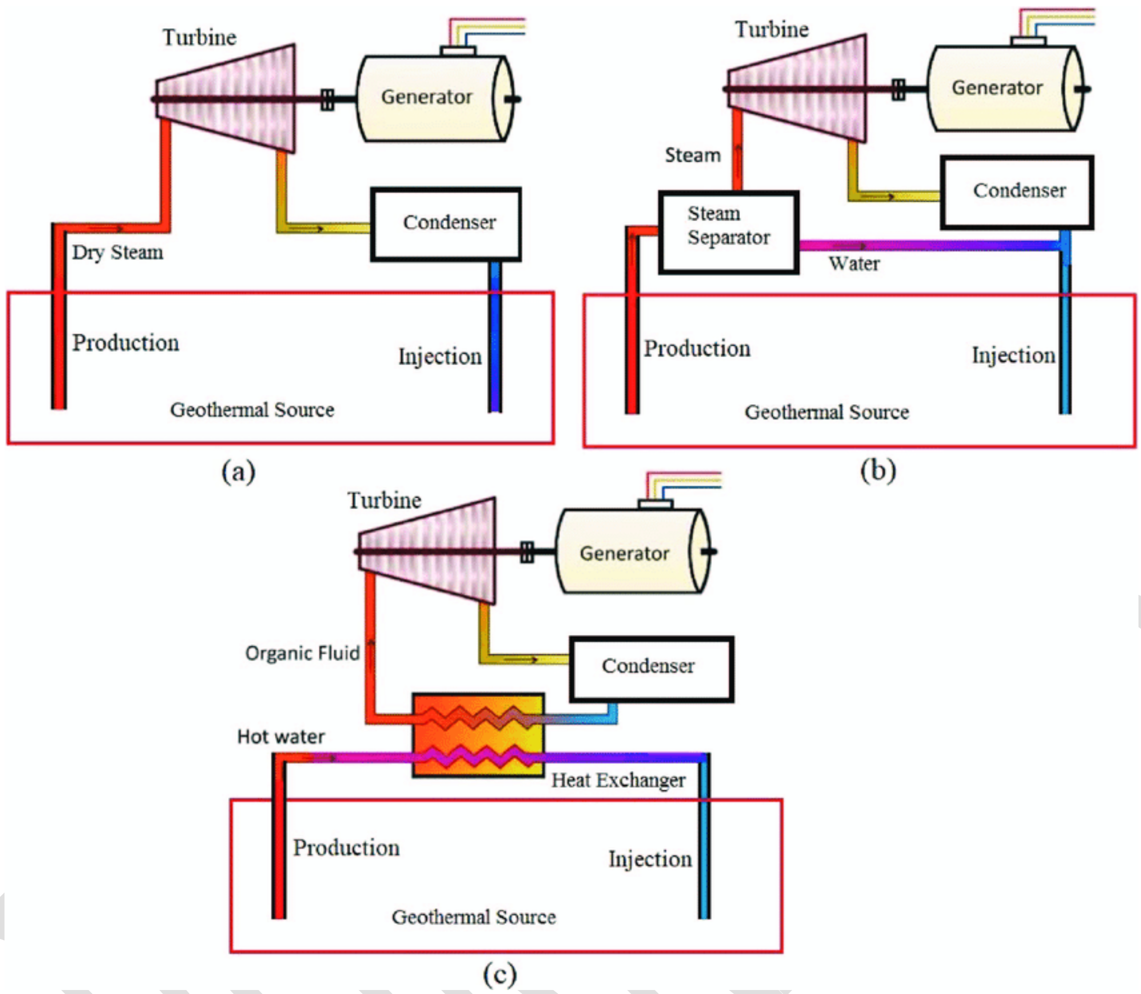

Figure 9: Geothermal energy[9]

Geothermal energy is highly reliable, offering consistent power generation independent of weather conditions. Its sustainability is ensured through reinjection techniques that maintain reservoir pressure and heat balance.

The instances included under this project use environmentally sound technologies in compliance with national environmental regulations.

---

9 https://www.researchgate.net/figure/Types-of-geothermal-power-plants-a-dry-steam-geothermal-plant-b-flash-steam_fig2_351120404

2.4 Project location

The boundary of the project, in terms of a geographical area within which all instances included in the project are implemented, encompasses the geographical boundary of Chile, specifically those instances connected to the SEN and Aysén subsystem. Chile is located between 17° 30' 00'' and 56° 30' 00'' south latitude, and its central meridian is 70° 30' 00'' west longitude.

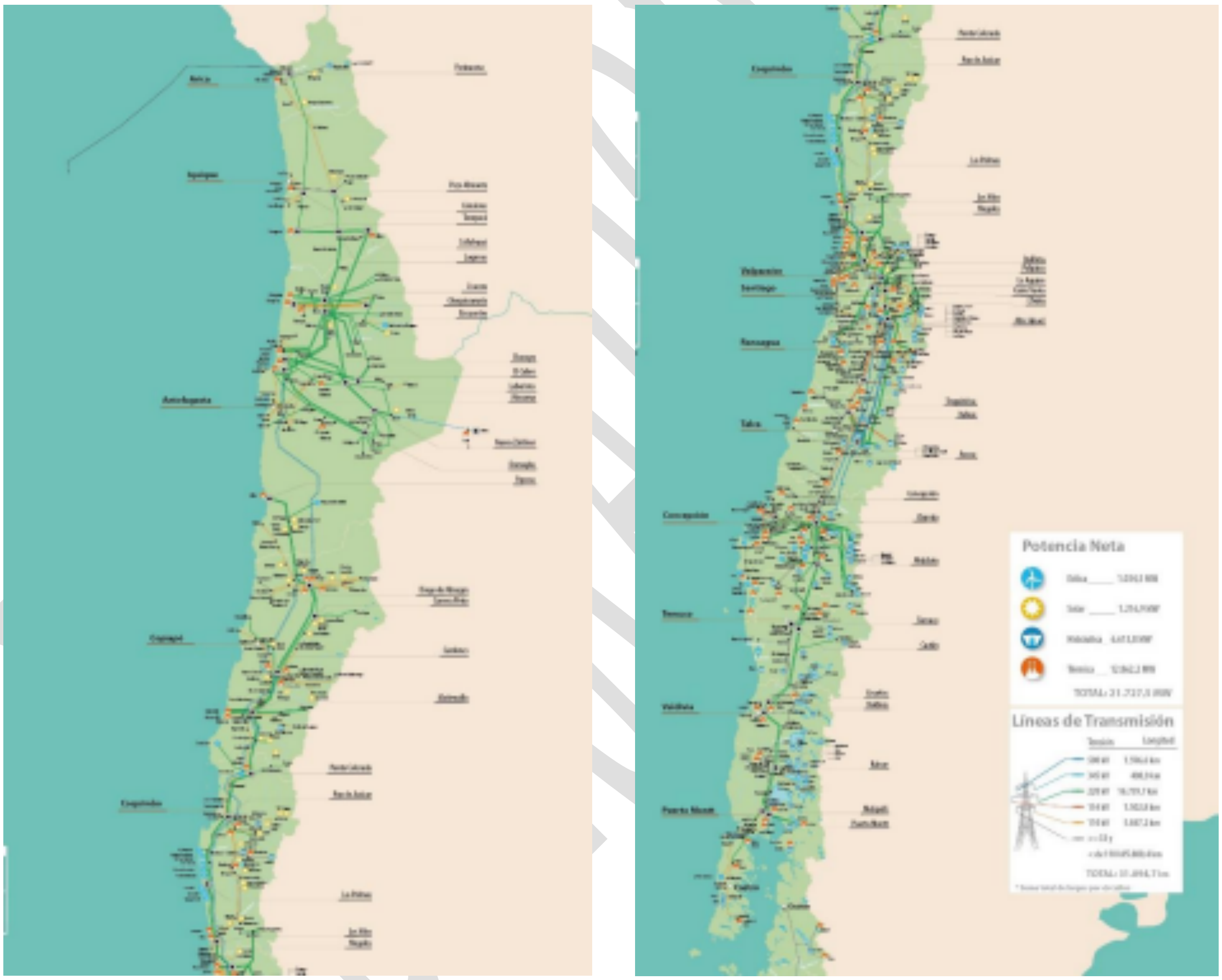

Figure 10: National Electric System (SEN), adapted from Coordinador Eléctrico Nacional

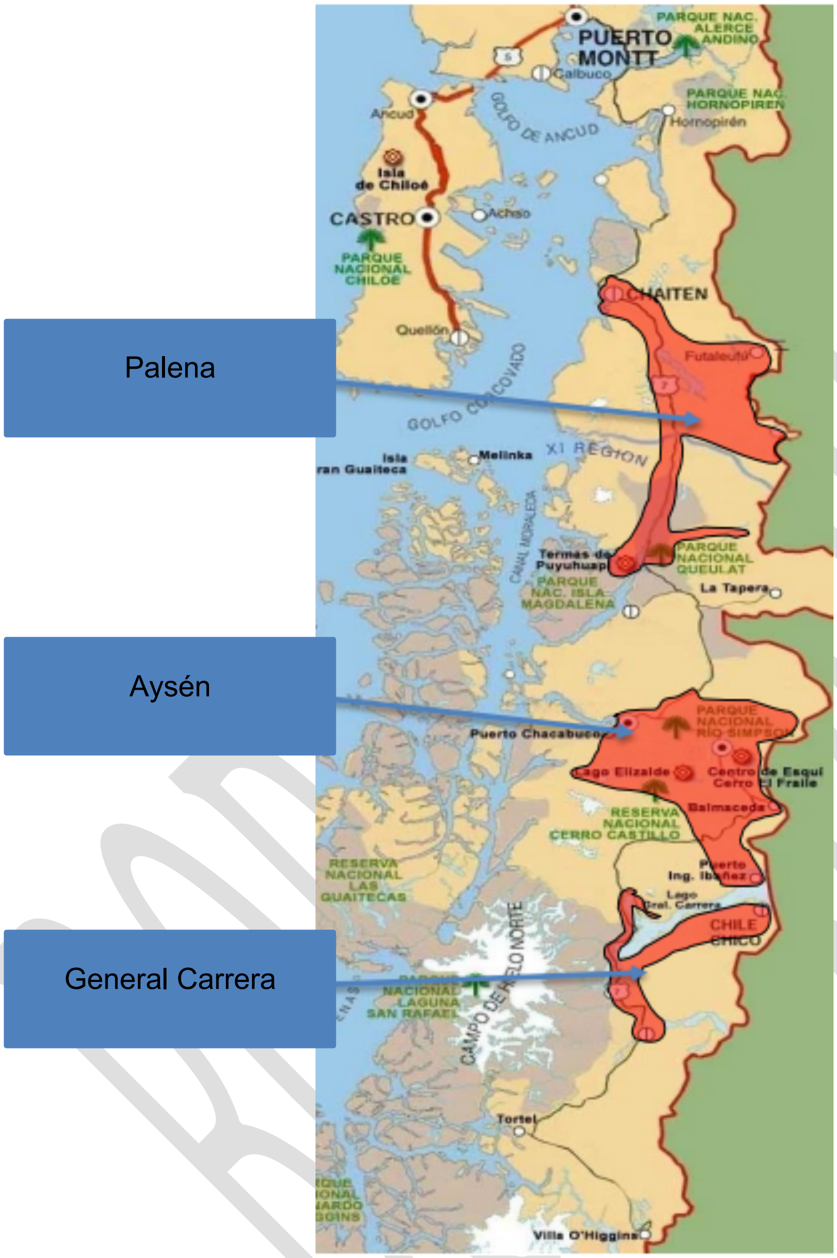

Figure 11: Medium systems, adapted from Grupo SAESA

The physical boundary of each instance is restricted to the geographical area of each one. All applicable national and/or sectoral policies and regulations of Chile within that chosen boundary will be taken into consideration and correspondingly referenced.

Furthermore, the location of the initial instance, “Quetena Solar Park”, is the following:

a. Quetena Solar Park

This instance is located in Chile, in the Antofagasta Region, El Loa province, Calama Commune, in a rural area just 1 km west of the city of Calama and 196 km northeast of Antofagasta, the regional capital.

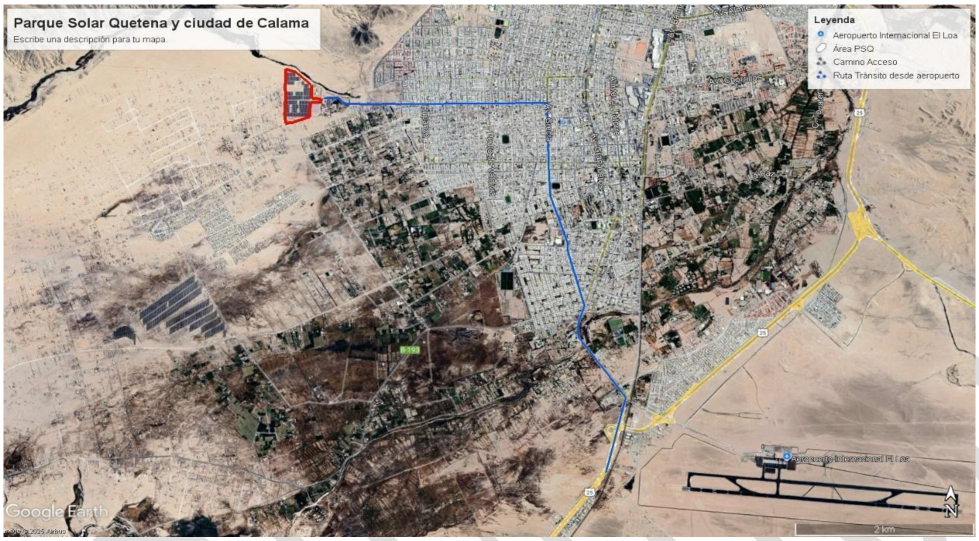

Figure 12: Quetena Solar Park and route from Calama's airport

Figure 13: Quetena Solar Park installations

The following table lists the general coordinates of the project, inside which the different components of the project are located:

Installations	Vertices	UTM Coordinates H 19S DATUM WGS-84		Area (ha)
		East	North	
Quetena Solar Park	1	503,809	7,517,081	18.00
	2	503,920	7,517,048	
	3	504,100	7,516,887	
	4	504,103	7,516,717	
	5	504,199	7,516,716	
	6	504,224	7,516,723	
	7	504,400	7,516,722	
	8	504,483	7,516,654	
	9	504,476	7,516,646	
	10	504,398	7,516,713	
	11	504,225	7,516,713	
	12	504,214	7,516,709	
	13	504,215	7,516,668	
	14	504,094	7,516,668	
	15	504,094	7,516,481	
	16	503,807	7,516,381	
	17	503,792	7,516,570	

Table 5: Quetena Solar Park coordinates

2.5 Additional information about the GHG Project

Not applicable.

3 Quantification of GHG emissions reduction

3.1 Quantification methodology

The methodology used to quantify GHG emissions reductions corresponds to the approved methodology AMS-I.D "Grid connected renewable electricity generation" Version 18.0 (hereinafter referred to as AMS-I.D).

According to the methodology, TOOL07 in its latest version must be used to calculate the combined margin of the CO_2 emission factor for grid-connected power generation. For this project, the latest version is Version 7.0.

Emission reductions are estimated based on the small-scale methodology AMS-I.D para. 43 equation (9), and are calculated on an instance-by-instance basis as follows:

$$ER_y = BE_y - PE_y - LE_y \qquad \text{Equation (1)}$$

Where:

- ER_y = Emission reductions in year y (t CO_2/y).
- BE_y = Baseline Emissions in year y (t CO_2/y).
- PE_y = Project emissions in year y (t CO_2/y).
- LE_y = Leakage emissions in year y (t CO_2/y).

3.1.1 Applicability conditions of the methodology

AMS-I.D conditions of applicability	Applicability of the project activity
This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass: a) Supplying electricity to a national or a regional grid; or b) Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.	Instances under this project will be renewable energy generation units: solar photovoltaic (PV), hydro, wind, tidal, wave, or geothermal grid-connected, complying with either requirement (a) or (b).
This methodology is applicable to project activities that: (a) Install a Greenfield plant; (b) Involve a capacity addition in (an) existing plant(s); (c) Involve a retrofit of (an) existing plant(s); (d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or (e) Involve a replacement of (an) existing plant(s).	Instances under this project will comprise of greenfield renewable energy power plants or capacity additions to existing renewable energy power plants/units only. Points (c), (d) and (e) are not applicable under this project.
Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology:	Instances may include hydro power plants with reservoirs which will be eligible if the hydro instance has a power density greater than 4 W/m2.

AMS-I.D conditions of applicability	Applicability of the project activity
The project activity is implemented in an existing reservoir with no change in the volume of reservoir; The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emissions section, is greater than 4 W/m2; The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m2.	
If the new unit has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	The eligibility limit of 15 MW for a small-scale CDM project activity applies.
Combined heat and power (co-generation) systems are not eligible under this category.	Not applicable. Co-generation instances are not eligible to be part of this project.
In the case of project activities that involve the capacity addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	Instances under this project may include the addition of renewable energy generation units at an existing renewable power generation plant. The capacity added by the new units will be lower or equal to 15MW and will be physically distinct from the existing units.
In the case of retrofit, rehabilitation or replacement, to qualify as a small-scale project, the total output of the retrofitted, rehabilitated or replacement power plant/unit shall not exceed the limit of 15 MW.	Not applicable. Instances will apply to greenfield renewable power plants and capacity additions only.

AMS-I.D conditions of applicability	Applicability of the project activity
In the case of landfill gas, waste gas, wastewater treatment and agro-industries projects, recovered methane emissions are eligible under a relevant Type III category. If the recovered methane is used for electricity generation for supply to a grid then the baseline for the electricity component shall be in accordance with procedure prescribed under this methodology. If the recovered methane is used for heat generation or cogeneration other applicable Type-I methodologies such as “AMS-I.C.: Thermal energy production with or without electricity” shall be explored.	Not applicable. Instances will apply to greenfield renewable power plants and capacity additions only.
In case biomass is sourced from dedicated plantations, the applicability criteria in the tool “Project emissions from cultivation of biomass” shall apply.	Not applicable. Instances will apply to greenfield renewable power plants and capacity additions only.

Table 6: Methodology applicability conditions

3.1.2 *Methodology deviations (if applicable)*

This grouped project includes small-scale renewable energy generation projects in Chile, following the AMS-I.D methodology “Small-scale Methodology: Grid-connected renewable electricity generation,” Version 18.0.

Some of the instances included in the scope of this project could involve capacity increases in existing plants. Paragraph 27 of the methodology states:

“(…) the electricity fed into the grid by the added power plants/units shall be directly metered and used to determine the quantity of net electricity generation supplied to the grid in year y by the project plant/unit that has been added under the project activity.”

In many small-scale plants, the installation of dedicated meters for each capacity expansion is not financially viable. Therefore, a single certified global meter under Chilean regulation is maintained for billing purposes.

In cases where a dedicated calibrated meter for monitoring the energy generation of the added capacity plants/units is not available, the generation recorded by the internal and/or operational meters of the new units (for example, inverters, which can measure generated electricity differentiating between the new and original capacity installed) can be used as a reliable basis to establish a proportionality factor between the energy generated by the existing and added capacity. The calibrated revenue-grade meter remains the reference for total plant generation, while the internal and/or operational meters provide the necessary information to allocate the share of electricity attributable to the added capacity without any risk of overestimation.

This is achieved using a conservative proportionality factor. To calculate this factor, the uncertainty associated with the internal meters of the newly installed equipment must first be considered. The absolute measurement uncertainty is then added to the generation value of the existing capacity and subtracted from the generation value of the capacity expansion. By dividing these adjusted results, a conservative proportionality factor is obtained. This factor is applied to the actual measurements from the certified billing meter, thereby allowing the separation of the generation from the original plant and the generation from the new installed capacity.

In this way, the proposed approach meets methodological requirements: it is traceable, verifiable, and conservative, ensuring reliable results regarding the contribution of the capacity expansion.

3.2 Project boundaries, sources and GHGs

The project boundaries according to the methodology AMS-I.D are described as follows:

"The spatial extent of the project boundary includes the project power plant, and all power plants connected physically to the electricity system that the CDM project power plant is connected to."

For the initial instances, their physical scope is described in section 2.4 above.

As described in paragraphs 39 and 40 of the methodology AMS-I.D, initial instances activities do not consider GHG emissions because of their nature, but any on-site consumption of fossil fuels due to the project activity shall be calculated using the latest version of TOOL03 "Tool to calculate project leakage CO_2 emissions from fossil fuel combustion". In this case, the instance will account for its CO_2 emissions.

3.2.1 Spatial limits of the project

As stated in the methodology AMS-I.D:

The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to.

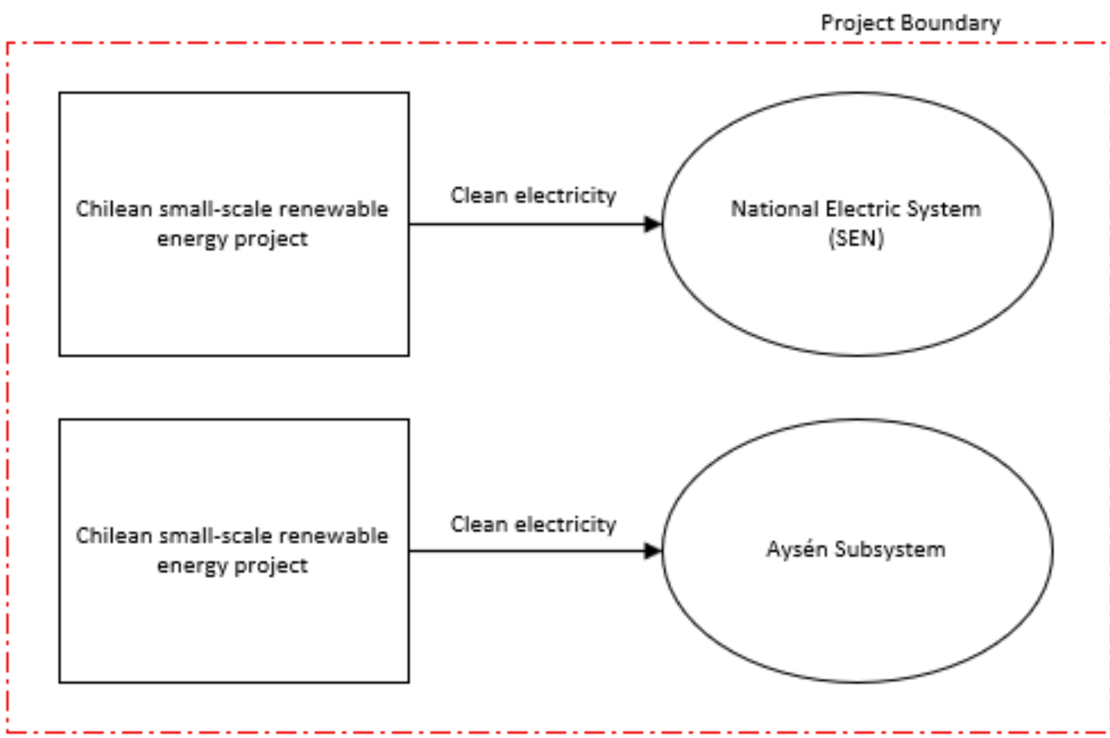

Figure 14: Project boundary diagram

3.2.2 *Carbon reservoirs and GHG sources*

The are no carbon reservoirs included in the project.

Source	**GHG**	**Included (Yes/No/ Optional)**	**Justification**
(Baseline) CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Yes	Main emission source
	CH_4	No	Minor emission source
	N_2O	No	Minor emission source

(Project activity) On-site combustion of fossil fuels	CO_2	No*	CO_2 emissions from on-site combustion of fossil fuels due to the project activity shall be considered (whenever applicable) as per AMS-I.D and TOOL03
	CH_4	No*	Hydro power instances will only have CH_4 emissions when the activities contain reservoirs, in any other case project scenario will not include CH_4 emissions.
	N_2O	No	Minor emission source

3.2.3 Time limits and analysis periods

The project timeframe corresponds to a ten-year period for quantifying GHG emission reductions, with no option to renew it, considering that its length will not exceed the end of the project activities.

3.2.3.1 Project start date

The start date of this project is 23.09.2021, which is the commissioning date of the instance "Quetena Solar Park", meeting the maximum retroactivity of five years to the first validation of the project.

3.2.3.2 Quantification period of GHG emission reductions/removals

As stated in section 3.2.3, the quantification period for GHG emission reductions is ten years, not renewable, in this case starting from 23.06.2021 to 22.06.2031.

3.2.3.3 Monitoring periods

The first monitoring period will cover from 23.06.2021 to 31.12.2024. Future monitoring and verification for this project will be held every 3 years at maximum.

3.3 Identification and description of the baseline or reference scenario

As per the methodology AMS-I.D:

i. For greenfield projects: "The baseline scenario is that the 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 into the grid.".
ii. For projects that involve capacity addition the baseline scenario is calculated as follows: "If the project activity is a capacity addition to existing grid-connected

renewable energy power plant/unit, the baseline scenario is the existing facility that would continue to supply electricity to the grid at historical levels, until the time at which the generation facility would likely be replaced or retrofitted ($DATE_{BaselineRetrofit}$), and electricity delivered to the grid by the added capacity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources. From that point of time onwards, the baseline scenario is assumed to correspond to the project activity, and no emission reductions are assumed to occur."

For the case of the instances under this project, the baseline corresponds to the quantity of emissions that would have been generated by the SEN or Aysén subsystem in absence of them.

3.4 Additionality

Each instance part of this grouped Project must comply with the eligibility requirements, and its additionality must be demonstrated at the instance level to be included.

Instances must assess additionality by following the provisions stated in the BCR Tool "Identification of a baseline scenario and demonstration of additionality".

Since all instances part of this grouped project are energy generation instances with an installed capacity up to 15 MW, additionality will be demonstrated by using the simplified procedures established in the Tool.

Step 1 – Barrier or investment test

The instances under this grouped project will demonstrate that:

a) They are not legally required under existing national or subnational laws or regulations.
b) They are not the most attractive investment option based on the comparison of their simple payback period and the established benchmark for each type of project.

Step 2 – Common practice analysis

The instances under this grouped project will demonstrate that, at the time of the decision date, they were not a commonly adopted technology. This is done by identifying other activities in the same sector (energy production) that were implemented in the 10 years prior to the instance decision date and are not registered under crediting programs, and then calculating the aggregate magnitude of similar activities, ensuring that they do not represent over 20% of the total energy production capacity installed.

It's important to note that in Chile, projects with less or equal than 9 MW of injectable power are subject to the option of adopting a pricing system called "Stabilized price scheme", in which the selling price of energy may differ from the traditional price scheme. This is a differentiating feature that is to be considered at the moment of comparing similar activities.

The additionality analysis of the initial instance "Quetena Solar Park" is explained below:

- Quetena Solar Park

The decision date for this instance is 12.11.2020. This project is not legally required under existing laws or regulations.

Step 1 - Investment test

The parameters used for the calculation of the instance's Simple Payback Period are the following:

Parameters	**Unit**	**Value or range**
Instance Lifespan	years	25
Capacity installed	MWp	9.94
Generation Objective	MWh/year	26,667
Energy Price	USD/MWh	36-49
Power Price	USD/kW/year	84
CAPEX	USD	8,532,475
OPEX	% CAPEX	1
Equipment Depreciation	years	10
Chilean Tax Rate	%	27

Table 7: Quetena Solar Park principal parameters for calculations

The result of this analysis is that the simple payback period of the project is 8 years, meaning that it is above the 4-5 years benchmark established by the BCR Tool. Based on that, this instance goes on to step 2.

Step 2 – Common practice analysis

The common practice analysis was carried out based on this instance as described above, complying with all restrictions. From this, it was determined that M_{all} corresponds to a capacity of 7,987 MW, from which 7,275.5 MW are similar activities with essential differences, based on energy source, size, and price scheme (As this instance can inject a maximum of 9 MW to the grid), leaving a market penetration of $F = 8.9\%$.

This results in the instance not being a common practice, and therefore, it is considered additional.

3.5 Uncertainty management

All the approximations and calculations related to the methodology AMS-I.D are carried out transparently and conservatively, as the methodology itself explains in section 5.5, and in TOOL07.

The equipment used at all instances is calibrated and maintained in accordance with the Chilean Technical Norm of Security and Service Quality (NTSyCS), which is the most relevant regulation in terms of operational safety, service quality, and the technical standards that generation, transmission, and distribution facilities must comply with when connected to the national grid.

Data relating to the net electricity supplied by the instances to the grid is monitored continuously, electronically recorded, and consolidated monthly. The backup strategy has been structured into three levels for greenfield instances:

- Primary: Copies of the data stored by an authorized entity or business.
- Secondary: Invoice reports emitted by the authorized entity or business.
- Tertiary: Information on monitoring extracted directly from the grid coordinating entity, since generation monitoring is reported directly to it

For instances with capacity addition:

- Primary: Copies of the data stored by an authorized entity or business.
- Secondary: Information on monitoring extracted directly from the grid coordinating entity.

The monitoring data for capacity addition instances will be cross-checked with the invoice reports for the electricity sales as stated in the methodology AMS-I.D, and the value of the one with lower electricity generation will be used, as a conservative approach.

Usually, the net electricity generation is measured, but if an instance decides to measure its gross generation and consumption separately and the latter is unavailable for a given period, its maximum consumption measurement recorded during the respective analysis year should be used for each measurement where no consumption is reported.

If data is unavailable from all possible sources for a given period, the project shall not claim any GHG emission reductions to that timeframe.

3.6 Leakage and non-permanence

As per the methodology AMS-I.D, paragraph 42 states “General guidance on leakage in biomass project activities shall be followed to quantify leakages pertaining to the use of biomass residues.”. Based on the above, it is confirmed that leakages in the project are zero, as the project does not contain any activities related to the use of biomass.

The project will present periodical verifications that ensure the permanence of project activities.

3.7 Mitigation results

All mitigation results are measured and calculated based on the provisions of the methodology AMS-I.D.

Furthermore, the emission reductions are calculated as described in section 3.1 above:

$$ER_y = BE_y - PE_y - LE_y \qquad \text{Equation (1)}$$

Where:

- ER_y = Emission reductions in year y (tCO_2)
- BE_y = Baseline emissions in year y (tCO_2)
- PE_y = Project emissions in year y (tCO_2)
- LE_y = Leakage emissions in year y (tCO_2)

3.7.1 Eligible areas within GHG project boundaries (AFOLU sector projects)

Not applicable.

3.7.2 Stratification (Projects in the AFOLU sector)

Not applicable.

3.7.3 GHG baseline emissions.

i. Justification of applicable scenarios

The baseline emissions for greenfield generation units, as described in AMS-I.D are the product of the electrical energy baseline expressed in MWh of electricity produced by the relevant renewable generation unit multiplied by the grid emission factor. The calculation procedure is shown in subsection ii, below.

For instances under this Project document involving capacity addition, the baseline emissions, as described in AMS-I.D, are determined based on the electricity generated by existing plants/units, and it is assumed that the addition of new capacity does not significantly affect the electricity generation of the renewable power plant/unit.

The calculation procedure is shown in subsection ii., below. As per the technologies encompassed in this grouped project, paragraphs 26, 27, 28, and 31 of the methodology apply.

The grid emission factor calculations are carried out in a transparent and conservative manner for the grid, according to the TOOL07, and as described in the AMS-I.D.

ii. Relevant equations

For either greenfield generation projects or capacity addition instances, AMS-I.D baseline and monitoring methodology is used for estimation of baseline emissions. Calculation of the quantity of electricity generation that is produced and fed into the grid because of the implementation of the project activity is different for greenfield and capacity addition projects, where equations (3), (4), and (5) are applicable.

For capacity addition in solar or wind instances, it is assumed that the additions do not affect the electricity generated by existing plants/units. Therefore, the electricity generated by the newly added power plants could be directly metered and used to determine $EG_{PJ,y}$ provided that the electricity generated by the added power plant/units is metered separately. Thus, the baseline emissions are calculated as follow:

$$BE_y = EG_{PJ,y} \cdot EF_{grid,y} \qquad \text{Equation (2)}$$

Where:

- BE_y = Baseline emissions in year y (tCO2)
- $EG_{PJ,y}$ = Quantity of net electricity supplied to the grid because of the implementation of the project activity in year y (MWh)
- $EF_{grid,y}$ = CO2 emission factor of the grid in year y (tCO2/MWh)

<u>Greenfield power plants</u>:

$$EG_{PJ,y} = EG_{PJ,facility,y} \qquad \text{Equation (3)}$$

Capacity addition in solar, wind, wave or tidal power plants:

$$EG_{PJ,y} = EG_{PJ,add,y} \quad \text{Equation (4)}$$

Where:

- $EG_{PJ,facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh).
- $EG_{PJ,add,y}$ = Quantity of net electricity generation supplied to the grid in year y by the project plant/unit that has been added under the project activity (MWh).

The calculation procedure described below shall be used for estimation of electricity generation ($EG_{PJ,y}$) for hydro power generation instances under this project. This ensures that the baseline electricity generation is conservative and that the calculated emissions reductions are attributable to the project activity. This will address the associated uncertainty, taking into account historical generation data of the existing plant/units, including the standard deviation:

Capacity addition for hydro and geothermal power:

$$EG_{PJ,y} = \{max\big(EG_{PJ,facility,y} - (EG_{historical} + \sigma_{historical}), 0\big), until \; DATE_{BaselineRetrofit} \; 0, after \; DATE_{BaselineRetrofi} \quad \text{Equation (5)}$$

Where:

- $EG_{historical}$ = Annual average historical net electricity generation by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity (MWh);
- $\sigma_{historical}$ = Standard deviation of the annual average historical net electricity supplied to the grid by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity (MWh);
- $DATE_{BaselineRetrofit}$ = Annual average historical net electricity generation by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity (MWh).

The average of historical net electrical energy levels delivered by the existing facility, spanning all data from the most recent available year (or month, week, or other time period) to the time at which the facility was constructed, retrofit, or modified in a manner that significantly affected output (i.e., by 5% or more), shall be used.

To determine $EG_{historical}$, the instance implementer may choose between the following two historical periods:

a) The three last calendar years (in case of hydro power plants five years) prior to the implementation of the instance; or
b) The time period from the calendar year following $DATE_{hist}$, up to the last calendar year prior to the implementation of the project, as long as this time span includes at least five calendar years, where $DATE_{hist}$ is the latest point in time-between:

    i. The commercial commissioning of the plant/unit

    ii. If applicable: the last capacity addition to the plant/unit; or

    iii. If applicable: the last retrofit of the plant/unit

The relevant parameter(s) and parameters fixed ex-ante are listed and described in section 16. The CO_2 emission factor of the grid will be calculated according to the TOOL07.

<u>Grid emission factor</u>:

The grid emission factor is calculated based on "Tool to calculate the emission factor for an electricity system", version 7.0 for each instance. Six steps in the calculation procedure (Option (a) ex-ante) will be applicable, as follows:

- Step 1: Identify the relevant electricity systems.
- Step 2: Choose whether to include off-grid power plants in the project electricity system (optional).
- Step 3: Select a method to determine the operating margin (OM).
- Step 4: Calculate the operating margin emission factor according to the selected method.
- Step 5: Calculate the build margin (BM) emission factor.
- Step 6: Calculate the combined margin (CM) emission factor.

a) **Step 1. Identify the relevant electricity systems.**

For determining the relevant project electricity system, the project participants may choose among the following options:

1. Option 1. A delineation of the project electricity system and connected electricity systems published by the Designated National Authority (DNA) or the group of the DNAs of the host country(ies). In case a delineation is provided by a group of DNAs, the same delineation should be used by all the project participants applying the tool in these countries.
2. Option 2. A delineation of the project electricity system defined by the dispatch area of the dispatch center responsible for scheduling and dispatching electricity generated by the project activity. Where the dispatch area is controlled by more than one dispatch center, i.e. layered dispatch area, the higher level area shall be used as a delineation of the project electricity system (e.g. where regional dispatch centers are required to comply with dispatch orders of the national dispatch center then area controlled by the national dispatch center shall be used).
3. Option 3. A delineation of the project electricity system defined by more than one independent dispatch area, e.g. multi-national power pools.

In the case of the initial instances, the electricity system is defined by Option 2.

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

All instances under this Project document will be grid-connected renewable power plants; therefore, Option I is chosen:

Option I: Only grid power plants are included in the calculation.

c) Step 3: Select a method to determine the operating margin (OM).

The calculation of the OM emission factor is based on one of the following methods:

(i) Simple OM; or
(ii) Simple adjusted OM; or
(iii) Dispatch data analysis OM; or
(iv) Average OM.

The chosen method will depend on the data requirements and conditions to be met to apply a specific OM method. Those requirements are presented in the following figure:

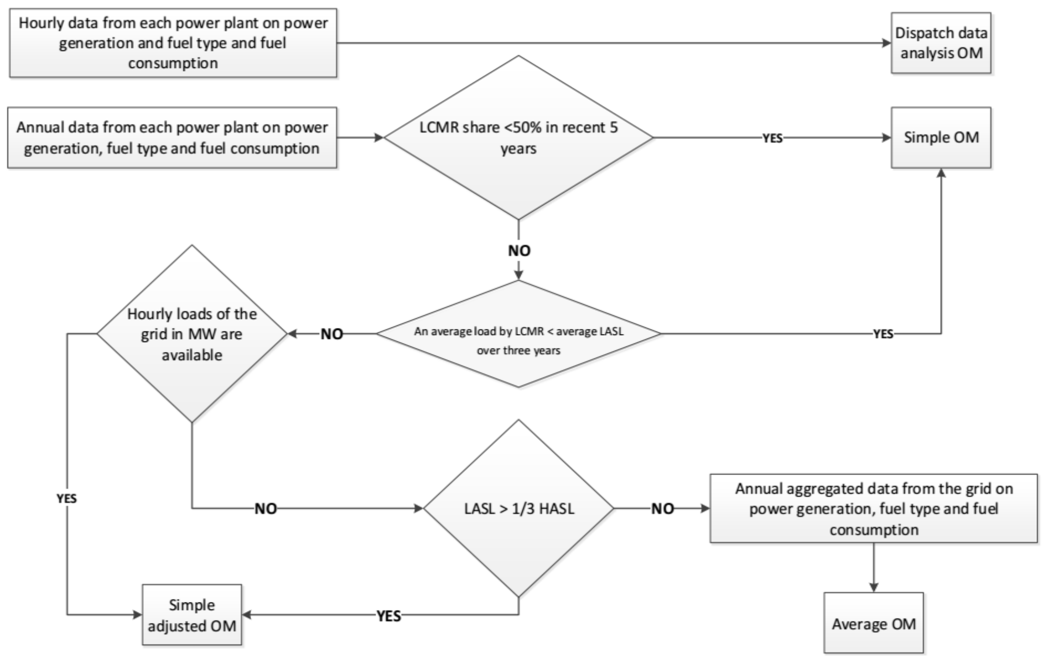

Figure 15: CDM TOOL07 requirements for determining the operating margin method

The simple OM method can only be used if any one of the following requirements is satisfied:

"(a) Low-cost/must-run resources constitute less than 50 per cent of total grid generation (excluding electricity generated by off-grid power plants) in: 1) average of the five most recent years, and the average of the five most recent years shall be determined by using one of the approaches described below; or 2) based on long-term averages for hydroelectricity production (minimum time frame of 15 years); or"

To calculate the average of five most recent years, the following equations are applicable:

- Approach 1:

$$Share_{LCMR} = average\left[\frac{EG_{LCMR,y-4}}{total_{y-4}}, \dots, \frac{EG_{LCMR,y}}{total_y}\right] \quad \text{Equation (6)}$$

- Approach 2:

$$Share_{LCMR} = \frac{average\left(EG_{LCMR,y-4}, \dots, EG_{LCMR,y}\right)}{average\left(total_{y-4}, \dots, total_y\right)} \quad \text{Equation (7)}$$

Where:

- $Share_{LCMR}$ = Share of the low cost/must run resources (per cent).
- $EG_{LCMR,y}$= Electricity generation supplied to the project electricity system by the low cost/must run 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 resources considered as LCMR are hydro, geothermal, wind, biomass and solar (PV and concentration). Calculations and disaggregated information of generation for each system can be found in the files "LCMR calculations (Aysen[10]/SEN[11]).xlsx" in the complementary files folder. Information on the original sources can be found in the same files.

The tables below show each system $Share_{LCMR}$ based on Approach 1:

Year	Total Generation (GWh)	LCMR Generation (GWh)	LCMR/Total
2020	77,696	35,888	46.2%
2021	81,443	36,779	45.2%
2022	83,210	45,956	55.2%
2023	83,392	52,909	63.4%
2024	85,332	59,257	69.4%
$Share_{LCMR}$			**55.9%**

Table 9: Proportion of LCMR resources in the SEN

[10] Source: Generación bruta SSMM. https://www.cne.cl/normativas/electrica/consulta-publica/electricidad/
[11] Source: Generación bruta SEN. https://www.cne.cl/normativas/electrica/consulta-publica/electricidad/

Year	Total Generation (MWh)	LCMR Generation (MWh)	LCMR/Total
2020	152,923	98,763	64.6%
2021	162,678	86,936	53.4%
2022	166,271	89,429	53.8%
2023	175,153	108,223	61.8%
2024	181,259	105,455	58.2%
$Share_{LCMR}$			**58.4%**

Table 10: Proportion of LCMR resources in the Aysén subsystem

Approach 2 do not change the $Share_{LCMR}$ calculated greatly. Based on that and the calculations above, both systems go on to requirement (b):

"(b) The average amount of load (MW) supplied by low-cost/must-run resources in a grid in the most recent three years is less than the average of the lowest annual system loads (LASL) in the grid of the same three years (i.e. average of LASLy, LASLy-1, LASLy-2)."

Only information on LASL for the SEN is available:

Year	System load (MW)	LASL (MW)	Average system load[12] (MW)	Average LASL (MW)
2022	5,246.1	7,155.7		
2023	6,039.9	7,416.9	6,016.8	7,173.6
2024	6,764.4	6,948.3		
Avg load < Avg LASL?			**TRUE**	

Table 11: LASL information for the SEN

As shown above in calculations related to requirement (a) and (b), the Simple OM method is applicable for the SEN, but not for the Aysén subsystem, so it goes on to the following requirement. To apply the Simple adjusted OM method, data of hourly loads of the grid in MW must be available, or the following condition shall be met:

- The lowest annual system loads (LASL) > 1/3 highest annual system loads (HASL).

No data on LASL is available for the Aysén subsystem, meaning that none of the above conditions are met for the Aysén subsystem and therefore, the Average OM method shall be used based on the annual aggregated data from the grid on power generation, fuel type and fuel consumption.

Additionally, for simple OM, simple adjusted OM and average OM, the emission factor can be calculated either of the following options:

- Ex-ante option: the emission factor is determined once the validation stage and no monitoring and recalculation is needed during the crediting period. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission; or

[12] Source: Histórico generación de energía (por hora) https://www.coordinador.cl/reportes-y-estadisticas/

- Ex-post option: the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emission factor to be updated annually during monitoring.

The data vintage chosen is ex-ante for both electricity systems, which will be consistently applied to all instances connected to a given one.

Dispatch data analysis OM is not applicable to historical data; thus, this method can only be used for grid power units where there is hourly data from each power plant on power generation, fuel type and fuel consumption.

d) Step 4: Calculate the operating margin emission factor according to the selected method.

A. Simple OM ex-ante:

The Simple Operating Margin (OM) is calculated ex-ante using the equations (3) to (9) (when applicable) of the TOOL07, as follows:

The Simple OM is calculated using preferably Option A, as follows:

Option A – Calculation based on average efficiency and electricity generation of each plant:

$$EF_{OMsimple,y} = \frac{\sum_m EG_{m,y} \cdot EF_{EL,m,y}}{\sum_m EG_{m,y}}$$ Equation (8)

Where:

- $EF_{OMsimple,y}$ = Simple operating margin CO_2 emission factor in year y (tCO_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 (tCO_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 $EF_{EL,m,y}$

As described in the methodology, the emission factor of each power unit m should be determined in the order of preference A1, A2, A3 as follows:

- Option A1. If for a power unit m data on fuel consumption and electricity generation is available, the emission factor ($EF_{EL,m,y}$) should be determined as follows:

$$EF_{EL,m,y} = \frac{\sum_i \quad FC_{i,m,y} \cdot NCV_{i,y} \cdot EF_{CO_2,i,y}}{EG_{m,y}} \qquad \text{Equation (9)}$$

Where:

- $EF_{EL,m,y}$ = CO2 emission factor of power unit m in year y (tCO2/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).
- $EF_{CO_2,i,y}$ = CO2 emission factor of fossil fuel type i in year y (tCO2/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. If for a power unit m, only data on electricity generation and the fuel types used is available, the emission factor should be determined based on the CO2 emission factor of the fuel type used and the efficiency of the power unit, as follows:

$$EF_{EL,m,y} = \frac{EF_{CO_2,m,i,y} \cdot 3.6}{\eta_{m,y}} \qquad \text{Equation (10)}$$

Where:

- $EF_{EL,m,y}$ = CO2 emission factor of power unit m in year y (tCO2/MWh).
- $EF_{CO_2,m,i,y}$ = Average CO2 emission factor of fuel type i used in power unit m in year y (tCO2/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, use the fuel type with the lowest CO2 emission factor for $EF_{CO_2,m,i,y}$.

- Option A3. If for a power unit m, only data on electricity generation is available, an emission factor of 0 tCO2/MWh can be assumed as a simple and conservative approach.

Calculation of $EG_{m,y}$

For grid power plants, $EG_{m,y}$ will be determined as per the provisions in the monitoring tables.

B. Simple Adjusted OM ex-ante:

The Simple Adjusted Operating Margin (OM) is calculated ex-ante using the equation (10) of TOOL07 as follows:

$$EF_{grid,OM-adj,y} = \left(1 - \lambda_y\right) \cdot \frac{\sum_m EG_{m,y} \cdot EF_{EL,m,y}}{\sum_m EG_{m,y}} + \lambda_y \cdot \frac{\sum_k EG_{k,y} \cdot EF_{EL,k,y}}{\sum_k EG_{k,y}} \quad \text{Equation (11)}$$

Where:

- $EF_{grid,OM-adj,y}$ = Simple adjusted operating margin CO2 emission factor in year y (tCO2/MWh).
- λ_y = Factor expressing the percentage of time when low-cost/must-run power units are on the margin in year y.
- $EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh).
- $EG_{k,y}$ = Net quantity of electricity generated and delivered to the grid by power unit k in year y (MWh).
- $EF_{EL,m,y}$ = CO2 emission factor of power unit m in year y (tCO2/MWh).
- $EF_{EL,k,y}$ = CO2 emission factor of power unit k in year y (tCO2/MWh).
- m = All grid power units serving the grid in year y except low-cost/must-run power units.
- k = All low-cost/must run grid power units serving the grid in year y.
- y = The relevant year as per the data vintage chosen in Step 3.

$EF_{EL,m,y}$, $EF_{EL,k,y}$, $EG_{m,y}$ and $EG_{k,y}$ are determined using the same procedures as those for the parameters $EF_{EL,m,y}$ and, $EG_{m,y}$ in Option A of the simple OM method above. Off-grid power plants/units are outside the scope of this project document.

As stated in TOOL07, net electricity imports must be considered low-cost/must-run units k.

The parameter λ_y is defined as follows:

$$\lambda_y(\%) = \frac{Number\ of\ hours\ LCMR\ sources\ on\ the\ margin\ year\ y}{8760\ hours\ per\ year} \qquad \text{Equation (12)}$$

Where:

- LCMR = Low-cost/must-run

There are two approaches to determine lambda (λ_y):

Approach 1: Use default values of lambda from Table 1 appendix 2 of the TOOL07 based on the share of electricity generation from low-cost/must-run in total generation derived using 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production. Approach 1 can only be applied if the LASL is not less than one-third of the HASL in a project electricity/grid system demonstrated based on the yearly data for the years used to determine the OM emission factor.

Approach 2: Lambda (λ_y) is calculated according to the following steps:

- Step (i)
  Plot a load duration curve. Collect chronological load data (typically in MW) for each hour of the year y and sort the load data from the highest to the lowest MW level. Plot MW against 8760 hours in the year, in descending order.
- Step (ii)
  Collect electricity generation data from each power plant/unit. Calculate the total annual generation (in MWh) from low-cost/must-run power plants/units (i.e. $\sum_k EG_{k,y}$).
- Step (iii)
  Fill the load duration curve. Plot a horizontal line across the load duration curve such that the area under the curve (MW times hours) equals the total generation (in MWh) from low cost/must-run power plants/units (i.e. $\sum_k EG_{k,y}$).
- Step (iv)
  Determine the "Number of hours for which low-cost/must-run sources are on the margin in year y". First, locate the intersection of the horizontal line plotted in Step (iii) and the load duration curve plotted in Step (i). The number of hours (out of the total of 8760 hours) to the right of the intersection is the number of hours for which low-cost/must-run sources are on the margin. If the lines do not intersect,

then one may conclude that low-cost/must-run sources do not appear on the margin and λ_y is equal to zero.

In determining λ_y only grid power units (and no off-grid power plants) should be considered.

C. Dispatch data analysis OM:

The dispatch data analysis OM emission factor ($EF_{grid,OM-DD,y}$) is determined based on the grid power units that are actually dispatched at the margin during each hour h where the project is displacing grid electricity. This approach is not applicable to historical data and, thus, requires annual monitoring of $EF_{grid,OM-DD,y}$.

The emission factor is calculated as follows:

$$EF_{grid,OM-DD,y} = \frac{\sum_h EG_{PJ,h} \cdot EF_{EL,DD,h}}{EG_{PJ,y}} \quad \text{Equation (13)}$$

Where:

- $EF_{grid,OM-DD,y}$ = Dispatch data analysis operating margin CO_2 emission factor in year y (tCO_2/MWh).
- $EG_{PJ,h}$ = Electricity displaced by the project activity in hour h of the year y (MWh).
- $EF_{EL,DD,h}$ = CO_2 emission factor for grid power units in the top of the dispatch order in hour h in year y (tCO_2/MWh).
- $EG_{PJ,y}$ = Total electricity displaced by the project activity in year y (MWh).
- h = Hours in year y in which the project activity is displacing grid electricity.
- y = Year in which the project activity is displacing grid electricity.

The hourly emission factor $EF_{EL,DD,h}$ can be either calculated based on the hourly fuel consumption data if available, following equation (13) of the TOOL07, or based on the energy efficiency of the grid power unit and the fuel type used, following equation (14) of the tool.

To determine the set of grid power units that are in the top of the dispatch, the procedures stated in paragraphs 68-69 of the tool must be followed.

D. Average OM:

The average OM emission factor is calculated as the average emission rate of all power plants serving the grid, as stated for the Simple OM, but including the LCMR power plants in all equations.

e) **Step 5: Calculate the build margin (BM) emission factor.**

The build margin emission factor is calculated ex-ante using Option 1, according to the guidelines of the TOOL07 para. 72(b). This option does not require monitoring the emission factor during the crediting period. Capacity additions from retrofits of power plants are not included in the calculation of the build margin emission factor. The BM is calculated as follows:

$$EF_{grid,bm,y} = \frac{\sum_m EG_{m,y} \cdot EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad \text{Equation (14)}$$

Where:

- $EF_{grid,bm,y}$ = Build margin CO2 emission factor in year y (tCO2/MWh).
- $EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh).
- $EF_{EL,m,y}$ = CO2 emission factor of the power unit m in year y (tCO2/MWh).
- m = Power units included in the build margin.
- y = Most available historical year for which electricity generation data is available.

The selection of sample of the power units considered in the calculation will be determined as per the following procedure, according to the Tool:

a. Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and determine their annual electricity generation.
b. Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities. Then, identify the set of power units that started to supply electricity to the grid most recently and comprises 20% of the total generation.
c. From this set selected the set of power units that comprises the larger annual electricity generation and:

i. If none of the power units started supply electricity to the grid more than 10 years ago, then calculate the BM directly; otherwise,

ii. Exclude from the set the power units that started to supply electricity more than 10 years ago and include in the set the power units registered as CDM project activities, until the electricity generation of the set comprises 20% of the generation. If the annual generation of the set comprises 20% of the annual generation of the project system, use the sample group to calculate the BM. Otherwise,

iii. Include in the sample group resulted from sub-step (ii) the power units that started to supply electricity to the grid more than 10 years ago until the electricity generation of the set comprises 20% of the annual generation of the project electricity system. Use this sample group to calculate the BM.

f) Step 6: Calculate the combined margin (CM) emission factor.

Combined margin (CM) emission factor for the grid:

The calculation of the Combined Margin (CM) emission factor ($EF_{grid,CM,y}$) for the grid is conducted at instance level based on equation 16 of TOOL07 as follows:

(a) Weighted average CM;

(b) Simplified CM.

Weighted average CM is the preferred option, since all requirements needed to calculate it can be met.

The combined margin emissions factor is calculated as follows:

$$EF_{grid,cm,y} = EF_{grid,OM,y} \cdot W_{OM} + EF_{grid,BM,y} \cdot W_{BM} \quad \text{Equation (15)}$$

Where:

$EF_{grid,cm,y}$ = Build margin CO2 emission factor in year y (tCO2/MWh).

$EF_{grid,OM,y}$ = Operating margin CO2 emission factor in year y (tCO2/MWh).

W_{OM} = Weighting of operating margin emissions factor (%).

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

The following default values should be used for W_{OM} and W_{BM}:

- Wind and solar power generation project activities: W_{OM} = 0.75 and W_{BM} = 0.25 (due to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods.
- All other projects: WOM = 0.5 and WBM = 0.5 for the first crediting period, and WOM = 0.25 and WBM = 0.75 for the second and third crediting period

The following tables indicate the emission factor calculated for the operating margin, build margin and the combined margin for the SEN and Aysén subsystem:

	SEN			Aysén		
Year	Generation (MWh)	$EF_{OM,y}$ (tCO2/MWh)	$EF_{BM,y}$ (tCO2/MWh)	Generation (MWh)	$EF_{OM,y}$ (tCO2/MWh)	$EF_{BM,y}$ (tCO2/MWh)
2022	37,337,493	0.6875		165,632	0.3138	
2023	30,759,610	0.6543		175,156	0.2506	
2024	25,812,196	0.6601	0.0004772	181,721	0.2788	0.3162
EF_{OM} & EF_{BM}	0.6691		0.0004772	0.2804		0.3162

Table 12: EF_{OM} and EF_{BM} for the SEN and Aysén

First period EF_{CM}				
Technology	w_{OM}	w_{BM}	$EF_{CM,SEN}$	$EF_{CM,Aysén}$
Solar	0.75	0.25	0.5020	0.2894
Wind	0.75	0.25	0.5020	0.2894
Hydro	0.5	0.5	0.3348	0.2983
Tidal	0.5	0.5	0.3348	0.2983
Wave	0.5	0.5	0.3348	0.2983
Geothermic	0.5	0.5	0.3348	0.2983

Table 13: EF_{CM} for the SEN and Aysén

3.7.4 GHG project emissions

i. Justification of applicable scenarios

According to the methodology AMS-I.D most renewable energy projects will have zero project emissions ($PE_y = 0$) irrespective of the grid to which the generated electricity will be delivered. This condition is applicable to any solar, wind, tidal and wave renewable instance.

However, some project activities may involve project emissions which may be significant, those are, the operation of geothermal power plants (e.g. non-condensable gases, electricity/fossil fuel consumption) and water reservoirs of hydro power plants. As defined in the methodology, project emissions are calculated according to the most recent version of ACM0002 “Grid-connected electricity generation from renewable sources” Version 22.0 (hereinafter referred to as ACM0002).

According to AMS-I.D para. 40, CO_2 emissions from on-site consumption of fossil fuels due to the project activity (e.g. combustion in process j, when a diesel generator is used as a backup) will be calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels as per the procedures described in TOOL03 “Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion” Version 3.0 (hereinafter referred to as TOOL03).

ii. Relevant equations

Project emissions will be calculated as follows:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y} + PE_{BESS,y} + PE_{PSP,y} \quad \text{Equation (16)}$$

Where:

- PE_y = Project emissions in year y (tCO_2e/yr);
- $PE_{FF,y}$ = Project emissions from fossil fuel consumption in year y (tCO_2/yr);
- $PE_{GP,y}$ = Project emissions from the operation of dry, flash steam or binary geothermal power plants in year y (tCO_2e/yr);
- $PE_{HP,y}$ = Project emissions from water reservoirs of hydro power plants and pumped storage plants in year y (tCO_2e/yr).
- $PE_{BESS,y}$ = Project emissions from charging of a BESS using electricity from the grid or from fossil fuel electricity generators ($t\ CO_2e/yr$)
- $PE_{PSP,y}$ = Project emissions from utilizing electricity from the grid for pumping operation of PSP in excess to the production of the renewable power plant operating in coordination with the PSP ($t\ CO_2e/yr$)

Quantification of project emissions for the instances included in this document is carried out in accordance with the requirements of the applied methodology AMS-I.D. Based on this, the terms $PE_{BESS,y}$ and $PE_{PSP,y}$ are not quantified in this context, resulting in the following equation:

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

Equation (17)

Emissions from fossil fuel consumption ($PE_{FF,j,y}$)

For geothermal or solar thermal projects which also use fossil fuels for electricity generation, CO2 emissions from fossil fuel shall be accounted for as project emissions. For all renewable energy power generation project activities, emissions due to the use of fossil fuels for the backup generator can be neglected.

CO2 emissions from fossil fuel combustion in process j is calculated based on the quantity of fuels combusted and the CO2 emission coefficient of those fuels, as follows:

Equation (18)

$$PE_{FF,j,y} = \sum_i FC_{i,j,y} \cdot COEF_{i,y}$$

Where:

- $PE_{FF,j,y}$ = Are the CO2 emissions from fossil fuel combustion in process j during the year y (tCO2/yr).
- $FC_{i,j,y}$ = Is the quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr).
- $COEF_{i,y}$ = Is the CO2 emission coefficient of fuel type i in year y (tCO2/mass or volume unit).
- i = Are the fuel types combusted in process j during the year y.

In order to calculate the CO2 emission coefficient $COEF_{i,y}$, the instance implementer can choose one of the following two Options (Option A should be preferred), depending on the availability of data on the fossil fuel type i, as follows:

Option A: The CO2 emission coefficient $COEF_{i,y}$ is calculated based on the chemical composition of the fossil fuel type i, using the following approach:

If $FC_{i,j,y}$ is measured in a mass unit:

$$COEF_{i,y} = w_{C,i,y} \cdot \frac{44}{12}$$

Equation (19)

If $FC_{i,j,y}$ is measured in a volume unit:

$$COEF_{i,y} = w_{C,i,y} \cdot \rho_{i,y} \cdot \frac{44}{12} \quad \text{Equation (20)}$$

Where:

- $COEF_{i,y}$ = Is the CO_2 emission coefficient fuel type i (tCO_2/mass or volume unit).
- $w_{C,i,y}$ = Is the weighted average mass fraction of carbon in fuel type i in year y (tC/mass unit of the fuel).
- $\rho_{i,y}$ = Is the weighted average density of fuel type i in year y (mass unit/volume unit of the fuel).
- i = Are the fuel types combusted in process j during the year y.

Option B: The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on the net calorific value and CO_2 emission factor of the fuel type i, as follows:

$$COEF_{i,y} = NVC_{i,y} \cdot EF_{CO2,i,y} \quad \text{Equation (21)}$$

Where:

- $COEF_{i,y}$ = Is the CO_2 emission coefficient fuel type i in n year y (tCO_2/mass or volume unit).
- $NVC_{i,y}$ = Is the weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit).
- $EF_{CO2,i,y}$ = Is the weighted average CO_2 emission factor of fuel type i in year y (tCO_2/GJ).
- i = Are the fuel types combusted in process j during the year y.

Emissions from the operation of dry steam, flash steam and binary geothermal power plants due to non-condensable gases and/or working fluid ($PE_{GP,y}$)

For dry or flash steam geothermal project activities, project participants shall account for emissions of CO_2 and CH_4 due to release of non-condensable gases from produced steam. Non-condensable gases in geothermal reservoirs usually consist mainly of CO_2 and H_2S. They also contain a small quantity of hydrocarbons, predominantly CH_4. In dry or flash steam geothermal power projects, non-condensable gases flow with the steam into the power plant. A small proportion of the CO_2 is converted to carbonate/bicarbonate in the cooling water circuit. In addition, parts of the non-condensable gases are re-injected into the geothermal reservoir. However, as a conservative approach, the methodology assumes that all non-condensable gases entering the power plant in dry or flash steam geothermal technologies are discharged to atmosphere via the cooling tower. Fugitive CO_2 and CH_4 emissions due to well testing and well bleeding are not considered, as they are negligible.

$PE_{GP,y}$ is calculated as follows:

$$PE_{GP,y} = PE_{dry\ or\ flash\ steam,y} + PE_{binary,y} \qquad \text{Equation (22)}$$

Where:

- $PE_{GP,y}$ = Project emissions from the operation of dry steam, flash steam and/or binary geothermal power plants in year y (t CO_2e/yr)
- $PE_{dry\ or\ flash\ steam,y}$ = Project emissions from the operation of dry steam or flash steam geothermal power plants due to release of non-condensable gases in year y (t CO_2e/yr)
- $PE_{binary,y}$ = Project emissions from the operation of binary geothermal power plants due to physical leakage of non-condensable gases and working fluid in year y (t CO_2e/yr)

(a) Project emissions from dry or flash steam geothermal power plants:

$$PE_{dry\ or\ flash\ steam,y} = \left(w_{steam,CO2,y} + w_{steam,CH4,y} \cdot GWP_{CH4}\right) \cdot M_{steam,y} \qquad \text{Equation (23)}$$

Where:

- $w_{steam,CO2,y}$ = Average mass fraction of CO_2 in the produced steam in year y (t CO_2/t steam)
- $w_{steam,CH4,y}$ = Average mass fraction of CH_4 in the produced steam in year y (t CH_4/t steam)
- GWP_{CH4} = Global warming potential of CH_4 valid for the relevant commitment period (t CO_2e/t CH_4)
- $M_{steam,y}$ = Quantity of steam produced in year y (t steam/yr)

(b) Project emissions from binary geothermal power plants:

$$PE_{binary,y} = PE_{steam,y} + PE_{working\ fluid,y} \qquad \text{Equation (24)}$$

Where:

- $PE_{steam,y}$ = Project emissions from the operation of binary geothermal power plants due to physical leakage of non-condensable gases in year y (t CO_2e/yr). In case the difference between steam inflow and outflow to the power plant is less than 1%, then the project participants are not required to account these project emissions.
- $PE_{working\ fluid,y}$ = Project emissions from the operation of binary geothermal power plants due to physical leakage of working fluid contained in heat exchangers in year y (t CO_2e/yr).

$$PE_{steam,y} = \left(M_{inflow,y} - M_{outflow,y}\right) \cdot \left(w_{steam,CO2,y} + w_{steam,CH4,y} \cdot GWP_{CH4}\right) \qquad \text{Equation (25)}$$

Where:

- $M_{inflow,y}$ = Quantity of steam entering the geothermal plant in year y (t steam/yr)
- $M_{outflow,y}$ = Quantity of steam leaving the geothermal plant in year y (t steam/yr)

$$PE_{working\ fluid,y} = M_{working\ fluid,y} \cdot GWP_{working\ fluid} \qquad \text{Equation (26)}$$

Where:

- $M_{working\ fluid,y}$ = Quantity of working fluid leaked/reinjected in year y (t working fluid/yr)
- $GWP_{working\ fluid}$ = Global Warming Potential for the working fluid used in the binary geothermal power plant.

Emissions from water reservoirs of hydro power plants ***($PE_{HP,y}$)***

The power density of the project activity (*PD*) is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \qquad \text{Equation (27)}$$

Where:

- PD = Power density of the project activity (W/m2)
- Cap_{PJ}= Installed capacity of the hydro power plant after the implementation of the project activity (W)
- Cap_{BL} = Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value 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 (m2)
- A_{BL} = 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.

For hydro power instances that result in new single or multiple reservoirs, and hydro power instances that result in the increase of single or multiple existing reservoirs, project proponents shall account for CH_4 and CO_2 emissions from the reservoir, estimated as follows:

(a) For integrated hydro power project PD of the entire project is calculated as follows:

$$PD = \frac{\sum_i \quad Cap_{PJ,i}}{\sum_i \quad A_{PJ,j}} \qquad \text{Equation (28)}$$

Where:

- i = individual power plants included in integrated hydro power project;
- j = individual reservoirs included in integrated hydro power project.

(b) If the power density of the single or multiple reservoirs (*PD*) is greater than 4 W/m2 and less than or equal to 10 W/m2:

$$PE_{HP,y} = \frac{EF_{Res} \cdot TEG_y}{1000}$$ Equation (29)

Where:

- $PE_{HP,y}$ = Project emissions from reservoirs of hydro power plants in year y (tCO_2e);
- EF_{Res} = Default emission factor for emissions from reservoirs of hydro power plants
  ($kgCO_2e/MWh$);
- TEG_y = Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year *y* (MWh).

(c) If the power density of the PA is greater than 10 W/m2:

$$PE_{HP,y} = 0$$ Equation (30)

3.7.5 GHG leakages.

As per AMS-I.D para. 42, leakage will be considered only for biomass project activities. Hence, no leakage emissions are considered for any instances under this project document.

Information on estimated emissions reductions for the initial instance "Quetena Solar Park" is below:

- Quetena Solar Park:

The generation objective for this instance is 26,667 MWh/y, a value that translates to an estimated emissions reduction of 13,387 tCO_2/y, considering a grid emission factor of 0.5020, starting from 23.09.2021, as this is the instance's commissioning date. This means that for 2021, the estimated emission reductions are 3,668 tCO_2, for 2031 are 9,719 tCO_2, and for the remaining years are 13,387 tCO_2.

The following table indicates the total estimated emission reductions during the project's quantification period and the estimated annual average:

Year	GHG emission reductions/removals in the baseline scenario (tCO_{2e})	GHG emission reductions/removals in the project scenario (tCO_{2e})	GHG emissions attributable to leakages (tCO_{2e})	Estimated Net GHG Reduction/Removals (tCO_{2e})
23.06.2021 to 31.12.2021	**0**	3,668	**0**	**3,668**
2022	0	13,387	0	**13,387**
2023	0	13,387	0	**13,387**
2024	0	13,387	0	**13,387**
2025	0	13,387	0	**13,387**
2026	0	13,387	0	**13,387**
2027	0	13,387	0	**13,387**
2028	0	13,387	0	**13,387**
2029	0	13,387	0	**13,387**
2030	0	13,387	0	**13,387**
01.01.2031 to 22.06.2031	0	9,719	0	**9,719**
Total	**0**	**133,868**	**0**	133,868

4 Compliance with Laws, Statutes and Other Regulatory Frameworks

In Chile there are legal and environmental frameworks that regulate the implementation of new projects in the country:

- Law 19.300[13] "Law on general bases of the environment", in effect since 1994, establishes the legal framework for the proposal, evaluation, and implementation of projects that may generate an environmental impact in Chile.
- Supreme Decree No. 40 of 2012[14] approves the Regulation of the Environmental Impact Assessment System (RSEIA). This decree establishes the provisions by which the Environmental Impact Assessment System and Community Participation in the Environmental Impact Assessment process will be governed.

  The RSEIA establishes the provisions and procedures for evaluating the environmental impact of projects and activities in Chile. The objective of the RSEIA is to ensure that projects are developed sustainably and with the least possible impact on the environment and the vulnerable groups in the area, including indigenous groups.

If a new renewable energy project has an installed capacity of less than 3 MW, it is not required to undergo the Environmental Impact Assessment process, either through a full Environmental Impact Study (EIA for its acronym in Spanish) or a Declaration of Environmental Impact (DIA for its acronym in Spanish). Instead, it is sufficient to submit a Letter of Pertinence, which, once reviewed and approved by the environmental authority, certifies that the project is not subject to mandatory environmental assessment.

The initial instances of this grouped project comply with environmental regulations either by entering the Environmental Impact Assessment System through a DIA or an EIA, obtaining the corresponding Environmental Sectorial Permits (PAS), and securing a favorable Environmental Qualification Resolution (RCA), or, for smaller projects below 3 MW, by submitting a Letter of Pertinence approved by the relevant authority. A regulatory review will be conducted every two years to assess whether new or amended legislation may affect the project or any of its individual instances.

The information for the initial instance "Quetena Solar Park" is below:

a. Quetena Solar Park

   i. DIA presented
   ii. Sectorial permits obtained.

[13] Source: https://www.bcn.cl/leychile/navegar?idNorma=30667
[14] Source: https://www.bcn.cl/leychile/navegar?idNorma=1053563&idVersion=2024-02-01&idParte=9369908

- PAS 138 (Permit for the construction, repair, modification, and expansion of any public or private work intended for the evacuation, treatment, or final disposal of sewage and wastewater of any nature.)
- PAS 140 (Permit for the construction, repair, modification, and expansion of any garbage and waste treatment plant of any kind or for the installation of any place intended for the accumulation, sorting, processing, sale, or final disposal of garbage and waste of any kind.)
- PAS 142 (Permit for any site intended for the storage of hazardous waste.)
- PAS 160 (Permit to subdivide and develop rural land or for construction outside urban limits.)

iii. Favorable RCA No. 0122 (04.07.2019)

5 Carbon ownership and rights

5.1 Project holder

Individual or organization	***Natural Assets SpA***
Contact person	*Cristián Mosella*
Job position	*Managing Director*
Address	*Fidel Oteiza 1941, of.504, Providencia*
Phone number	*+56 9 8828 7578*
Email	*cmosella@energylab.cl*

5.2 Other project participants

Individual or organization	***Parque Solar Quetena S.A.***
Contact person	*Alberto Falcone*
Job position	*Deputy project manager*
Address	*Augusto Leguía Sur 160, of. 51, Las Condes*
Phone number	*+56 9 9917 8798*
Email	*afalconea@icafal.cl*

5.3 Agreements related to carbon rights

All agreements related to carbon rights are presented in this section. Specifically for the initial instance “Quetena Solar Park”, the following agreements were made:

a. Quetena Solar Park

An agreement between Parque Solar Quetena S.A. and Natural Assets SpA was made on 03.09.2025 to enter to this grouped project with Quetena Solar Park. The period in which the VCCs are generated is from 23.09.2021 to 22.09.2031. In this agreement the responsibilities of both parties were defined, meaning Natural Assets SpA will take the role of Project Holder carrying out operational and implementation activities like coordinating the inclusion of the instances to the project, supporting and administering the validation, monitoring, verification and issuance processes, preparation of monitoring reports, data security, backup and recovery from each instance under this project, etc., while Parque Solar Quetena S.A. will take the role of Instance Implementer, being responsible for the correct implementation of the procedures and processes, ensuring that all the personnel participating in the tasks are properly trained and maintain coordination with the Project Holder, managing, analyzing and reporting to the Project Holder, etc.

Quetena Solar Park, as stated in its DIA and recognized by the Environmental Impact Assessment System (SEIA) through the emission of the corresponding RCA, does not take place in a populated area, meaning that there was no need to make an agreement with local communities or indigenous people.

5.4 Land tenure (Projects in the AFOLU sector)

Not applicable.

6 Climate change adaptation

The BCR Standard presents criteria that the project must comply with related to climate change adaptation as follows:

(a) consider one or more of the strategic lines proposed in the National Climate Change Policies and/or focuses aspects outlined in the regulations of the country where the project is implemented;

(b) improve conditions for the conservation of biodiversity and its ecosystem services, in the areas of influence, outside the project boundaries; i.e., natural cover on environmentally key areas, biological corridors, water management in watersheds, among others;

(c) implement activities that generate sustainable and low-carbon productive landscapes;

(d) propose restoration processes in areas of specific environmental importance;

(e) design and implement adaptation strategies based on an ecosystem approach;

(f) strengthen the local capacities of institutions and/or communities to take informed decisions to anticipate negative effects derived from climate change (recognition of conditions of vulnerability); as well as to take advantage of opportunities derived from expected or evidenced changes.

This project contributes to the conditions (a) and (c) described below:

(a) Chile aims to achieve and maintain GHG emission neutrality no later than 2050. This is legally demonstrated through the enactment of Law 21,455 or the Framework Law on

Climate Change, in 2022. In this regard, the development of new projects related to clean energy production becomes important, complying with this requirement. Furthermore, the Chilean NDC 2015 states that 20% of electricity generation from renewables (non-hydro) by 2025 and that Chile is committed to reducing its CO_2 emissions intensity per GDP unit by 30% below 2007 levels by 2030. In the actualization of 2020, the NDC declares an absolute reduction target of 25-30% below 2016 levels and an electricity matrix composed of 70% renewable energy by 2030.

(c) The implementation of this project, directly related to clean energy production contributes to the decarbonization of Chile's electricity matrix and, therefore, to low-carbon landscapes.

With respect to conditions (b), (d), (e) and (f), this project is composed of instances that comply with all Chilean environmental procedures, including biodiversity related criteria. Furthermore, the included instances correspond to small-scale projects, resulting in minimal land use and a reduced environmental impact. In this context, measures aimed at conservation beyond project boundaries (criterion b) are unnecessary. Likewise, restoration processes (criterion d) are not applicable, as the regions in which the instances are implemented lack specific environmental importance that would require intervention. Since there are no significant ecosystems requiring adaptive strategies, ecosystem-based approaches (criterion e) do not align with the project's context. Finally, because the instances do not affect local communities or create climate vulnerabilities, strengthening local capacities for adaptation (criterion f) is not relevant in this case. Instead, the project contributes to sustainability by generating clean energy without negatively impacting the surrounding environment or social conditions.

7 Risk management

Implementers assessed and managed the risks related to their corresponding instances in their construction, operation, and closing phases. Identified risks and mitigation measures for the initial instance "Quetena Solar Park" are listed in the table below, in accordance with the BCR Tool "Permanence and Risk Management" V.1.1.

- Quetena Solar Park:

Risk Category	Identified risks	Mitigation
Environmental	Atmospheric emissions	Atmospheric emissions are primarily generated during the construction phase but are considered non-significant. Additionally, mitigation measures have been implemented,

		such as limiting vehicle speed and prohibiting the burning of materials within the instance area. This risk is considered low.
	Waste Generation	Waste generation is considered only during the construction phase. All solid waste is segregated and temporarily stored in designated safe zones until its final disposal by authorized companies. No liquid waste is generated, as chemical toilets are used, and their contents are ultimately processed by authorized companies. This risk is considered low.
	Noise Pollution	The noise levels generated during the construction and operation phases remain below the maximum limits set by Chilean regulations and are considered safe to wildlife. This risk is considered low.
Financial	Market risk – Interest rate risk	Quetena Solar Park has a low exposure to interest rate risk, given its policy of predominantly long-term fixed interest rates, achieved through structured loans. This risk is considered low.
Social	Impact on local groups	This instance does not interfere with or restrict the free circulation of local groups or their access to natural resources used for financial livelihood or any other traditional purpose. Additionally, there is no relocation of indigenous groups, nor any impact on the free expression of traditions, culture, or interests. This risk is considered low.

Table 14: Identified risks

7.1 Reversal Risk

The equipment used at all instances is calibrated and maintained in accordance with the Chilean Technical Norm of Security and Service Quality (NTSyCS), which is the most relevant regulation in terms of operational safety, service quality, and the technical standards that generation, transmission, and distribution facilities must comply with when connected to the national grid.

Data relating to the net electricity supplied by the instances to the grid is monitored continuously, electronically recorded, and consolidated monthly. The backup strategy has been structured into three levels for greenfield instances:

- Primary: Copies of the data stored by an authorized entity or business.
- Secondary: Invoice reports emitted by the authorized entity or business.
- Tertiary: Information on monitoring extracted directly from the grid coordinating entity, since generation monitoring is reported directly to it

For instances with capacity addition:

- Primary: Copies of the data stored by an authorized entity or business.
- Secondary: Information on monitoring extracted directly from the grid coordinating entity.

The monitoring data for capacity addition instances will be cross-checked with the invoice reports for the electricity sales as stated in the methodology AMS-I.D, and the value of the one with lower electricity generation will be used, as a conservative approach.

Usually, the net electricity generation is measured, but if an instance decides to measure its gross generation and consumption separately and the latter is unavailable for a given period, its maximum consumption measurement recorded during the respective analysis year should be used for each measurement where no consumption is reported.

If data is unavailable from all possible sources for a given period, the project shall not claim any GHG emission reductions to that timeframe.

As stated in the "Risk and permanence" Tool, the system automatically discounts a reserve of 10% of the total quantified GHG emission reductions for each verified period.

7.1.1 Loss Event Report

Not applicable at this stage.

8 Sustainable development safeguards (SDSs)

The BCR Tool “Sustainable Development Safeguards, SDSs” Annex A was completed and it can be found in the complementary files folder.

Below are the summarized safeguard analyses for the “Quetena Solar Park” instance:

- **Quetena Solar Park**

Environment:

a) Land use: Resource efficiency and pollution prevention and management

> Activities related to this instance are related to the generation of electricity by means of solar energy, in other words, there are no impacts on human health and the environment, no pollution is generated. Also, this instance is located in a desertic zone, with low to no existence of animal or vegetal life, so no considerable impact is generated.

b) Water

> The activities do not consider extraction of water from underground reservoirs and do not generate liquid waste that could pollute them or water streams nearby.

c) Biodiversity and ecosystems

> This instance studied the biodiversity and ecosystems in the affected area before the construction phase and concluded that the zone is devoid of flora and with highly impacted fauna, given that this is a desert environment near an urban center.

d) Climate change

> This instance, as explained in section 6, contribute to generating sustainable and low-carbon productive landscapes by generating electricity from solar energy, reducing Chile’s reliance on fossil fuels and contributing to its energy matrix goals.

Social:

a) Human rights

> - Labor and working conditions

This instance is regulated by Chilean work laws, preventing forced labor and child labor, discrimination in respect to employment and occupation, and providing a safe work environment and freedom of association.

- Gender equality and women empowerment

This instance promotes an inclusive work environment that provides opportunities and space within the company for everyone, regardless of their personal conditions, based exclusively on personal merit.

- Land acquisition, restrictions on land use, displacement, and involuntary resettlement

This instance does not generate relocation of human groups, as is located in a zone with no human or indigenous groups present. Also, the area affected does not represent a traditional, medicinal, spiritual or cultural zone and no community uses it as an economic livelihood. Land usage is legally authorized through a signed lease agreement between the instance implementer and the landowner.

- Indigenous people and cultural heritage

As stated in the previous answer, the area affected does not represent a traditional, medicinal, spiritual or cultural zone. The instance location is not near indigenous land and does not register heritage-related elements.

- Community health and safety

All the waste generated in the construction phase was disposed of properly and no waste that could generate potential impact on the community's health or safety is produced during the operation phase. All phases in the life cycle of this instance comply with the health and safety regulations for workers and operators. The photovoltaic park has a perimeter fence with the purpose of restricting access to unauthorized individuals and always ensure maximum security, both for the park and for the people.

b) Corruption

The instance developer regulates its internal processes through, for example, internal audits, preventing consequences such as misuse of funds, fraudulent reporting, conflict of interest, lack of transparency, weak regulatory oversight, lack of accountability mechanisms, environmental permitting corruption and subcontractor corruption.

c) Economic impact

During all phases, the instance implementation has created opportunities for employment for the local community, contributing to the economic development of the region. There are no agreements made with local communities, as there is no presence of people in the influence zone nor use of the land for any kind of activity.

Governance and compliance:

This instance operates in compliance with all applicable laws and regulations. The Environmental Impact Declaration related to this instance is publicly available and demonstrates transparency in the decision-making process, and its annexes contain information on how diverse perspectives were considered while the instance was in the assessment phase.

9 Stakeholder engagement and consultation

In Chile, generation projects that install an effective capacity of more than 3 MW And those which install less than 3 MW but generates or presents at least one of the effects, characteristics or circumstances established in article 11 of the Law 19,300, are required to identify relevant stakeholders, including governmental authorities and possibly affected communities, to whom project information must be communicated and whose inquiries or concerns must be addressed. For generation projects that do not present the above-mentioned characteristics, this recognition is not legally mandatory for all stakeholders, but relevant parties may include entities or people involved in land-use agreements, the local electricity distributor, and the National Energy Commission (CNE) when notifying the project as "under construction." By engaging these stakeholders, the project complies with national regulations regarding stakeholder consultation and simultaneously fulfills the BioCarbon Standard requirements.

Quetena Solar Park:

The instance's name and information were published in the Official Gazette the day 01.06.2018, and, as established by the RSEIA, five radio announcements were broadcast through Radio Topater FM (Frequency 105.7 in Calama), a local broadcasting station.

These announcements were broadcast once a day on days 4, 5, 6, 7 and 8 of June 2018, and contained the following message:

"Trivento SpA, through its legal representative Mr. Pedro Ewing, informs the community that it has submitted the Environmental Impact Declaration (DIA) for the project named "Parque Solar Quetena" to the Environmental Impact Assessment System. The project will be located in the municipality of Calama, in the Province of El Loa, Antofagasta Region, specifically 1 km west of Calama. It will have a lifespan of 30 years and will be developed over an area of 18 hectares. The project consists of the construction and operation of a photovoltaic solar park with an installed capacity of 9.9 MWp and a 300-meter-long, 23 kV transmission line to generate electricity and connect to the Local Distribution System.

According to Article 10 of Law 19.300, the project's entry classification corresponds to section (c), which covers power generation plants exceeding 3 MW. The Environmental Impact Declaration is available for consultation in digital format on the website www.sea.gob.cl and in physical format at the offices of the Environmental Assessment Service of the Antofagasta Region, located at Avenida República de Croacia 0336, on business days, Monday to Friday, from 9:00 AM to 2:00 PM, in continuous hours, Antofagasta.

If the project generates environmental burdens for nearby communities, a citizen participation process may be initiated, provided that at least two legally recognized civic organizations, through their representatives, or a minimum of ten directly affected individuals submit a written request to the Environmental Assessment Service by June 15, 2018."

Also, the DIA was submitted for comments from the State Administration bodies with environmental competence, which, in accordance with current regulations, participate in the environmental impact assessment process, and a meeting with Human Groups Belonging to Indigenous Peoples (GHPPI for its acronym in Spanish) was held, during which concerns were raised regarding potential risks associated with the implementation of the instance. These comments and concerns were documented and did not lead to any modifications in the instance's structure or planning.

9.1 Summary of comments received

<u>Quetena Solar Park</u>:

The consultation resulted in observations and questions from some of the State Administration Bodies, mostly clarifications based on the DIA, which the instance implementer considered and addressed through an addendum. After that, a revision of said addendum was made by the State Administration bodies and resulted in new questions and comments, which were again considered and addressed through a complementary addendum.

Although a revision of the public environmental impact record confirms that no comments, observations, opinions or questions were received from individuals or civic organizations in relation to the radio broadcast or Official Gazette publication, an agreement was settled with the community Likan Tatay, located near the project site, in which the instance implementer commits to installing a surveillance system to improve the safety of the community's communal headquarters.

9.2 Consideration of comments received

Quetena Solar Park:

As stated in the previous section, comments received were considered and addressed through an addendum and subsequently by a complementary addendum. The answers satisfactorily resolved the questions as the project was later approved by means of obtaining its corresponding favorable RCA.

The agreement with the community Likan Tatay was fulfilled and was documented through a letter signed by a representative of the community.

10 Sustainable Development Goals (SDGs)

This grouped project aims to contribute to reducing GHG emission by incorporating projects related to the production of non-conventional renewable energy, specifically solar photovoltaic, wind, hydro, geothermal, tidal and wave energies. It also contributes to the sustainable development in Chile through environmental, social, economic and technological benefits, such as the deployment of clean energy sources, creation of local employment opportunities, stimulation of local economies, and technology transfer from both international and urban centers to rural areas. Furthermore, this grouped project aims to facilitate and encourage the development of small and medium-sized grid-connected renewable energy projects in Chile, by helping instance implementers overcome local barriers related to development and financing through inclusion under this grouped project.

Instances under this grouped project will, at a minimum, report contribution to the following SGDs:

- SDG 7 "Affordable and clean energy"
- SDG 9 "Industry, innovation and infrastructure"
- SDG 13 "Climate action"

The target and indicator related to each SDG will be identified and reported for each instance using the BCR Tool for Determining the Contributions of GHG Projects to Achieving the Sustainable Development Goals (SDGs).

a. Quetena Solar Park

Contribution to SDG 7 (Target 7.2 - Indicator 7.2.1): "Renewable energy share in the total final energy consumption". This instance contributes by providing verifiable data on the total amount of solar electricity produced and injected into the grid.

Contribution to SDG 9 (Target 9.4 - Indicator 9.4.1): "CO_2 emission per unit of value added". This instance represents a modernization of the national electric infrastructure by producing electric energy with no carbon emissions.

Contribution to SDG 13 (Target 13.2 - Indicator 13.2.1):"Number of countries that have communicated the establishment or operationalization of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production (including a national adaptation plan, nationally determined contribution, national communication, biennial update report or other)". While this indicator applies at the national level, the project supports Chile's implementation of its climate strategy and NDC targets by avoiding GHG emissions, as quantified in this document.

11 REDD+ Safeguards (For REDD+ projects)

Not applicable

12 Special categories, related to co-benefits (optional)

The project will not apply to special categories.

13 Grouped projects (if applicable)

This project considers the possibility of inclusion of:

1. Greenfield or capacity addition photovoltaic small-scale projects
2. Greenfield or capacity addition wind small-scale projects
3. Greenfield or capacity addition hydro small-scale projects (with or without reservoirs)
4. Greenfield or capacity addition geothermic small-scale projects
5. Greenfield or capacity addition tidal small-scale projects
6. Greenfield or capacity addition wave small-scale projects

The BCR standard indicates that activities in the energy, transportation and waste sectors may develop grouped projects that shall meet the following requirements:

a) Identify during the validation process, the geographical area(s) within which (initial and additional) instances of the project are developed and define the criteria for the addition of new cases.

The geographical area within every instance (initial or additional) of the project is developed is the territory of Chile, while the facility is physically connected to the SEN or Aysén subsystem, as established in the methodology AMS-I.D.

The criteria for the addition of a new greenfield instance will be, in first place, to have up to 15 MW of installed capacity and it must connect to the SEN or Aysén subsystem. This criteria applies to greenfield solar, wind, geothermal, tidal, wave and hydro without reservoirs instances. Criteria stated in the methodology such as complying with being a renewable energy generator can be understood as automatically fulfilled by the nature of the instance.

Greenfield hydro instances with reservoirs must comply with the above-mentioned criteria and at least one of the following:

i. The instance is implemented in an existing reservoir with no change in its volume.
ii. The instance is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity is greater than 4 W/m2.

iii. The instance results in new reservoirs and the power density of the power plant is greater than 4 W/m2.

The criteria for the addition of a new instance related to capacity addition will be, in first place, that the added capacity of the units added by the project should be lower than 15 MW, it should be physically distinct from the existing units, and it must connect to the SEN or Aysén subsystem. This criteria applies to greenfield solar, wind, geothermal, tidal, wave and hydro without reservoirs instances. Criteria stated in the methodology such as complying with being a renewable energy generator can be understood as automatically fulfilled by the nature of the generic instance.

Capacity addition hydro instances with reservoirs must comply with the above-mentioned criteria and:

i. The instance is implemented in an existing reservoir with no change in its volume.
ii. The instance is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity is greater than 4 W/m2.
iii. The instance results in new reservoirs and the power density of the power plant is greater than 4 W/m2.

b) Comply with the guidelines of the BCR Standard, in their most recent version.

Additional instances will comply with the guidelines of the BCR Standard, in their most recent version.

c) Comply with all the provisions of the BioCarbon methodological documents they apply, in their latest release.

Additional instances will fully adhere to the provisions outlined in the latest release of the applicable BioCarbon methodological documents.

d) Include emission reductions only for validated project activities.

Emission reductions will be included only for validated project activities and will be informed separately for each instance.

e) Implement the GHG emission reduction activities described in the validated project document.

The GHG emission reduction activities described in the validated project document will be implemented.

f) Demonstrate that the new instances meet the conditions of applicability described in the methodology applied.

All new instances meet the conditions of applicability described in the methodology as it contains the same criteria used to add new instances to the project.

g) Demonstrate that geographic areas (to be included in the project boundaries) in which there are no initial instances are subject to the same baseline scenario conditions and additionality as the areas in which are the initial instances.

The geographic area where new instances could take place is the same as the initial instances, in other words, Chilean territory and the SEN and Aysén subsystem, so any new instances would have the same baseline scenario conditions. Without prejudice to the foregoing, baseline scenario conditions and additionality will be evaluated individually for each instance, prior to the decision to add them to the project.

h) Provide evidence of the start date activities in the new instances, demonstrating that this date is later than the start date of the GHG emission reduction activities in the cases included in the validation (initial instances).

All new instances will start their activities at a later date than the initial instances. The start of activities is understood as the moment when new instances begin to generate reductions of GHG.

i) The baseline scenario shall be determined for each instance, in accordance with the applicable methodology.

The baseline scenario for all instances (initial and additional) is the same, and corresponds to the baseline described in section 3.3, as every new instance will be connected to the SEN or Aysén subsystem. The baseline scenario conditions for each instance will be evaluated.

j) Additionality shall be assessed at the instance level as required by the applicable methodology. Within the eligibility criteria set at the time of registration for the inclusion of new project activity instances, criteria regarding the additionality requirements for inclusion shall be defined.

Every new instance's additionality will be evaluated before its addition to the project following the procedure described in this document, and if any instance does not manage to qualify as additional it could not be included as a new instance.

k) Confirm that each instance complies with all methodology applied provisions, including the capacity limits set out in the methodologies applicable to the project type.

Every new instance will comply with all methodology applied provisions. New instances are limited to projects encompassing small-scale greenfield projects and capacity addition below 15 MW, conditions stated by the methodology.

14 Other GHG program

No instance under this grouped project has been registered, submitted for registration, or certified under any other GHG program (e.g., CDM, Verra, Gold Standard, Cercarbono). Furthermore, no instance has sought or received environmental crediting certifications from other standards.

To ensure alignment with the BCR Standard, the following has been verified for all project instances:

- No Dual Registration: No instance is currently (or has been previously) registered in another GHG program, eliminating the need for cancellation.
- Exclusive Claim to GHG Reductions: All projected GHG reductions/removals are solely attributed to this initiative and are not counted toward any other program or project.
- Legal and BCR Alignment: All instances comply with Chile's national legal framework and the BCR Standard Operating Procedures.

Additionally, no instance has been rejected by or withdrawn from another GHG program.

15 Double counting avoidance

As provided by the BCR Tool "Avoiding Double Counting (ADC)" in its latest version, there are scenarios in which double counting could happen:

1) Double issuance of VCC
2) Double use of VCC
3) Double claiming

4) Duplicate certification or serialization
5) Improper attribution for financial or benefit purposes

The project holder ensures that none of the above will be met at any point during the project life cycle by complying with the provisions of the BCR Standard, for example, a fraction of the VCCs (10%) will be contributed to the general reserve account.

BCR standard is the only GHG program that this project and its instances have applied to.

16 Monitoring plan

16.1 Description of the monitoring plan

The monitoring plan will be carried out according to the methodology and separately for each instance under this project. Each instance developer has overall responsibility for monitoring and reporting to the project holder of all parameters at the instance site.

As stated in the methodology, the variables to be monitored are the grid emission factor and the net quantity of electricity generation supplied by each instance to the grid. For the monitoring of the emission factor, it is stated in section 3.7.3 that this factor is calculated ex-ante using the provisions in TOOL07 and fixed for the entire period, so in this case no monitoring is needed.

In relation to the net electricity supplied to the grid, monitoring procedures, data management, equipment calibration and maintenance schedules comply with the relevant national standards.

To secure accurate and timely collection of all the relevant data for an instance under this project, the electricity supplied by the instance to the grid will be measured by an electricity meter that complies with the national standards. The parameters will be monitored at the electricity delivery point or another point defined by the grid operator. The net electricity generation (MWh) monitoring data is archived electronically and kept for at least 2 years after the end of the last crediting period, or the last issuance of VCCs for the project, whichever occurs later.

The equipment used at all instances is calibrated and maintained in accordance with the Chilean Technical Norm of Security and Service Quality (NTSyCS), which is the most relevant regulation in terms of operational safety, service quality, and the technical standards that generation, transmission, and distribution facilities must comply with when connected to the national grid.

Data relating to the net electricity supplied by the instances to the grid is monitored continuously, electronically recorded, and consolidated monthly. The backup strategy has been structured into three levels for greenfield instances:

- Primary: Copies of the data stored by an authorized entity or business.
- Secondary: Invoice reports emitted by the authorized entity or business.
- Tertiary: Information on monitoring extracted directly from the grid coordinating entity, since generation monitoring is reported directly to it

For instances with capacity addition:

- Primary: Copies of the data stored by an authorized entity or business.
- Secondary: Information on monitoring extracted directly from the grid coordinating entity.

The monitoring data for capacity addition instances will be cross-checked with the invoice reports for the electricity sales as stated in the methodology AMS-I.D, and the value of the one with lower electricity generation will be used, as a conservative approach.

Usually, the net electricity generation is measured, but if an instance decides to measure its gross generation and consumption separately and the latter is unavailable for a given period, its maximum consumption measurement recorded during the respective analysis year should be used for each measurement where no consumption is reported.

If data is unavailable from all possible sources for a given period, the project shall not claim any GHG emission reductions to that timeframe.

The day-to-day procedure for record handling consists of the automatic registration of the net electricity data supplied by the project activity to the grid (in MWh) which is automatically sent to an internal software system (e.g. SCADA system) at the time that data measured by the meter is transmitted in real time to the grid operator in accordance with national procedures and standards "Norma Técnica de Seguridad y Calidad de Servicio" (NTSyCS), National Energy Commission. If any activity of any instance creates project emissions, data/parameters to be monitored will follow the procedures, frequency and QA/QC procedures described in TOOL03.

As stated in section 10, all instances included in this project comply with at least SDGs 7, 9 and 13.

Quetena Solar Park shows its compliance with those SDGs by providing verifiable data on the total amount of electricity produced using solar power and injected into the grid (indicator 7.2.1), the instance tCO2eq/MWh ratio (indicator 9.4.1) and the amount of GHG emissions avoided (indicator 13.2.1). Furthermore, Quetena Solar Park does not generate impact on any of the SDSs in the corresponding assessment Tool and this project does not apply for co-benefits, so monitoring of extra variables is not required.

16.2 Data and parameters determined at registration and not monitored during the quantification period, including default values and factors

<table>
<tr><td>Data / Parameter</td><td>$EF_{grid,CM,y}$</td></tr>
<tr><td>Data unit</td><td>tCO2/MWh</td></tr>
<tr><td>Description</td><td>Combined margin emission factor for grid connected power generation in year y for the SEN and Aysén subsystem.</td></tr>
<tr><td>Source of data used</td><td>From official records from the regulator.</td></tr>
<tr><td>Value (s)</td><td>
<table>
<tr><td>Technology</td><td>$EF_{SEN,CM,y}$</td></tr>
<tr><td>Solar and wind</td><td>0.5020</td></tr>
<tr><td>Hydro, tidal, wave and geothermic</td><td>0.3348</td></tr>
</table>
<table>
<tr><td>Technology</td><td>$EF_{Aysen,CM,y}$</td></tr>
<tr><td>Solar and wind</td><td>0.2894</td></tr>
<tr><td>Hydro, tidal, wave and geothermic</td><td>0.2983</td></tr>
</table>
</td></tr>
<tr><td>Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)</td><td>Calculation of the emission reductions.</td></tr>
<tr><td>Justification of choice of data or description of measurement methods and procedures applied</td><td>As per procedures of TOOL07</td></tr>
<tr><td>Additional comments</td><td>Fixed value during the 1st crediting period and updated for the next crediting periods.</td></tr>
</table>

Data / Parameter	$EG_{m,y}$
Data unit	*MWh*
Description	*Net quantity of electricity generated and delivered to the grid by power unit m in year y.*
Source of data used	*From operational statistics and yearbooks of the electricity/energy sector, and/or from official records from the regulator.*
Value (s)	*Provided in the monitoring report.*
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	*Calculation of the grid emission factor.*
Justification of choice of data or description of measurement methods and procedures applied	*Official data provided by the dispatch center and/or the regulator for all plants connected to the grid.*
Additional comments	*Data will be kept for two years after the end of the crediting period or the last verification date for this project activity, whatever occurs later.*

Data / Parameter	$EG_{k,y}$
Data unit	*MWh*
Description	*Net quantity of electricity generated and delivered to the grid by power unit k in year y*
Source of data used	*From operational statistics and yearbooks of the electricity/energy sector, and/or from official records from the regulator.*
Value (s)	*To be provided when a new instance requires it.*
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	*Calculation of the grid emission factor.*

Justification of choice of data or description of measurement methods and procedures applied	Official data provided by the dispatch center and/or the regulator for all plants connected to the grid.
Additional comments	Data will be kept for two years after the end of the crediting period or the last verification date for this project activity, whatever occurs later.

Data / Parameter	$FC_{i,m,y}, FC_{i,y}, FC_{i,k,y}, FC_{i,n,y}$ and $FC_{i,n,h}$
Data unit	Mass or volume unit
Description	Amount of fuel type i consumed by power plant/unit m, k or n in year y or hour h
Source of data used	From official records from the regulator.
Value (s)	Provided in the monitoring report.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Calculation of the grid emission factor.
Justification of choice of data or description of measurement methods and procedures applied	Official data provided by the regulator for all plants connected to the grid.
Additional comments	Data will be kept for two years after the end of the crediting period or the last verification date for this project activity, whatever occurs later.

Data / Parameter	$NCV_{i,y}$
Data unit	GJ/m^3 or GJ/ton
Description	Net calorific value (energy content) of fossil fuel type i in year y.
Source of data used	From operational statistics and yearbooks of the electricity/energy sector and from official records from the regulator.

Value (s)	*Data provided by the regulator are gross value. Therefore, values will be amended as per 2006 IPCC Guidelines for National Greenhouse Inventories vol 2 p.1.16.* *Biogas = 0.021* *Biomass = 13.397* *Coal = 27.824* *Natural Gas = 0.035* *LPG = 45.564* *NGL = 0.036* *Petroleum Coke = 32.196* *Diesel = 43.325* *Fuel Oil = 41.735*
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	*Calculation of the grid emission factor.*
Justification of choice of data or description of measurement methods and procedures applied	*Gross values are extracted from the most recent version available (at the time of submission of this document) of the national energy balance. Data is adjusted to be expressed as GJ/ton or GJ/m^3. (1 KCal = 4.184 KJ).*
Additional comments	*Data will be kept for two years after the end of the crediting period or the last verification date for this project activity, whatever occurs later.*

Data / Parameter	$EF_{CO2,i,y}, EF_{CO2,m,i,y}$
Data unit	*tCO_2/GJ*
Description	*CO_2 emission factor of fossil fuel type i in year y.*
Source of data used	*IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.*
Value (s)	*Fuel Oil = 0.0755* *Diesel = 0.0726*

	Coal = 0.0895* *Petcoke = 0.0829* *Natural Gas = 0.0543* *LNG = 0.0583* ** The type of coal according to table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories is "other bituminous coal"*
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	*Calculation of the grid emission factor.*
Justification of choice of data or description of measurement methods and procedures applied	*Values from the fuel supplier of the power plants (in invoices) are not available for the project participant. There are no regional or national average default values in the energy statistics/energy balance.*
Additional comments	*Data will be kept for two years after the end of the crediting period or the last verification date for this project activity, whatever occurs later.*

Data / Parameter	$\eta_{m,y}, \eta_{k,y}$
Data unit	-
Description	*Average net energy conversion efficiency of power unit m in year y.*
Source of data used	*Default values provided by TOOL09.*
Value (s)	*To be provided when a new instance requires it.*
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	*Calculation of the grid emission factor.*
Justification of choice of data or description of	*The diesel power plants for which only data on electricity generation and fuel type is available started operation after 2000. The only plant with CFBS system for which only data on*

measurement methods and procedures applied	electricity generation and fuel type is available was constructed before 2000. The only natural gas fired power plant for which only data.
Additional comments	Data will be kept for two years after the end of the crediting period or the last verification date for this project activity, whatever occurs later.

Data / Parameter	$EG_{historical}$
Data unit	MWh
Description	Annual average historical net electricity generation by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity.
Source of data used	No source has been used yet.
Value (s)	To be provided when a new instance requires it.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Calculation of baseline emissions.
Justification of choice of data or description of measurement methods and procedures applied	Will be calculated when a new instance requires it.
Additional comments	Only for instances that involve a capacity addition to an existing renewable energy plant/unit.

Data / Parameter	$\sigma_{historical}$
Data unit	MWh
Description	Standard deviation of the annual average historical net electricity generation supplied to the grid by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity.

Source of data used	*Calculated from data used to establish* $EG_{historical}$
Value (s)	*To be provided when a new instance requires it.*
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	*Calculation of baseline emissions.*
Justification of choice of data or description of measurement methods and procedures applied	*Calculated from data used to establish* $EG_{historical}$*. Parameter to be calculated as the standard deviation of the annual generation data used to calculate* $EG_{historical}$*l for capacity additions in hydro or geothermal power plants.*
Additional comments	*Only for instances that involve a capacity addition to an existing hydro or geothermal energy plant/unit.*

Data / Parameter	$DATE_{BaselineRetrofit}$
Data unit	-
Description	*Point in time when the existing equipment would need to be replaced in the absence of the project activity.*
Source of data used	*Calculated from the typical average technical lifetime of the type equipment*
Value (s)	*To be provided when a new instance requires it.*
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	*Calculation of baseline emissions.*
Justification of choice of data or description of measurement methods and procedures applied	*Calculated as per the "Tool to determine the remaining lifetime of equipment". If a range is identified, the earliest date should be chosen.*
Additional comments	*Only for instances that involve a capacity addition to an existing hydro or geothermal energy plant/unit.*

Data / Parameter	GWP_{CH_4}
Data unit	t CO2e/t CH4
Description	Global warming potential of methane valid for the relevant commitment period
Source of data used	IPCC
Value (s)	For the first commitment period: 21 t CO2e/t CH4 For the second commitment period: 25 t CO2e/t CH4
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Calculation of geothermal instances emissions.
Justification of choice of data or description of measurement methods and procedures applied	As per ACM0002
Additional comments	-

Data / Parameter	$GWP_{working\ fluid}$
Data unit	
Description	Global warming potential for the working fluid used in the binary geothermal plant
Source of data used	IPCC 2006
Value (s)	To be provided when a new instance requires it.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Calculation of geothermal instances emissions.
Justification of choice of data or description of	As per ACM0002

measurement methods and procedures applied	
Additional comments	-

Data / Parameter	EF_{Res}
Data unit	kgCO2e/MWh
Description	Default emission factor for emissions from reservoirs.
Source of data used	Decision by EB23
Value (s)	90
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Calculation of hydro instances with reservoirs emissions.
Justification of choice of data or description of measurement methods and procedures applied	No measurement required; data is obtained from Decision by EB23
Additional comments	-

Data / Parameter	Cap_{BL}
Data unit	W
Description	Installed capacity of the hydro power plant before the implementation of the project activity. For the new hydro power plants, this value is 0.
Source of data used	No source has been used yet.
Value (s)	To be provided when a new instance requires it, but it is 0 for new plants.
Indicate what the data are used for (Baseline/	Calculation of hydro instances with reservoirs emissions.

Project/ Leakage emission calculations)	
Justification of choice of data or description of measurement methods and procedures applied	*Will be calculated when a new instance requires it.*
Additional comments	-

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. For new reservoirs this value is 0.*
Source of data used	*No source has been used yet.*
Value (s)	*To be provided when a new instance requires it, but it is 0 for new reservoirs*
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	*Calculation of hydro instances with reservoirs emissions.*
Justification of choice of data or description of measurement methods and procedures applied	*Will be calculated when a new instance requires it.*
Additional comments	-

16.3 Data and parameters monitored

Based on AMS-I.D, the following data and parameters will be monitored during the instance crediting period.

Data / Parameter	$EG_{PJ,facility,y}$ *(for capacity additions the parameter is called* $EG_{PJ,add,y}$*)*

Data unit	*MWh/y*
Description	*Quantity of net electricity supplied to the grid in year y.*
Measured /Calculated /Default:	*Measured*
Source of data	*Measured by electricity meter(s) at the electricity delivery point or other defined by the grid operator (e.g. project site).*
Value(s) applied	*Provided in the monitoring report.*
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	*Calculation of project reductions.*
Monitoring frequency	*Continuous monitoring, hourly measurement and at least monthly recording.*
Measuring/ Reading/ Recording frequency	*Hourly*
Measurement/Calculation method (if applicable)	*The net electricity will be measured continuously using energy meters, which measure the net energy generated by the instance and consumed/injected by its storage systems (where applicable), and will be electronically recorded, consolidated and aggregated on a monthly basis.* *Monitoring frequency, and accuracy/precision provisions comply with the applicable regulation and/or relevant industry standards. The measurements will be cross-checked with records of the electricity sold for* $EG_{PJ,add,y}$. *Calibration and failure procedure provisions for metering equipment comply with the applicable regulation and/or relevant industry standards.* *Information on accuracy/precision can be found in* section 2.3*, along with the description of the meters.* *The above in compliance with section 6.1, table 2. of the methodology AMS-I.D and paragraph 102 of the TOOL07.*
QA/QC procedures applied	*According to the TOOL07, paragraph 102(c): "All measurements should be conducted with calibrated*

	measurement equipment according to relevant industry standards."

Based on AMS-I.D, ACM0002 and TOOL03, the following data and parameters will be monitored during the instance crediting period. Please note that these parameters will be monitored solely for instances which have fossil fuel combustion, geothermal operation or water reservoirs.

Data / Parameter	$FC_{i,j,y}$
Data unit	*Mass or volume unit per year (e.g. ton/yr or m³ /yr).*
Description	*Quantity of fuel type i combusted in process j during the year y.*
Measured /Calculated /Default:	*Measured*
Source of data	*Onsite measurements.*
Value(s) applied	*To be provided when a new instance requires it.*
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	*Calculation of leakages and/or project emissions.*
Monitoring frequency	*Continuously*
Measuring/ Reading/ Recording frequency	*Daily/per shift*
Measurement/Calculation method (if applicable)	*Use either mass or volume meters. In cases where fuel is supplied from small daily tanks, rulers can be used to determine mass or volume of the fuel consumed, with the following conditions:* *The ruler gauge must be part of the daily tank and calibrated at least once a year and have a book of control for recording the measurements (daily or per shift).* *Accessories such as transducers, sonar and piezoelectronic devices are accepted if they are properly calibrated with the ruler gauge and receiving reasonable maintenance.*

	In case of daily tanks with pre-heaters for heavy oil, the calibration will be made with the system at typical operational conditions.
QA/QC procedures applied	*The consistency of metered fuel consumption quantities should be cross-checked by an annual energy balance that is based on purchased quantities and stock changes. Where the purchased fuel invoices can be identified specifically for the project, the metered fuel consumption quantities should also be cross-checked with available purchase invoices from the financial records.*

<table>
<tr><td>Data / Parameter</td><td>$w_{C,i,y}$</td></tr>
<tr><td>Data unit</td><td>tC/mass unit of the fuel.</td></tr>
<tr><td>Description</td><td>Weighted average mass fraction of carbon in fuel type i in year y.</td></tr>
<tr><td>Measured /Calculated /Default:</td><td>Provided/Measured</td></tr>
<tr><td>Source of data</td><td>The following data sources may be used if the relevant conditions apply:
<table>
<tr><td>Data Source</td><td>Conditions for using the data source</td></tr>
<tr><td>(a) Values provided by the fuel supplier in invoices</td><td>This is preferred source.</td></tr>
<tr><td>(b) Measurements by the project participants</td><td>If (a) is not available.</td></tr>
</table></td></tr>
<tr><td>Value(s) applied</td><td>To be provided when a new instance requires it.</td></tr>
<tr><td>Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)</td><td>Calculation of project emissions and/or leakages</td></tr>
<tr><td>Monitoring frequency</td><td>The mass fraction of carbon should be obtained for each fuel delivery, from which weighted average annual values should be calculated.</td></tr>
</table>

Measuring/ Reading/ Recording frequency	*For each fuel delivery*
Measurement/Calculation method (if applicable)	*Measurements should be undertaken in line with national or international fuel standards.*
QA/QC procedures applied	*Verify if the values under (a) and (b) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in b) should have ISO17025 accreditation or justify that they can comply with similar quality standards.*
Additional comment	*Applicable where Option A described in TOOL03 is used.*

<table>
<tr><td>Data / Parameter</td><td>ρ_{iy}</td></tr>
<tr><td>Data unit</td><td>Mass unit/volume unit.</td></tr>
<tr><td>Description</td><td>Weighted average density of fuel type i in year y.</td></tr>
<tr><td>Measured /Calculated /Default:</td><td>Provided/Measured/Default</td></tr>
<tr><td>Source of data</td><td>The following data sources may be used if the relevant conditions apply:
<table>
<tr><th>Data Source</th><th>Conditions for using the data source</th></tr>
<tr><td>(a) Values provided by the fuel supplier in invoices.</td><td>This is preferred source.</td></tr>
<tr><td>(b) Measurements by the project participants</td><td>If (a) is not available.</td></tr>
<tr><td>(c) Regional or national default values.</td><td>If (a) is not available These sources can only be used for liquid fuels and should be based on well-</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td></td><td><table><tr><td></td><td>documented, reliable sources (such as national energy balances).</td></tr></table></td></tr>
<tr><td>Value(s) applied</td><td>To be provided when a new instance requires it.</td></tr>
<tr><td>Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)</td><td>Calculation of leakages and/or project emissions</td></tr>
<tr><td>Monitoring frequency</td><td>The density of the fuel should be obtained for each fuel delivery, from which weighted average annual values should be calculated.</td></tr>
<tr><td>Measuring/ Reading/ Recording frequency</td><td>For each fuel delivery</td></tr>
<tr><td>Measurement/Calculation method (if applicable)</td><td>Measurements should be undertaken in line with national or international fuel standards.</td></tr>
<tr><td>QA/QC procedures applied</td><td>-</td></tr>
</table>

<table>
<tr><td>Data / Parameter</td><td>$NCV_{i,y}$</td></tr>
<tr><td>Data unit</td><td>GJ per mass or volume unit (e.g. GJ/m³, GJ/ton).</td></tr>
<tr><td>Description</td><td>Weighted average net calorific value of fuel type i in year y.</td></tr>
<tr><td>Measured /Calculated /Default:</td><td>Provided/Measured/Default</td></tr>
<tr><td>Source of data</td><td>The following data sources may be used if the relevant conditions apply:
<table>
<tr><td>Data Source</td><td>Conditions for using the data source</td></tr>
<tr><td>(a) Values provided by the fuel supplier in invoices.</td><td>This is preferred source.</td></tr>
<tr><td>(b) Measurements by the project participants.</td><td>If (a) is not available.</td></tr>
<tr><td>(c) Regional or national default values.</td><td>If (a) is not available These sources can only be</td></tr>
</table></td></tr>
</table>

<table>
<tr><td></td><td><table><tr><td></td><td>used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances).</td></tr><tr><td>(d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.2 of Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.</td><td>If (a) is not available</td></tr></table></td></tr>
<tr><td>Value(s) applied</td><td>To be provided when a new instance requires it.</td></tr>
<tr><td>Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)</td><td>Calculation of leakages and/or project emissions.</td></tr>
<tr><td>Monitoring frequency</td><td>For (a) and (b): The NCV should be obtained for each fuel delivery, from which weighted average annual values should be calculated.
For (c): Review appropriateness of the values annually.
For (d): Any future revision of the IPCC Guidelines should be considered.</td></tr>
<tr><td>Measuring/ Reading/ Recording frequency</td><td>For each fuel delivery/Annually</td></tr>
<tr><td>Measurement/Calculation method (if applicable)</td><td>For (a) and (b): Measurements should be undertaken in line with national or international fuel standards.</td></tr>
<tr><td>QA/QC procedures applied</td><td>Verify if the values under (a), (b) and (c) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in (a), (b) or (c) should have ISO17025 accreditation or justify that they can comply with similar quality standards.</td></tr>
</table>

Additional comment	Applicable where Option B described in TOOL03 is used.

<table>
<tr><td>Data / Parameter</td><td>$EF_{CO2,i,y}$</td></tr>
<tr><td>Data unit</td><td>tCO_2/GJ</td></tr>
<tr><td>Description</td><td>Weighted average CO_2 emission factor of fuel type i in year y.</td></tr>
<tr><td>Measured /Calculated /Default:</td><td>Provided/Measured/Default</td></tr>
<tr><td>Source of data</td><td>The following data sources may be used if the relevant conditions apply:
<table>
<tr><td>Data Source</td><td>Conditions for using the data source</td></tr>
<tr><td>(a) Values provided by the fuel supplier in invoices.</td><td>This is preferred source.</td></tr>
<tr><td>(b) Measurements by the project participants.</td><td>If (a) is not available.</td></tr>
<tr><td>(c) Regional or national default values.</td><td>If (a) is not available These sources can only be used for liquid fuels and should be based on well-documented, reliable sources (such as national energy balances).</td></tr>
<tr><td>d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td>If (a) is not available.</td></tr>
</table></td></tr>
<tr><td>Value(s) applied</td><td>To be provided when a new instance requires it.</td></tr>
<tr><td>Indicate what the data are used for (Baseline/</td><td>Calculation of leakages and/or project emissions.</td></tr>
</table>

Project/ Leakage emission calculations)	
Monitoring frequency	*For (a) and (b): The NCV should be obtained for each fuel delivery, from which weighted average annual values should be calculated.* *For (c): Review appropriateness of the values annually.* *For (d): Any future revision of the IPCC Guidelines should be considered*
Measuring/ Reading/ Recording frequency	*For every fuel delivery/Annually*
Measurement/Calculation method (if applicable)	*For (a) and (b): Measurements should be undertaken in line with national or international fuel standards.*
QA/QC procedures applied	-
Additional comment	*Applicable where option B described in TOOL03 is used.* *For (a): If the fuel supplier does provide the NCV value and the CO_2 emission factor on the invoice and these two values are based on measurements for this specific fuel, this CO_2 factor should be used. If another source for the CO_2 emission factor is used or no CO_2 emission factor is provided, Options (b), (c) or (d) should be used.*

Data / Parameter	$w_{steam,CO2,y}$
Data unit	*t CO_2/t steam*
Description	*Average mass fraction of carbon dioxide in the produced steam in year y*
Measured /Calculated /Default:	*Measured*
Source of data	*Instance activity site.*
Value(s) applied	*To be provided when a new instance requires it.*
Indicate what the data are used for (Baseline/	*Calculation of project reductions.*

Project/ Leakage emission calculations)	
Monitoring frequency	*At least every three months and more frequently, if necessary.*
Measuring/ Reading/ Recording frequency	-
Measurement/Calculation method (if applicable)	*Non-condensable gases sampling should be carried out in production wells and/or at the steam field-power plant interface using ASTM Standard Practice E1675 for Sampling 2-Phase Geothermal Fluid for Purposes of Chemical Analysis (as applicable to sampling single phase steam only). The CO_2 and CH_4 sampling and analysis procedure consists of collecting non-condensable gases samples from the main steam line with glass flasks, filled with sodium hydroxide solution and additional chemicals to prevent oxidation. H_2S and CO_2 dissolve in the solvent while the residual compounds remain in their gaseous phase. The gas portion is then analyzed using gas chromatography to determine the content of the residuals including CH_4. All alkanes concentrations are reported in terms of methane.*
QA/QC procedures applied	-
Additional comment	*Applicable to dry, flash steam and binary geothermal power instances.*

Data / Parameter	$w_{steam,CH4,y}$
Data unit	*t CH_4/t steam*
Description	*Average mass fraction of methane in the produced steam in the year y*
Measured /Calculated /Default:	*Measured*
Source of data	*Instance activity site.*
Value(s) applied	*To be provided when a new instance requires it.*

Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	*Calculation of project reductions.*
Monitoring frequency	*As per procedures outlined for* $w_{steam,CO2,y}$
Measuring/ Reading/ Recording frequency	-
Measurement/Calculation method (if applicable)	*As per procedures outlined for* $w_{steam,CO2,y}$
QA/QC procedures applied	-
Additional comment	*Applicable to dry, flash steam and binary geothermal power instances.*

Data / Parameter	$M_{steam,y}$
Data unit	*t steam/year*
Description	*Quantity of steam produced in year y*
Measured /Calculated /Default:	*Calculated*
Source of data	*Instance activity site.*
Value(s) applied	*To be provided when a new instance requires it.*
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	*Calculation of project reductions.*
Monitoring frequency	*Daily*
Measuring/ Reading/ Recording frequency	*Continuous*
Measurement/Calculation method (if applicable)	*The steam quantity discharged from the geothermal wells should be measured with a Venturi flow meter (or other equipment with at least the same accuracy). Measurement of temperature and pressure upstream of the Venturi meter is*

	required to define the steam properties. The calculation of steam quantities should be conducted on a continuous basis and should be based on national or international standards. The measurement results should be summarized transparently in regular production reports
QA/QC procedures applied	-
Additional comment	*Applicable to dry, flash steam and binary geothermal power instances.*

Data / Parameter	TEG_y
Data unit	*MWh*
Description	*Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y*
Measured /Calculated /Default:	*Measured*
Source of data	*Measured by electricity meter(s) at the electricity delivery point or other defined by the grid operator (e.g. project site) including internal usage*
Value(s) applied	*To be provided when a new instance requires it.*
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	*Calculation of project reductions.*
Monitoring frequency	*Continuous monitoring, hourly measurement and at least monthly recording.*
Measuring/ Reading/ Recording frequency	*Hourly*
Measurement/Calculation method (if applicable)	*The net electricity will be measured continuously using energy meters, and will be electronically recorded, consolidated and aggregated monthly.*

	Monitoring frequency, and accuracy/precision provisions comply with the applicable regulation and/or relevant industry standards. The measurements will be cross-checked with records of the electricity sold. *Calibration and failure procedure provisions for metering equipment comply with the applicable regulation and/or relevant industry standards.* *Information on accuracy/precision can be found in* section 2.3*, along with the description of the meters.*
QA/QC procedures applied	*According to TOOL07, para. 102(c): "All measurements should be conducted with calibrated measurement equipment according to relevant industry standards."*
Additional comment	*Applicable to hydro power instances with a power density between 4 and 10 W/m2*

Data / Parameter	Cap_{PJ}
Data unit	*W*
Description	*Installed capacity of the hydro power plant after the implementation of the instance*
Measured /Calculated /Default:	*Default, based on manufacturer's specifications*
Source of data	*Project activity site*
Value(s) applied	*To be provided when a new instance requires it.*
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	*Calculation of power density in hydro power instances.*
Monitoring frequency	*Only once, after the implementation of the instance*
Measuring/ Reading/ Recording frequency	-

Measurement/Calculation method (if applicable)	*Determine the installed capacity based on manufacturer's specifications or commissioning data or recognized standards.*
QA/QC procedures applied	-
Additional comment	-

Data / Parameter	A_{PJ}
Data unit	*m2*
Description	*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.*
Measured /Calculated /Default:	*Default, based on manufacturer's specifications*
Source of data	*Project activity site*
Value(s) applied	*To be provided when a new instance requires it.*
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	*Calculation of power density in hydro power PAs*
Monitoring frequency	*Only once, after the implementation of the project activity*
Measuring/ Reading/ Recording frequency	-
Measurement/Calculation method (if applicable)	*Determine the installed capacity based on manufacturer's specifications or commissioning data or recognized standards.*
QA/QC procedures applied	-
Additional comment	-

Data / Parameter	$M_{inflow,y}$
Data unit	t steam/year
Description	Quantity of steam entering the geothermal plant in year y
Measured /Calculated /Default:	Calculated
Source of data	Instance activity site.
Value(s) applied	To be provided when a new instance requires it.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Calculation of project reductions.
Monitoring frequency	Continuous
Measuring/ Reading/ Recording frequency	Continuous
Measurement/Calculation method (if applicable)	The steam quantity discharged from the geothermal wells should be measured with a Venturi flow meter (or other equipment with at least the same accuracy). Measurement of temperature and pressure upstream of the Venturi meter is required to define the steam properties. The calculation of steam quantities should be conducted on a continuous basis and should be based on national or international standards. The measurement results should be summarized transparently in regular production reports
QA/QC procedures applied	The flow meter must be calibrated according to the national, international, or manufacturer's instructions. The recorded data must be stored daily in a central database with backup
Additional comment	-

Data / Parameter	$M_{outflow,y}$

Data unit	*t steam/year*
Description	*Quantity of steam leaving the geothermal plant in year y*
Measured /Calculated /Default:	*Calculated*
Source of data	*Instance activity site.*
Value(s) applied	*To be provided when a new instance requires it.*
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	*Calculation of project reductions.*
Monitoring frequency	*Continuous*
Measuring/ Reading/ Recording frequency	*Continuous*
Measurement/Calculation method (if applicable)	*The steam quantity discharged from the geothermal wells should be measured with a Venturi flow meter (or other equipment with at least the same accuracy). Measurement of temperature and pressure upstream of the Venturi meter is required to define the steam properties. The calculation of steam quantities should be conducted on a continuous basis and should be based on national or international standards. The measurement results should be summarized transparently in regular production reports*
QA/QC procedures applied	*The flow meter must be calibrated according to the national, international, or manufacturer's instructions. The recorded data must be stored daily in a central database with backup*
Additional comment	-

Data / Parameter	$M_{working\ fluid,y}$
Data unit	*t working fluid/year*

Description	*Quantity of working fluid leaked/reinjected in year y*
Measured /Calculated /Default:	*Measured*
Source of data	*Instance activity site.*
Value(s) applied	*To be provided when a new instance requires it.*
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	*Calculation of project reductions.*
Monitoring frequency	*Annually*
Measuring/ Reading/ Recording frequency	-
Measurement/Calculation method (if applicable)	*Measured via logbooks and maintenance reports of the plant*
QA/QC procedures applied	*Measured from the amount of working flow reinjected to the binary system of the geothermal plant. Cross check with the purchase invoices.*
Additional comment	-

- **Appendix 1. Post-registration changes summary.**

No changes have been made to the original document.

NOTE: This Project Document (PD) shall be completed following the instructions included. However, it is important to highlight that these instructions are complementary to the BCR STANDARD, and the Methodology applied by the project holder, in which more information on each section can be found.