

# Climate Finance Options for Innovative Projects in Chile's Energy Sector

Case study: Conversion of a Coal-fired Thermoelectric Plant to a Thermal Storage  
Plant using Carnot Battery Technology - September 2020



## CONTEXT

On behalf of the German Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) the project "Decarbonization of the Chilean Energy Sector", implemented by the Deutsche Gesellschaft für internationale Zusammenarbeit (GIZ) GmbH and the Chilean Ministry of Energy, GIZ has commissioned a study called "Climate Finance Options for Innovative Projects in the Chile's Energy Sector".

## INTRODUCTION

Both, achieving the decarbonization of societies and slowing down the progression of climate change require innovative infrastructure and solutions in the energy sector, beyond the use of renewable plants such as photovoltaic or wind farms. An example of these solutions is the conversion of the coal fired power plants to thermal energy storage units (Carnot batteries), which could play an important role in reducing GHGs in Chile. However, this innovative technology implies high initial investments to which are attached high financial risks, i.e., a scenario that presents a great challenge to the energy sector in Chile. Although, international concessionary financing and other types of financial instruments are not very widely used in Chile, they could present an alternative to facilitate the implementation of the technology mentioned above. Taking into account these circumstances, this study seeks to answer whether international climate finance could help materialize innovative energy projects.

## OBJECTIVE

To support the Chilean energy market actors and generate discussion about the search for financing options of the Carnot Battery project, by:

- Establishing a compendium of financing options and their applicability in the Chilean energy sector
- Proposing a concrete financing structure for the case of converting a coal-fired power plant to a thermal energy storage unit based on Carnot Battery technology

## METHODOLOGY

The methodological approach focuses on four aspects when it comes to project funding, as shown in Figure 1, which correspond to suggestions in the "Mind the Gap" study<sup>1</sup>. Firstly, it classifies the stage of development of a project, that is early, bankable, funded or mature. Secondly, it analyzes the associated risks with different types of innovative energy solutions, such as electricity generation, energy storage, inputs for industry, thermal use in industry, low-carbon transport and energy efficiency. Thirdly, it provides a compendium of the different climate financing options, which were analyzed for their applicability in the Chilean market. Seventeen interviews with the main stakeholders in the climate finance ecosystem in Chile and the world complement the information provided in the compendium.

Two of the six types of energy innovation solutions are examined in detail: the conversion of a coal-fired power plant and a low-carbon ammonia production plant. For these cases the study sought the most appropriate financing options.

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<sup>1</sup> "Mind the Gap: Bridging the Climate Financing Gap with Innovative Financial Mechanisms" by the [Global Green Growth Institute, 2016](#)

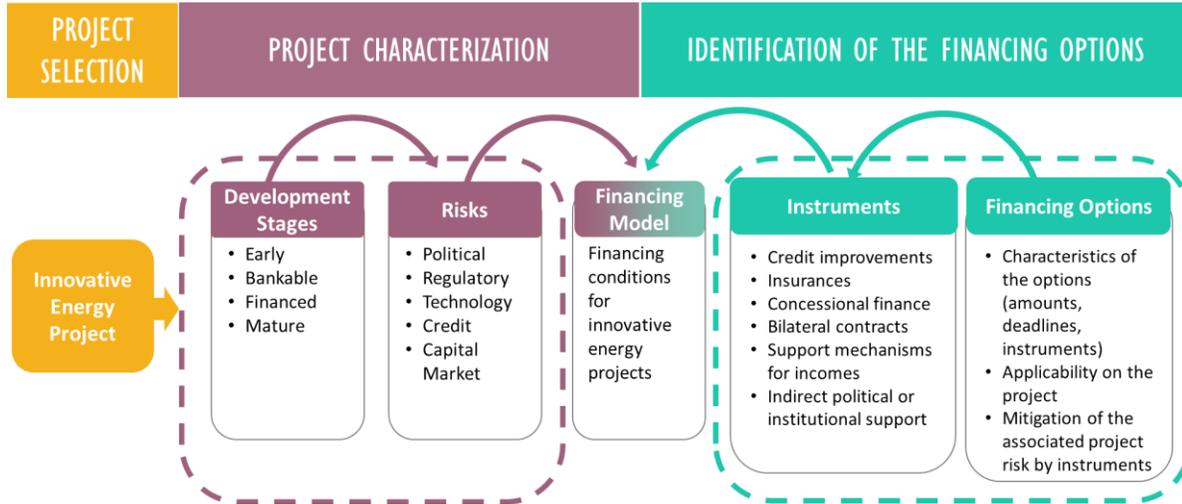


Figure1 Methodological framework for the identification of financing options that meet the needs of an energy innovation project.

## RESULTS

### Compendium of financing options

The compendium includes 178 climate financing options of concessional and non-concessional nature, of which only **13** are applicable in Chile, due to the fact that the country is not listed as eligible for international development aid ODA (Official Development Aid) since 2018, which makes it difficult to materialize projects with this type of financing:

N°	Name	Promoter
1	Zero Gap Fund	The Rockefeller Foundation and the John D. and Catherine T. MacArthur Foundation
2	GCF Simplified Approval Process	Green Climate Fund (GCF)
3	GCF	Green Climate Fund (GCF)
4	Breakthrough Energy Ventures (BEV)	Breakthrough Energy
5	GEF	Global Environment Facility
6	The French Global Environment Facility - FISP Climat	France
7	EIB Infrastructure Project	EIB
8	MIGA	World Bank Group
9	Bloomberg Philanthropies	Michael Bloomberg
10	Children's Investment Fund Foundation	Chris Hohn and Jamie Cooper
11	Ikea Foundation	Stichting INGKA Foundation
12	The Climate Pledge Fund	Amazon
13	Microsoft Climate Innovation Fund	Microsoft

Table 1 - Financing options for Chile

### Case study: Conversion of a coal-fired power plant based on Carnot Battery technology

The conversion of thermoelectric plants aims to replace fossil fuel combustion by renewable energy while maintaining the same (grid) infrastructure. In the case of the Carnot Battery, molten salts are heated with electricity generated from renewable sources in order to store the thermal energy. The heat can then be exchanged with a water circuit, generating steam to drive a turbine that generates electricity. Given its characteristics, the project falls within the category of “Energy storage”, second step of the methodology, and it would be connected to the National Electrical System, Chile’s main grid. A plant of this type can generate three types of revenues: energy arbitration, complementary services and power sales.

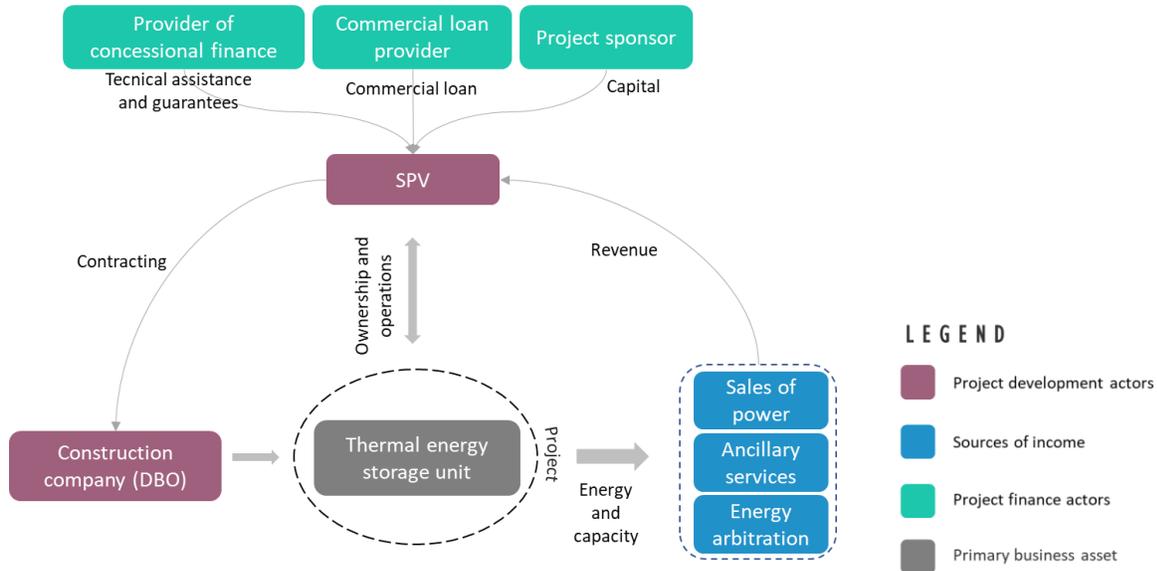


Figure2 - Business case for coal-fired power plant conversion project

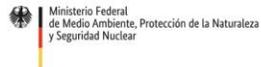
Two main risks were identified for this technology: (1) technology performance risk and (2) construction and cost overrun risk. These risks belong to the group of technological risks, which are normally mitigated through insurances. However, since this is an innovative technology, there is no insurance available to reduce the risk to an acceptable level for capital providers. As an alternative, the study developed a *Blended Finance* structuring process that through a guarantee, placed in an *escrow account*, and technical assistance can replace the insurances, enabling the participation of a commercial debt provider in the project. The potential actors for this financing structure are international climate funds such as the Green Climate Fund (GCF) and the Global Environmental Facility (GEF), assuming the role of provider of concessional financing, and the commercial lines of multilateral development banks such as BID Invest or the CFI.

### Conclusion

Given Chile's status as a non ODA-eligible country, the options of access to international climate finance are small and restricted, although there are alternatives that could be applied and taken advantage of when it comes to projects at the edge of the technological frontier, if private companies were familiar with these funding source options.

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