



## Viewpoint

# Efficient capacity investment and joint production agreements in an oligopolistic electricity market: The HidroAysén joint venture project <sup>☆</sup>

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## ABSTRACT

We develop a model for a power market with the characteristics of the Chilean power supply industry, which is an integrated system with a system operator (SO) with a vast authority to define the dispatch of the system. We evaluate whether a large joint power generator project made up by the two largest power generators is an anti-competitive project. Considering four investment technologies for power generation, namely, hydro, coal, diesel, and an advantageous hydro technology which can only be built in a large scale (HidroAysén) for the joint venture case, we use an oligopolistic Cournot model and a Benevolent Social Planner, both calibrated to the Chilean power industry, in order to assess the efficiency of alternative investment strategies and conditions whether the HidroAysén joint venture project can be barred to be judged as anti-competitive. Results suggest that the joint venture is an efficient investment and there is a pro-competitive behaviour on the part of the two power generators, and that there are benefit to consumers, who should expect non-increasing energy prices as a result of the advantageous hydrotechnology.

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## 1. Introduction

One of the largest challenges faced by the Chilean economy is to assure clean sources of energy supply in a country where electricity consumption has grown more than 6% annually during the last two decades. The country should double its installed capacity within a decade, which currently reaches 13,137 MW in a mix of hydro- and thermal power plants. Happily enough for the country, it has a huge potential for the development of renewable energies such as hydro, solar, wind, tidal and geothermal energy, where currently it has 25,000 MW of hydrocapacity to be developed.<sup>1</sup> However, energy security and independency has become top among the concerns after Chile suffered a sudden discontinuation of natural gas supply from Argentina, which in 2004 fuelled 38% of the installed capacity.<sup>2</sup> Also, the challenge of having clean energy sources places the country's hydroelectric resources among the best alternatives to satisfy future energy needs.

The two largest electricity generating companies in Chile, Colbún S.A. and Endesa S.A. (the “Companies”, which represent 75% of the installed capacity in the largest interconnected system in Chile – the SIC – with 9386 MW of capacity and which in 2008 concentrates 71% of the domestic demand), have plans to jointly develop a 2775 MW hydropower project (HidroAysén) in the south of the country, in the Aysén or XI Region, and to inject the electricity into the SIC system. The project cost is over USD 4 billion and involves the construction and operation of 5 hydropower plants which require a HVDC transmission line for carrying the electricity produced in the Aysén Region to the Capital city, Santiago (main consumption centre in the SIC) over a distance of 2000 km.

The HidroAysén project is in particular a strategic alliance between the two largest generators of the country, Endesa S.A. (51% stake in HidroAysén and 48% market share), who invites Colbún S.A. (49% stake in HidroAysén and 29% market share) to develop this joint project, where Endesa S.A. is the one who initially owns the water rights in the Baker and Pascua Rivers where the hydroplants will be located.

The problem analysed in this paper is the Companies' chance to exert the market power by investing in a joint power plant project in a centrally dispatched de-regulated electricity market as the Chilean one, where oligopolistic agents make joint capacity investments – the HidroAysén project – in addition to other own independent projects. The solution obtained in the oligopolistic scenario (with and without the joint investment project) is compared to the solution obtained from a Social Planner's

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<sup>1</sup> De la Torre et al. (2009).

<sup>2</sup> Raineri (2007c).

problem that minimizes the total investment and the operating cost of the system.

The application of market power is known as the ability of an agent to influence the market price. In a de-regulated electricity market, generators can exert market power by restricting their output in periods with a more inelastic demand or can dynamically distort the use of its water reserves (Arellano and Serra, 2004; Borenstein, 1997). In markets subject to peak load pricing regulations, some previous work (Joskow, 1976; Oren, 2003) suggests that agents can exert market power by over-investing in peaking technology and under-investing in base load technology (Arellano and Serra, 2007). In this sense, the premise in this study establishes that a joint investment project by oligopolistic agents in base load generation technology with central dispatch system should be seen as a pro-competitive investment.<sup>3</sup>

Among the reasons identified by the literature to justify a joint project between two or more companies are: the possibility to share the risk of a project that demands a large amount of resources; to enter into markets where the companies can have the capability to take advantage of others' expertise, such as technological know-how; or take advantage of the distribution channel of the partner company (Dussauge et al., 2000; Gulati, 1998; Gulati et al., 2000). However, joint projects or agreements of this kind can have adverse effects on market competition. For example and in that respect, within the legislation that regulates the cooperation agreements between companies there are two main legislative frameworks, one from the US and another one from the European Economic Community. In the US, such agreements are regulated by the *Antitrust Guidelines for Collaborations among Competitors*, that assume that production cooperation agreements are not illegal per-se, and hence must be analysed by the rule of reason to see if they are pro- or anti-competitive, where the emphasis of the analysis should be placed in the transfer price (Diewert, 1985; Federal Trade Commission and U.S. Department of Justice, 2000). In the European Economic Community, the rules governing cooperation agreements is contained in the Founding Treaty, which emphasizes the differences between a merger and a cooperation agreement, understanding the former as an agreement that creates a new entity that carries out all the functions of its parent company, and the latter is defined as an agreement that does not strengthen a dominant position.

According to the Endesa S.A. and Colbún S.A. joint production agreement, HidroAysén is a company that will operate as a cost centre, where the energy produced by the company will be split by the share of each company in the project. Therefore, HidroAysén does not perform all the duties usually carried out by a generation company that sells energy in the electricity market. However, it is the permanent nature of HidroAysén the one that makes it necessary to analyse it according to a concentration criterion. In this way, as HidroAysén does not perform all the functions carried out by its parent companies and following the previous rules, one can expect that HidroAysén cannot be seen as a merger, but as a cooperative agreement, where the transfer price is among the relevant points.

<sup>3</sup> Between antitrust agencies, the cooperation agreements that deserve most concern are the arrangements for collaboration in production. It is recognized that although such agreements are generally pro-competitive, there is a risk of anti-competitive practices that should be analysed in greater detail. In particular, it is noted that the transfer price is something to watch carefully, because if you have a high transfer price, this can artificially increase the costs of the participants and thereby affect the level of competition for the market participants in the final product. See the *Antitrust Guidelines for Collaborations Among Competitors* from the Federal Trade Commission and the U.S. Department of Justice, 2000, p. 13.

**Table 1**  
HidroAysén project power plants.

River	Power plant name	Capacity (MW)	Flooded area (ha)	Commissioning year
Salto	Salto	25	0	2011
Baker	Baker 1	660	710	2012
Pascua	Pascua 2	1270	1100	2014
Pascua	Pascua 1	460	500	2016
Baker	Baker 2	360	3600	2018
Total		2775	5910	

In November 2007 the Chilean Free Competition Defence Court (*Tribunal de Defensa de la Libre Competencia*, 2007) approved the HidroAysén project as a cooperation agreement between Endesa S.A. and Colbún S.A. with the following conditions<sup>4</sup>:

- Having a six-month Open Season process to explore the possibility about other companies' interest in the use of the 2000 km HVDC transmission line, increasing power generation projects in the Aysén Region (of course this being subject to the technical feasibility of the transmission line).
- Endesa S.A. and Colbún S.A. should give up the additional water rights they hold in the Region of Aysén beyond the ones they need for the HidroAysén project.
- Energy and capacity Contracts between HidroAysén and the parent companies should be executed as a cost centre to reflect the marginal production cost.
- HidroAysén should be governed under the rules of an open stock corporation.

Table 1 summarizes the main information provided by the companies with respect to the HidroAysén project, the five power plants, power and estimated date of commissioning.

In 1982, Chile pioneered the de-regulation of the electric industry establishing 3 segments (generation, transmission and distribution) and a system operator named CDEC,<sup>5</sup> which should ensure the most economical operation of the system (regardless of the supply contracts of generation companies) and free access to the transmission system (Raineri, 2007a).

Today the country faces the challenge of attracting large investments in the energy sector for clean and competitive sources of energy, where the most efficient opportunities of the country are in the expansion of its hydropower capacity. The country also has important investments in coal and gas power plants, but it lacks of fossil fuels. This creates dependency on imported fossil fuels and energy security problems as was evidenced with the recent experience with imported natural gas from Argentina. Renewable energies are growing, however they still are a very small portion of the installed capacity, and nuclear energy is a technology that has no chance to be available in the country for the next 15 years. While there is no single solution for the country energy needs, the large water resources available in the south of the country should be seen as an attractive alternative to be developed.

<sup>4</sup> The process was registered as cause NC 134-06 – “Consulta de Endesa y Colbún sobre Proyecto Aysén” (“Endesa and Colbún Consultation on Aysén Project”). With this respect, the report “El Proyecto Hidroeléctrico Aysén y sus efectos en la competencia del sector generación – transmisión” (“Aysén Hydro Project and its effects on the generation transmission sector competition”) written by Raineri, R. to the Competition Defense Court (CDC, Tribunal de Defensa de la Libre Competencia—TDLC) at the requirement of Colbún S.A., was one of the key indications for the CDC decision to approve the HidroAysén project between Endesa S.A. and Colbún S.A. as a cooperation agreement with specific conditions (Raineri, 2007b).

<sup>5</sup> Centro de Despacho Económico de Carga (Load Economic Dispatch Centre).

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