



Power transmission regulation in a liberalised context: An analysis of innovative solutions in South American markets



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ABSTRACT

After decades of reduced need for investment, transmission regulation is increasingly gaining relevance and complexity in liberalised power sectors, mainly due to the need to integrate sometimes distant and large-scale renewable energy sources. We identify the key principles that should be considered at three levels: transmission expansion, remuneration, and cost allocation.

The proposals we develop are built upon a review of the noteworthy experiences matured in South America, a region which, besides leading restructuring in the 1980s and 1990s, has with different levels of success always relied on innovative solutions to deal with this crucial regulatory challenge.

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1. Introduction

In a liberalised power sector, the transmission network is the meeting point for the different agents interacting in the wholesale electricity market. This central role requires sophisticated regulation to coordinate the transmission system with the generation market in place, in order to maximise the overall efficiency of electricity supply service. In the long term, a sound methodology for expansion planning of the network must be identified; this methodology must somehow be coordinated with planning for generation expansion, which, in a market environment, is the outcome of agent decisions. In the medium term, open and non-discriminatory access to the grid must be guaranteed to all the market agents, but at the same time priority rules for network access when conflicts arise around limited capacity must be outlined. Furthermore, network charges paid by different players must reflect the benefits generated by the network and should not distort the proper planning and operation decision-making processes.

Transmission regulation is particularly relevant in South America. Geographically, the region is characterised by large

countries and low population densities, with the load being usually concentrated in specific zones or bands, commonly far from the main energy resources. Furthermore, the shape of the territory combined with the presence of the Andes mountain range creates additional challenges to network development and radial transmission grids are a result (with Brazil as the main exception). From the historical point of view, South America pioneered power-sector restructuring and liberalisation, with the Chilean reform dating back to 1982 and Argentina, Peru, Colombia, and Brazil having restructured their sectors between 1992 and 1996 (Batlle et al., 2010). Differently from other systems in the world, these liberalisation processes occurred in a period of intense development of the power sectors, with demand growth rates near to or higher than 5% annually that have been more or less maintained until to date. This required sustained network expansion in a market environment, coupled with liberalised generation siting.¹ Furthermore, the

¹ A further complexity is related with the economic evaluation of new generation projects, which has to take into account an estimate of the associated transmission charges (to be paid by generators too). Thus, transmission charges may “tip the scale” in favour of one technology over the other. On top of this, renewable facilities are frequently far away from the demand and their construction times are often shorter than the ones relative to the transmission grid, if administrative procedures are considered, as mentioned in Rious et al. (2011).

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economic impact of the transmission segment on the overall power-sector cost in some South American countries (such as Chile or Brazil) can reach 20% or more as compared to 5% or at most 10% in Europe (Rivier et al., 2013).

Because of these reasons, since the initial liberalisations, South American policymakers² have implemented a variety of innovative solutions to regulate the power transmission activity which represent lessons learned for the elaboration of robust electricity transmission regulation. In many cases, compared to Europe, not only the generation sector but also the transmission facilities were initially privatised. This approach required the introduction of new, sound, and transparent regulation that would ensure on the one hand adequate remuneration for these assets (reducing the so-called regulatory risk) and also provide a level playing field for the new generation plants to be installed. After an in-depth analysis of the evolution of the regulation of transmission in the region, the authors put forward regulatory proposals on three levels: grid expansion, transmission regulation, and cost allocation. This guidance could be particularly useful in the current context of development of very large renewable energy projects,³ for which proper deployment will necessarily require a redesign of transmission networks, and, consequently, of the regulation of this segment.

2. Analysis and discussion

This article presents an in-depth analysis of the transmission regulation implemented in the main five South American power sectors (Argentina, Brazil, Chile, Colombia, and Peru⁴). The methodology used is a regulatory review following the structure and terminology outlined in Rivier et al. (2013), who present a textbook overview of transmission regulation. The study is focused on three main topics: network expansion, transmission remuneration, and cost allocation. Congestion management, due to its relation with the dispatch and the market design, lies out of the scope of this article. The qualitative analysis is presented as a country-by-country review followed by a comparison of the regulatory mechanisms.

2.1. Argentina

Argentina is the 8th largest country in the world in terms of geographic area but has a very low population density. Demand for electricity is concentrated in specific zones of the country and the Grand Buenos Aires area accounts for about 40% of total consumption. However, both fossil fuels and hydropower resources are located in the inner and the southern provinces and these conditions give the transmission segment a central role.

2.1.1. Expansion planning

The main factor that drove the significant redesign of the transmission regulation in Argentina was the expansion of the main corridor necessary to move electricity from Comahue hydropower plants to the demand in Buenos Aires (1300 km of line). The Electricity Act that reformed the Argentinean power sector in

1992 addressed this issue by introducing a new regulatory approach, presented here, whose underlying concept was to transform network users from passive to active participants in transmission expansion planning. The new regulation identified three possible methods for the authorisation of transmission expansion projects, as follows.

- A Contract between Parties may be used when one or several parties propose an expansion of the network to the transmission owner in the area, outlining a COM contract (Construction, Operation and Maintenance) and technical details of the line, subject to approval by the National Regulatory Authority (ENRE, *Ente Nacional Regulador de la Electricidad*). The investment costs are charged to the proponents and afterwards the line is treated in the same way as existing lines.
- A Minor Expansion is one that does not exceed a previously specified threshold investment. The incumbent transmission operator is in charge of such expansions. ENRE is in charge of determining the beneficiaries who will pay for the investment.
- A Public Contest is where a group of parties, called the “initiators”, can identify an expansion project and propose to have a public contest to provide it through a concession, outlining a COM contract and technical details of the line. All the data are presented to ENRE, which is in charge of checking that the benefits of the proposed expansion exceed costs. Furthermore, ENRE requires the System Operator to identify all beneficiaries of the expansion (through the Areas of Influence Method, described briefly later in this document, when presenting cost-allocation methodologies) and the share of investment that each of them should pay in case the line is installed. ENRE may only consider a request for which the initiators are associated with at least 30% of the “benefits” that the expansion would bring to the Area of Influence. If this condition is satisfied, this information is published and a hearing process is carried out; if 30% of the beneficiaries oppose to the expansion, then the proposal is rejected. Otherwise, under ENRE supervision, the proponents launch a public tender and a contractor is selected. The amortisation of the investment is paid by all of the beneficiaries based on shares identified by the System Operator, and not only by the initiators. After the amortisation expiration, the line is treated like other existing lines.

As explained by Littlechild and Skerk (2004a,b), the contract between parties and the minor expansion were supposed to be used for projects benefitting only a small number of users alone or for which the budget does not justify a complex procedure; the public contest method was supposed to be used for major transmission expansion projects, involving large investments and benefitting many parties. The idea, based on the “beneficiary-pays” principle, is that if the expansion costs are to be charged to a group of users because they are supposed to benefit from it, then those users should be willing to identify and propose such expansion projects.⁵

2.1.2. Transmission remuneration

The remuneration of new transmission facilities depends on the expansion planning methodology. In the case of the public contest method, the remuneration is based on the public tender to construct, operate, and maintain the proposed expansion.

² In this paper, by policymakers we refer to those institutions that actually design the regulation, as secretaries, ministries or governments, not necessarily the National Regulatory Authority.

³ For an analysis of the economic benefits of transmission expansion in a scenario of increased penetration of renewable generation technologies in the European Union, see Becker et al. (2014). For an identification of the main challenges to be faced by the EU Internal Electricity Market in terms of grid expansion and network cost allocation, see Glachant and Ruester (2014).

⁴ Other power sectors in the region, as e.g. Venezuela and Ecuador, are not suitable for this study because of the lack of a proper liberalisation of the sector.

⁵ The most important challenge that the new regulation had to face was the construction of the so-called Fourth Line, connecting Comahue generation plants to Buenos Aires demand. See Littlechild and Skerk (2004a,b) and Anderson and McCarthy (1999) for different evaluations of the regulation in place.

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