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POLICY BRIEF

Merchant Interconnectors in Europe: Merits and Value Drivers

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Highlights[1]

- Interconnectors can help the European Union (EU) resolve the energy trilemma, increasing security of supply, supporting the transition to a low carbon economy and favouring price convergence.
- The EU should rely more on merchant interconnectors, which are financed by private funds on a non-regulated basis. As interconnectors are replicable assets, they could avoid being regulated. Compared to the regulated model, the merchant model provides appropriate incentives to invest, to manage costs, to build on time and to make the asset available. However, there are only few merchant interconnectors in the EU. The ElecLink project between France and Great Britain is expected to be the next to be commissioned, in 2020.
- The main source of revenue for a merchant interconnector is the congestion rent, which has three main drivers: it increases with the average price differential (structural value) and the volatility of prices (volatility value) and decreases with the correlation between prices. The expanding share of renewable energy, from various sources and locations, increases the volatility of prices and creates value for interconnectors.

1. This policy brief is based on "ElecLink: shedding some light on a key European project" (December 2019), a study carried out by Axel Gautier and Altermind at the request and with the support of Getlink SE. This study is available on Getlink's website.

Introduction

Interconnectors help to address the trilemma between energy security, energy competitiveness and environmental sustainability. Indeed, by reducing congestion between countries, interconnectors increase the security of supply, allow for a better integration of energy produced by renewable energy sources and favour price convergence within the integrated zone.

In light of these benefits, the European Union (EU) has set ambitious interconnection targets of at least 10% of each Member State's installed electricity production capacity by 2020, extended to 15% by 2030. These targets have been reaffirmed in the Clean Energy for All Europeans package.

In order to achieve this goal, European regulations[1] promote regulated transmission assets. Under this default route, transmission system operators (TSOs) set up and operate interconnectors and recover all incurred costs, including a regulated return on investment. They are subject to various obligations, notably in respect of use of revenue, third party access and ownership unbundling.

As an exception, exemptions from some regulatory requirements can be granted to projects which are too risky to be developed under the regulated regime, notably in relation to non-use of the interconnector or variations in costs or revenues. Under this exempted regime, developers bear the full risk of the investment. Although they are still subject to some regulatory requirements (they must be approved by regulatory authorities and exemptions may be partial), these projects can be qualified as "merchant transmission investments", as opposed to standard "regulated investments".

European regulatory authorities have adopted a restrictive approach towards merchant interconnectors. In June 2018, ACER rejected the application by Aquind Limited for an exemption to build a merchant interconnector between France and Great Britain (decision confirmed by the Board of Appeal of ACER in October 2018), considering the level of risk of the project was not such that the investment would not take place unless the requested exemptions were granted. To date, only seven exempted projects have been carried out in the EU[2]. The ElecLink project between France and Great Britain, authorised in 2014, is expected to be the next in 2020.

However, as shown by the European Network of Transmission System Operators for Electricity (ENTSO-E), there are still some barriers to overcome in Europe in order to create a common electricity market and some Member States are currently considered as behind schedule to reach the 10% target by 2020[3]. In this context, a merchant interconnector could be a solution to finance investment and the merits of the investment model and its value drivers should be correctly understood.

Assessment of the Merchant Model

The assessment of this model covers two distinct issues: should interconnections be necessarily regulated given their characteristics? Is the regulated model superior to fulfil the European electricity policy objectives? The answers to these questions call for a revised approach to merchant interconnectors in Europe.

1. Directive 2009/72/EC, which will be repealed with effect from 1 January 2021 by Directive (EU) 2019/944; Regulation 714/2009 and, since 1 January 2020, Regulation 2019/943.

2. Estonia-Finland Estlink (between Estonia and Finland, 2005), BritNed (between Great Britain and Netherlands, 2011), Imera East-West cables (between Wales and Ireland, 2008), Tarvisio-Arnoldstein (between Italy and Austria, 2010), ElecLink (between Great Britain and France, 2014), Piemonte-Savoia (between Italy and France, 2016) and SI-IT Interconnectors (between Slovenia and Italy, 2014, modified in 2019).

3. Cyprus, Spain, UK, Poland.

Relevance of the Merchant Model

The scope of regulation of network assets varies across time, countries and industries. These differences can be explained by two major factors: alternatives and replicability. Three main situations should be distinguished:

- Assets for which competing alternatives exist: when alternatives to network assets exist, the latter are not (and should not be) regulated. This is the case, for instance, of gas and oil pipelines, for which shipping is an alternative;
- Assets that are replicable: assets which are easily replicable should be, at best, temporarily regulated, and not in the same way as non-replicable assets. Regulation should ensure that entry occurs, sometime through "entry assistance" which may require temporary access to replicable assets (as illustrated by the regulation of telecommunication and the ladder of investment theory – Cave, 2006). The degree of replicability of an asset is not only a technical attribute; replicability also depends on competition and technologies;
- Assets that have no alternatives and are not replicable: assets which have no alternatives and are not replicable (because of their prohibitive costs) should be permanently regulated. Such infrastructures may be defined as essential facilities (e.g. train tracks and stations in the rail transport sector).

In the electricity sector, the national transmission grid is a bottleneck: it cannot be replicated and it does not need to be if there is no congestion. However, interconnections between countries are much more replicable, as illustrated by the large number of interconnection projects under construction or development. Furthermore, interconnections become even more replicable as the European electricity market becomes more integrated. As an example, with the integration of various markets (France, Germany, Netherlands, Belgium and UK), an interconnection line between Belgium and Great Britain (such as Nemo) is a substitute to an interconnection between France and Great Britain, albeit not necessarily a perfect one. All these competing projects aim to integrate the market further, at the benefits of consumers, and they can be profitable as long as there is some congestion.

Therefore, as interconnections are replicable assets, they could avoid being regulated.

Merits of the Merchant Model

The academic literature shows there are difficulties entailed by the regulated model, notably in terms of incentives, which can be addressed under the merchant transmission investment model.

The key issue raised by the regulated model is that, although the regulatory approval of regulated investments is theoretically based on a European scope, the planning of investment in transmission and interconnection capacity is mainly done at the national level and takes into account national welfare. This national focus leads to suboptimal investment in interconnection capacity compared to what would be optimal when considering both countries involved in the interconnection. Regulators in the low-price zones may for instance be reluctant to agree on increased interconnection as price convergence is likely to lead to price increases in the low cost/price zone (De Vries and Hakvoort, 2002). Sagan and Meeus (2014) show with a simulated model that a lack of coordination at the European level leads to significantly less investment in interconnection than a centralized planning, leading them to label the current regulatory framework as "*imperfect*".

This difficulty does not exist in a pure merchant transmission investment model. The main merit of the merchant model is indeed to provide appropriate incentives for investment under certain conditions. Joskow and Tirole (2005) show that if nodal prices correctly reflect production costs (in other words, if the electricity wholesale markets in both zones are competitive), then the merchant investment model leads to efficient investment, in the sense that all profitable investments positively contribute to social welfare. Congestion rents provide adequate incentives for investments.

Another major merit of the merchant investment model is that, contrary to regulated investments whose risk is borne by consumers, merchant interconnectors financed by private funding have strong economic incentives to minimise costs (given they get to keep the upside), build the asset on time and maximise the availability. It also avoids setting a regulated price or income, which is often complex as there is information asymmetry between the regulated firm and the regulator on a number of variables (e.g. cost, efficiency, expected demand).

The advantages of the merchant investment model are confirmed by a study of Australia, where both models have coexisted (Littlechild, 2012).

Value Drivers of Interconnectors

Interconnectors rely on three types of revenues: energy market revenues, i.e. the congestion rent, capacity market revenues and ancillary revenues provided to TSOs (enhanced frequency response, reactive power, emergency assistance and cross-border balancing).

The Congestion Rent

The main streams of revenues of interconnectors come from the congestion rent i.e. *at any point of time,* the price differential between the two interconnected market zones. It is therefore not the average price differential between two zones that determines the congestion rent. Rather, the congestion rent depends on three main factors:

- The average price differential: a structural difference in price between the two interconnected countries, measured by the average price differential, increases the value of the interconnector;
- The volatility of prices: for a given average price difference, the value increases with the volatility of prices in each of the two countries. A higher volatility creates more room for arbitrage and increases the value of the interconnection capacity;
- The correlation of prices: an interconnector has more value when prices are not correlated in the two countries and move in different directions. In this case, there is more room for arbitrage and the congestion rent increases.

These three sources are influenced by several factors:

- The main factor influencing average price differential is market integration: a greater market integration, which can be achieved by increasing the interconnection capacity or by facilitating cross-border trade through market coupling, contributes to price convergence between the two countries;
- Volatility is essentially influenced by renewables: it is well documented (Ketterer, 2014) that the larger integration of renewable energy sources has two effects on prices: renewables (zero-marginal cost generators) contribute to reduce the mean electricity price and their intermittent nature increases price volatility;
- Correlation depends on various factors, such as time zones (different time zones have non synchronized peaks), and energy mix (different renewables at different locations proportion of renewables).

The price differential is important to determine the congestion rent when countries trade only in one direction. If trade goes both ways, the average price differential is a bad predictor of the congestion rent.

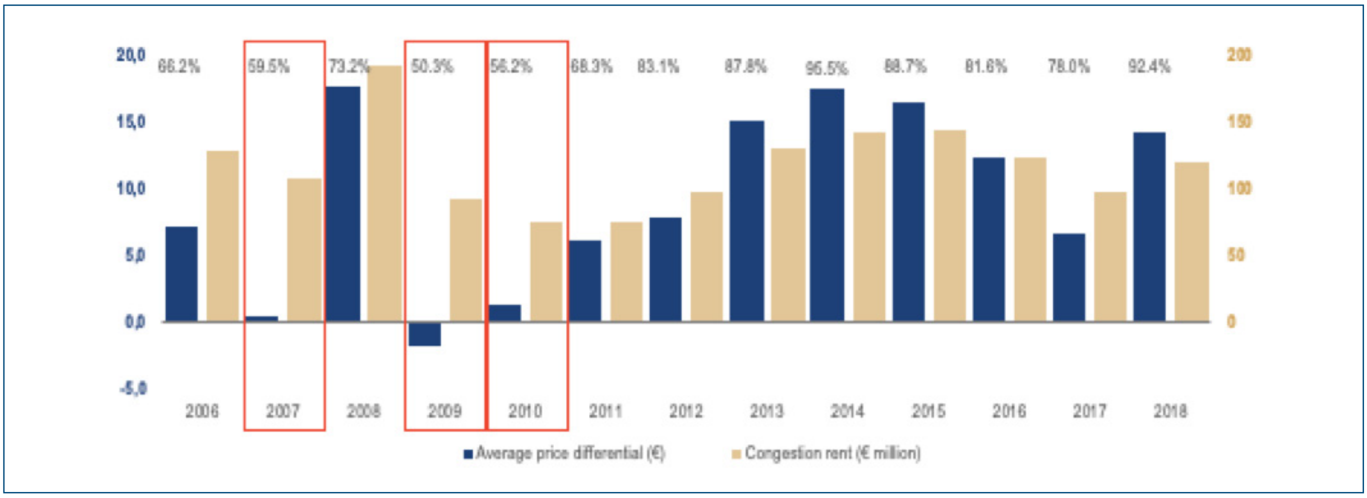
As an example, in the context of the Great Britain – France electricity trade, the analysis of historical data shows that there are several years in which prices were almost always higher in Great Britain than in France (such as 2013, 2014 and 2015), but other years in which trade took place in both directions (eg. 2007, 2009 and 2010).

In a study commissioned by Getlink SE, ElecLink's parent company, we have calculated the fluctuations of the congestion rent ElecLink interconnector could have theoretically benefited from based on hourly price data for France and Great Britain from 1 January 2006 to 30 April 2019. This exercise helps to understand the dynamics of the congestion rent.

It shows that there is no correlation between the average price differential and the congestion rent. Even when the price differential is very low (as for instance in 2007 where it was equal to €1.4), the congestion rent is substantial. This means that there is value beyond the price differential.

In the future, it can be expected that the average price differential between Great Britain and France will decrease over time, as market integration improves, in particular taking into account the proposed interconnectors between the two zones. However, the expanding share of intermittent renewables will be a major factor of price volatility in Great Britain and France. This means that the congestion rent of an interconnector will have strong value even if price convergence occurs.

Average price differential between GB and France and congestion rent (2006-2018)[4]



Source: Nord Pool, Epex Spot, ElecLink

4. The percentages on top of the histograms stand for the frequency (percentage of hours) where the price differential between France and Great Britain is positive and larger than €2 per MWh, and the percentage of hours where the price differential between France and Great Britain is negative and larger than €2 per MWh (in absolute value).

References

Cave M. (2006), Encouraging Infrastructure Competition via the Ladder of Investment, Telecommunication Policy, 30, 223-237

Cuomo, M. Glachant, J.-M., "EU Electricity Interconnector Policy: Shedding Some Light on the European Commission's Approach to Exemptions", Florence School of Regulation, Policy Brief, 2012/06, June 2012

De Vries, L.J. and R.A. Hakvoort (2002), 'An Economic Assessment of Congestion Management Methods for Electricity Transmission Networks', Journal of Network Industries, 3, 425-466

ENTSO-E, TYNDP 2018, Executive Report, "Connection Europe: Electricity, 2025, 2030, 2040", 28 November 2018.

European Commission, "Communication on Strengthening Europe's Energy Networks", 23 November 2017

European Commission, "Fourth Report on the State of the Energy Union", COM(2019) 175 final, 9 April 2019

Joskow, P. and J. Tirole (2005), Merchant Transmission Investment, Journal of Industrial Economics, 53, 233-264

Ketterer, J. (2014) The Impact of Wind Power Generation on the Electricity Price in Germany, Energy Economics 44, 270–280

Littlechild S. (2012), Merchant and Regulated Transmission: Theory, Evidence and Policy, Journal of Regulatory Economics, 42, 308–335

Sagan, M. and Meeus L. (2014) Impact of the Regulatory Framework for Transmission Investments on the Cost of Renewable Energy in the EU, Energy Economics, 43, 185–194

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