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Why (and how) to regulate power exchanges in the EU market integration context?

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Abstract

The European Union (EU) market integration is leading to increasingly monopolistic electricity market infrastructures, which has opened a debate on the regulation of these so-called power exchanges. In this paper, we start by stating that there are two types of power exchanges in Europe, i.e. "merchant" and "cost-of-service regulated" power exchanges. We then discuss how regulation can be used to better align their incentives with the main power exchange tasks. We conclude that adopting the cost-of-service regulated model for all power exchanges in Europe could be counterproductive in the current context, but that regulation can help ensure that the benefits of the EU market integration materialize. Promising regulatory actions include tempering the reinforced market power of power exchanges, and quality-of-service regulation for the ongoing cooperation among power exchanges to organize trade across borders.

Keywords

Electricity market; regulation; congestion management

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1. Introduction

Power exchanges are key institutions in open- and market-based electricity industries. The traditional market for power exchanges is an auction organized every day around midday to execute orders for the delivery of electrical energy the next day. Some power exchanges have also started organizing trade before the day-ahead stage (e.g. “forwards” and “futures”) and after the day-ahead stage (“intra-day”), but the focus in this paper is on the traditional day-ahead power exchange market. This day-ahead auction functions as the spot market that produces the reference or strike prices for the longer-term power markets (Meeus et al., 2005; Rademaekers et al., 2008).

Power exchanges typically operate in a single zone of the electricity grid where they then facilitate the exchange of commitments to withdraw/inject an amount of energy from/into this zone during a certain hour. Zones often correspond to the control zones of the Transmission System Operators (TSO), and most European Union (EU) member states have a single national TSO. There have been several cases of competing power exchanges operating in the same zone. For instance in 2000, Nord Pool (originally the Norwegian power exchange) founded the Leipzig Power Exchange (LPX), competing in Germany with EEX until the latter two merged in 2002. Also, in the UK, several power exchanges have been active, including APX (originally the Dutch power exchange) and Nord Pool.

More recently, electricity market infrastructures have been becoming more monopolistic because of two main reasons. The first reason is a wave of mergers and acquisitions, with, for instance, APX taking over Belpex (the Belgian power exchange) in 2010, and Powernext (originally the French power exchange) and EEX (originally the German power exchange) merging into EPEX in 2009. The second reason is that power exchanges are increasingly organizing trade between zones, which has traditionally been the territory of the Over The Counter (OTC) electricity trading business in Europe.

It is in this context that we discuss the regulation of power exchanges in this paper. The paper starts by stating that two types of power exchanges have to be distinguished, i.e. “merchant” power exchanges and “cost-of-service regulated” power exchanges (section 2: “Two types of power exchanges”). We consequently assess the incentives of “merchant” power exchanges to perform their main tasks, distinguishing between an isolated national market context and the EU market integration context (section 3: “Why to regulate power exchanges”). We then discuss how regulation of power exchanges can be used to better align the incentives of power exchanges with what is expected from them (section 4: “How to regulate power exchanges”). The paper concludes with the most promising regulatory actions in the context of the ongoing EU market integration.

2. Two types of power exchanges

In this section, we discuss the establishment of power exchanges across Europe, differentiating between "merchant" and "cost-of-service regulated" power exchanges. Figure 1 illustrates that both types of power exchanges are prominently present in Europe.

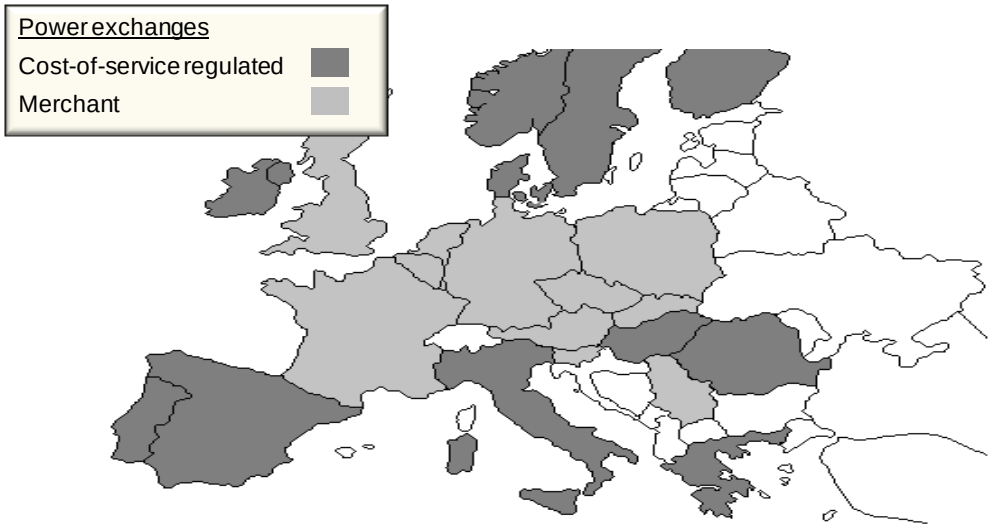

Figure 1: power exchanges in Europe[2]

In the above figure we have labeled member states according to the type of power exchanges they host, which is not always straightforward to do because of two main reasons. First, both types of power exchanges can be present in a certain member state. For instance in Hungary, a "cost-of-service regulated" power exchange has been set-up (HUPX), while there is also a competing "merchant" power exchange (PXE). Second, it is not always clear how to categorize a power exchange based on the available information. Still, the above figure is a first attempt and is only intended to illustrate that both types of power exchanges do exist in Europe.

2.1. First type of power exchanges: merchant

The first type of power exchanges is "merchant", i.e. a for-profit market institution whose core business is to provide trading services. Merchant power exchanges invest in market infrastructures, and their return on investment depends on various user fees (i.e. user registration fees, and annual membership fees) and the volume of trade executed by the power exchange for its users (i.e. commissions on the traded volumes). Examples of merchant power exchanges include APX (the Netherlands), Belpex (Belgium), BSP South Pool (Slovenia and Serbia), EXAA (Austria), EEX (Germany), OTE (Czech Republic), PolPX (Poland), Powernext (France) and PXE (Czech Republic and Slovakia). They have been established by 1// market parties; 2// financial market institutions; 3// TSOs; 4// or a combination of these private entities[3] (Boisseleau, 2004).

[2] Based on the limited available information on the Power Exchange websites.
[3] The Czech OTE seems to be an exception because it is a state owned merchant Power Exchange.

First are market parties setting up a merchant power exchange. An example is APX, which was founded in 1999 in the Netherlands by energy companies, which could have been motivated by their interest in reducing transaction costs. Note that later APX became a subsidiary of the Dutch TSO Tennet, while keeping its for-profit status. Second are financial market institutions setting up a merchant power exchange. An example is EEX, which was founded in 1999 by the exchange group EUREX, which could have been motivated by its interest in leveraging its competence from running financial markets. The same group EUREX is also behind the BSP South Pool initiative in Slovenia and Serbia with the ambition to cover South-East Europe. Third are TSOs setting up a merchant power exchange. An example is Nord Pool, which was founded in 1996 by the Norwegian TSO Statnett as the Norwegian power exchange. Nord Pool gradually became the power exchange of the Nordic region, and as it expanded its trading services into neighboring Nordic areas the corresponding Nordic TSOs have also been included in the ownership of the power exchange. Fourth is a combination of private actors setting up a merchant power exchange. An example is Powernext, which was founded in 2001 by the exchange group NYSE Euronext and the French TSO RTE, with several French utilities and banks having smaller shares. The French TSO could have been motivated by the regulatory obligation to procure losses that is imposed on many TSO in Europe, often making them the largest electricity consumer.

2.2. Second type of power exchanges: cost-of-service regulated

The second type of power exchanges is "cost-of-service regulated," i.e. a not-for-profit or regulated-profit institution whose income depends on approved costs for approved tasks. Like merchant power exchanges, some of them charge fees to their users, but these fees are approved by the regulator or the ministry (i.e. economic regulation). Examples of cost-of-service regulated power exchanges include GME (Italy), HUPX (Hungary), OMEL (Spain and Portugal), OPCOM (Romania), Power Pool (Greece) and SEMO (Ireland). They have been established by 1// a public initiative; or 2// an initiative by the TSO.

First are public initiatives to set up a state-owned cost-of-service regulated power exchange. Examples are the Spanish OMEL and the Italian GME. Second are TSOs receiving a mandate to set up a cost-of-service regulated power exchange. An example is SEMO, which was founded in 2006 in Ireland. SEMO has been established as a joint venture of the Irish TSOs Eirgrid and SONI. Also HUPX and Power Pool are subsidiaries of respectively the Hungarian TSO Mavir, and the Greek TSO HTSO.

Note that cost-of-service regulated power exchanges typically perform several tasks that go beyond providing trading services. For instance in Spain, OMEL has the additional task of allocating capacity payments, which is a public incentive scheme designed to promote generation adequacy. In Italy, GME has the additional task of managing internal congestions in the country. In Greece, Power Pool dispatches power plants. In Ireland, SEMO is allocating capacity payments (as in Spain), and dispatches power plants (as in Greece).

3. Why to regulate power exchanges: incentives of merchant power exchanges

In this section, we look at the empirical evidence from financial and power markets respectively, to assess whether the incentives of merchant power exchanges are such that regulation may be needed.

3.1. Financial markets

Interest in analyzing financial markets has contributed to analyzing power exchanges. Lee (2010) is a typical example of such contributions. He does notice that there is a widespread presumption that the for-profit model is the best governance structure for an exchange, while he also warns that potential benefits may not materialize and that there may be significant cons associated with the for-profit model.

The most important of the cons arises when the exchange has a dominant position in the provision of one or more of its market services and succeeds in exploiting its market power to act anti-competitively. As discussed by several authors, including Oesterle et al. (1992), McInish and Wood (1996), Pirrong (1999, 2000), and Lee (2010), anti-competitive behavior can consist of cartelizing the supply of trading services, passing self-interested and inefficient rules, deterring access to the exchange, deterring competition, or practicing monopoly pricing.

Exchanges can have natural monopoly characteristics. First, trading systems can benefit from a positive "network externality" because liquidity attracts liquidity. Second, significant economies of scale have been demonstrated in empirical work on exchanges, e.g. by Malkamäki (1999), Hasan and Malkamäki (2001), and Schaper (2009).

3.2. Power markets

In what follows, we discuss the incentives of merchant power exchanges in the context of an isolated national market and in the context of the EU market integration process respectively.

3.2.1. Incentives of merchant power exchanges in an isolated national market context

The day-ahead markets that power exchanges have traditionally organized function as spot markets in power markets. Only a fraction of total trade takes place in these spot markets, but spot-market prices are reference prices for most contracts traded in power markets. In other words, merchant power exchanges' core business is to provide trading services, but they also provide a public service by producing spot prices for electric energy.

However, because of structural problems in power markets, such as excessive concentration in generation, excessive integration of generation and supply, and a lack of interconnection capacity, many concerns have been expressed with regard to the reliability of the spot prices produced by power exchanges (European Commission, 2006). Often regulators have intervened with measures that force: 1// international traders; 2// TSOs; or 3// incumbent

generation companies to trade on the incumbent power exchange (i.e. “liquidity supporting measures”). First are international traders. An example is the Netherlands, which has an obligation for importers being active at the day-ahead stage to trade on the incumbent power exchange (APX). Another example is the Nordic market where market parties have to transact via the incumbent power exchange (Nord Pool) to get access to interconnection capacity. Second are TSOs. An example is France where the TSO has the regulatory obligation to procure losses, which is the case in many member states, and this obligation is often fulfilled via the incumbent power exchange. Third are incumbent generation companies. An example is Belgium, where the incumbent generation company has been obliged to create liquidity on the power exchange.

These measures improve the liquidity of the incumbent power exchange, but in combination with the natural monopoly characteristics of the exchanges, the measures also reinforce the dominant position of the incumbent power exchange, which can be problematic. As discussed in the previous section (section 3.1), market power can cause liquidity problems, i.e. in the case that power exchanges would exercise monopoly pricing on their users. There is at least one case where a regulator started to investigate concerns that had been voiced by market parties in relation to the fees charged by a power exchange. This was in the Netherlands in 2005 and in relation to the fees of the Dutch power exchange APX. Frontier (2005), in their report for the Dutch regulator, stated that the fees of APX had been higher than average, but the report also stressed that this is not an evidence of abuse. Furthermore, APX participants that had been spoken in the context of the report also indicated that while APX’s fees were high, they did not regard an investigation into their fees as a policy priority.

Still, “liquidity supporting measures” should be used very carefully, and the same can be said about: 1// deep cooperation between power exchanges and TSOs; 2// prudential regulations. First issue is deep cooperation between power exchanges and TSOs. We have already given several examples of power exchanges that are owned by the TSO of the zone in which they operate. Another example of deep cooperation is the Czech market where the incumbent power exchange organizes the balancing market in cooperation with the TSO. In light of the evidence collected in financial markets (section 3.1), a possible con is that such a cooperation can create a dominant position in the provision of one or more of the market services. The second issue is prudential regulations that aim at protecting parties other than the power exchange from an operational or financial failure of the latter. This can include promoting prudent and proper behavior, and ensuring an effective risk management with adequate collateral provisions as a buffer against unexpected losses. They are typical financial market regulations, but for instance in Germany and in the UK, power exchange spot markets are also subject to these financial market regulations (Frontier, 2005). A possible con of too-strict prudential regulations is that it becomes more costly to enter into the business of exchange services, so that these regulations can reinforce the market power of the incumbent power exchange.

3.2.2. Incentives of merchant power exchanges in the EU market integration context

The dominant market design in Europe has been to allocate the rights to trade across borders, i.e. cross-border grid capacities, in separate auctions ("explicit auctioning"). As a result, trade across borders has traditionally been the territory of OTC markets, and power exchanges have typically operated in a single zone of the electricity grid where they then facilitate the exchange of commitments to withdraw/inject an amount of energy from/into this zone during a certain hour.

However, the European experience is increasingly evidencing the inefficiencies caused by this market design, which relies heavily on traders to arbitrate between the different (mostly national) electricity markets. Several studies observe for different borders and periods that cross-border trade is often in the direction of the average price difference, even if the hourly price spread is frequently in the other direction. As a result, the scarcely available cross-border grid capacities are currently underused, and also frequently misused, increasing price spreads rather than reducing them (Bunn and Zachmann, 2010; Creti et al., 2010, Kristiansen, 2007a and 2007b; Meeus, 2010; Turvey, 2006; Zachmann, 2008).

At the 17th meeting of the Florence Forum in 2009,[4] a day-ahead-market target model was presented whereby the arbitrage across borders is internalized into the day-ahead auction procedures of power exchanges in order to eliminate the cross-border trade inefficiencies that the EU currently experiences ("implicit auctioning" or "market coupling"). Power exchanges have welcomed the target model and are proposing to cooperate to implement it, and several initiatives are already ongoing. The incentives of merchant power exchanges then have to be re-examined in this context. A merchant power exchange has a clear incentive to cooperate in the implementation of this model as it can generate significant additional trade volumes, and thus income for the power exchange.

However, the potential benefits of the EU target model will not necessarily materialize because of two main reasons: 1// market power; 2// coordination and harmonization issues. First, market power could be reinforced because the needed cooperation among power exchanges implies that they have to cartelize the supply of trading services and to monopolize the operation of trade across borders. Second, in order for the cooperation to be successful, coordination and harmonization are needed, which can be complicated and can impose costs unevenly on power exchanges (Meeus et al., 2009a and 2009b; Tersteegen, 2009). Contrary to successful implementations of the target model within the Nordic area, between Spain and Portugal, and between France, Belgium and the Netherlands (Vandenborre, 2008), the implementations of the Kontek Cable have not been without problems between East-Denmark and Germany (FGH/IAEW, 2009; Kristiansen, 2007b; Meeus, 2010).

[4] The Electricity Regulatory Forum, or Florence Forum, was set up in 1998 to discuss the creation of a true internal electricity market. Consensus was reached at the XVII meeting:
http://ec.europa.eu/energy/gas_electricity/forum_electricity_florence_en.htm

4. How to regulate power exchanges: aligning the incentives with what is expected

In this section, we discuss how cost-of-service regulation, regulatory actions to temper reinforced market power, and quality-of-service regulation, respectively, can be used to align the incentives of power exchanges with what is expected in the EU market integration context.

4.1. Cost-of-service regulation

In what follows, we discuss how cost-of-service regulation can be introduced for the main power exchange tasks in an isolated market, and their additional tasks in the EU market integration context.

4.1.1. For the main power exchange tasks in an isolated national market

There has been little regulation to control prices and/or service levels of exchanges in financial markets. Lee (2010) lists various costs that may arise when such a model is adopted by a market institution, including the possible inefficient management of the costs of the services provided, a cumbersome and expensive decision-making process, and difficulty in providing management the incentive to perform better.

Still, in power markets, cost-of-service regulation for power exchanges is not uncommon (Figure 1). By definition, cost-of-service regulated power exchanges have fewer incentives to abuse market power than merchant power exchanges, but they also have fewer incentives to provide an efficient trading service, or to innovate in trading systems[5].

4.1.2. For the additional power exchange tasks in the EU market integration context

Cooperating with another power exchange to eliminate cross-border trade inefficiencies could in principle be just another regulated task for the cost-of-service regulated power exchange. However, here we suffer a "regulatory gap" in Europe (Vasconcelos, 2005), i.e. the achievement and operation of the EU internal energy market is a common European regulatory task, but the corresponding regulatory function is not assigned to a "European wide" regulatory entity[6]. When dealing with problems related to cross-border trade, the national regulatory authorities frequently do not have effective and independent powers to define and enforce the needed regulation at EU level.

In France, Belgium and the Netherlands, merchant power exchanges have successfully implemented the day-ahead-market target model. They have been allowed to do so without being subjected to cost-of-service regulation for their main power exchange tasks, and they have been reimbursed for the costs associated with the implementation of the target model. The costs have been invoiced by the power exchanges to the TSOs and have then been

[5] Note that many North American power markets, such as PJM, have a cost-of-service regulated spot market operator, and this spot market operator is typically integrated with the system operator.

[6] Note that this is an important difference with for instance the US where there is a federal regulator (FERC) that is competent to deal with trade issues between states.

considered by the regulators as approved costs to be recuperated by the TSOs via the transmission tariff.

This is then a possible model for the many ongoing initiatives to implement the target model in Europe, but as will be argued in section 4.3, it may also be opportune to apply quality-of-service regulation for power exchanges instead of the "cost pass-through" that has been applied in the case of France, Belgium and the Netherlands.

4.2. Tempering reinforced market power

In what follows, we respectively discuss how transparency, the governance of the day-ahead-market target model, and the forward-market target model that is being discussed can help tempering the reinforced market power of power exchanges.

4.2.1. Transparency

Transparency of power exchange outcomes is important because of 1// competition from other markets; 2// market supervision. The first issue is competition from other markets, which can be OTC markets as well as other power exchanges. Regulatory transparency requirements can improve power exchange transparency, increasing the competitive impact of other market institutions. Note that without such a requirement, the power exchange will be transparent enough to attract sufficient trading, but not necessarily as transparent as possible.

The second issue is market supervision. Transparency regarding the bidding behavior of market parties on power exchanges is important in allowing the relevant authorities to do their work in supervising the market and detecting abuse by exchange members. In Germany, for instance, EEX is required to participate in "market monitoring" activity; it even has a market surveillance office that monitors both trades and settlement of those trades to ensure compliance with EEX's rule book. Another example is Powernext in France, which has adopted a cooperative relationship with the national energy regulatory authority (CRE) that is charged with the supervision of electricity markets. CRE has access to all relevant information on bidding behavior and Powernext's contracts with participants specify that Powernext has the right to furnish the CRE with information.

4.2.2. Governance of the day-ahead-market target model

In the context of the EU market integration process, we need power exchanges to cooperate so that the cartelization of the supply of trading services by power exchanges is unavoidable (section 3.2.2), but this need not result in a closed cartel. The governance of the day-ahead-market target model needs to include the possibility of more than one power exchange offering trading services in the markets that are involved in the cooperation, so that power exchanges can continue to be contested by other power exchanges.

Even though this should be possible in principle, it is not clear whether this is already foreseen in the governance rules, which are still being discussed among regulators and stakeholders. For instance, the Florence Forum meeting where the target model has been

officially introduced referred to governance issues, but the discussion at the meeting was mainly about the rules that are needed to govern the implementation of the target model from a subset of markets to an increasing number of markets.

4.2.3. Forward market target model

In the context of the EU market integration process, we need power exchanges to organize trade across borders, so that the monopolization of day-ahead trade by power exchanges is unavoidable (section 3.2.2), but complete monopolization need not arise as a result. The forward-market target model, which is still being discussed, would need to include a long-term allocation of rights to trade across borders (so-called physical transmission rights, as in France, Belgium and the Netherlands), instead of implementing financial rights that are settled via the power exchange spot markets (so-called financial transmission rights or contracts for differences, as in the Nordic area).

There are many arguments in favor of financial transmission rights (Benjamin, 2010; Bushnell and Stoft, 1996; Chao and Peck, 1996; Joskow and Tirole, 2000; Hogan, 1992 and 1999), but in light of the discussion in this paper, there is also the counterargument that power exchanges would completely monopolize the organization of trade across borders, which is currently the territory of OTC markets. Note also that 90% of total trade in Europe is OTC, with the main exception being the Nordic area (that does not have long term physical transmission rights) where it is only half of trade (Rademaekers et al., 2008).

Following Lee (2010), there is a common believe that it is important to have OTC market institutions competing with organized exchanges (e.g. Nystedt, 2004) and complementing them (e.g. Kroszner, 1999). It might therefore be advisable for TSOs to, at least initially, continue to allocate long term physical rights to trade across their borders, so that OTC markets could continue to provide physical customized trading services across borders.

4.3. Quality-of-service regulation

Power exchanges, like other companies, use inputs to produce outputs. The inputs they use are their resources, including the technologies they use, and the outputs are the quantities and qualities of the services they provide. The quality of the prices produced by power exchanges is of particular importance because of two main issues: 1// public service; and 2// cross-border trade efficiency. First issue is public service. As discussed in section 3.2.1, only a fraction of total trade takes place in the day-ahead spot markets organized by power exchanges, but their prices are a reference price for most contracts traded in power markets. With regard to this public service function of power exchanges, a key service quality is the reliability of the spot prices they produce.

The second issue is cross border trade efficiency. As discussed in section 3.2.2, cooperation among power exchanges is about eliminating the cross-border trade inefficiencies Europe is currently experiencing, but cooperation might generate new trade inefficiencies due to the resulting reinforced market power of power exchanges, and coordination and harmonization

issues. With regard to this cross-border exchange scheduling function of power exchanges, a key service quality is the degree of optimality of the scheduled exchanges and the prices at which they are scheduled.

From experience with grid companies (Sappington, 2005; Joskow, 2006a; and Fumagalli et. al., 2007), we know that the preferred approach to regulate companies towards important qualities of service is to regulate the outputs rather than the inputs needed to produce the outputs because the company normally has more capabilities and information (than the regulator) to choose the best combination of inputs to produce a given output. In practice, it can however be difficult to regulate outputs for four main reasons: 1// output controllability; 2// output measurability. First issue is output controllability. While power exchanges have limited control over the reliability of the spot prices they produce (depends strongly on the market structure, such as market concentration, integration between generation and supply, and interconnection capacity), they do control to what extent their cooperation with other power exchanges produces optimal cross-border exchanges and prices so that this could be subject to quality-of-service regulation.

Second issue is output measurability. FGH/IAEW (2009), Kristiansen (2007b) and Meeus (2010) empirically analyze the cooperation between EEX and Nord Pool on the Kontek Cable using various indicators to illustrate that this cooperation among power exchanges produced suboptimal outcomes. While FGH/IAEW (2009) and Kristiansen (2007b) provide descriptive statistics that can be considered as proxies for performance, Meeus (2010) proposes an indicator that measures the optimality of the scheduled exchanges and the prices at which they are scheduled, i.e. the hourly values of unused capacity (available capacity minus scheduled exchange) times the price spread. The indicator should be zero in every trading period. In trading periods where the indicator is positive, the value of the indicator measures the degree of sub-optimality of the outcome. Using the optimality conditions discussed in Meeus et al. (2009a) and Wu et al. (1996), the indicator can also be generalized so that it can be used in meshed grids.

In other words, it is possible to define and measure the performance of power exchanges when cooperating to implement the day-ahead-market target model. A scheme could then be envisaged whereby power exchanges are rewarded to achieve the target, or punished for not achieving it. For instance in the case of France, Belgium and the Netherlands, power exchanges have had to demonstrate to be able to live up to a predefined performance before they were allowed to launch their initiative. In the case of the Kontek Cable, the power exchanges did not live up to the expectations, but they have not been sanctioned for this by the regulatory authorities.

Conclusions

In the EU market integration context, why and how to regulate power exchanges can be provocatively rephrased as why and how to regulate a "cartel" of "incumbent" and merchant power exchanges that is proposing to "monopolize" the organization of trade across borders.

Even though building such a cartel is questionable from an economical point of view, it is likely to be the only institutionally feasible way to eliminate the significant cross-border trade inefficiencies that Europe is currently experiencing. It is true that a theoretical alternative could be to adopt the cost-of-service regulated power exchange model all over Europe because such a power exchange has no profit incentives to abuse the monopoly of cross-border trade. However it will require having all of them perfectly regulated, while coordinating and harmonizing across borders is far from just another regulated task in a mainly national regulatory frame.

It is not an accident that merchant power exchanges are already organizing trade across borders in some parts of Europe. And there are several promising regulatory actions that could help preventing that Europe's increasingly monopolistic market infrastructure would generate new trade inefficiencies. First, the reinforced market power of power exchanges could be tempered by 1// enhancing transparency requirements; 2// introducing governance rules to prevent that the cooperation among power exchanges could become closed cartels; 3// continuing to allocate physical long term transmission rights. Second, the power exchanges' quality-of-service in the context of the EU market integration could be rewarded and the lack of it could be sanctioned.

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