Electricity Market Integration in Europe and the role of Power Exchanges

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Since the early 1990's, the European Union has been working to liberalise and integrate its electricity markets to deliver benefits to European energy consumers in terms of better prices and more choice[1] . Organised marketplaces – and, in particular, power exchanges – have played a key role in this process and in ensuring its success.

The market liberalisation and integration process has been supported by a sequence of EU legislative packages[2] , initially defining common rules for the participating electricity markets and then the ways in which these markets were to be integrated. Over the last ten years, legislation has been complemented by more detailed technical rules in the Network Codes and in the so-called 'Terms and Conditions or Methodologies'.

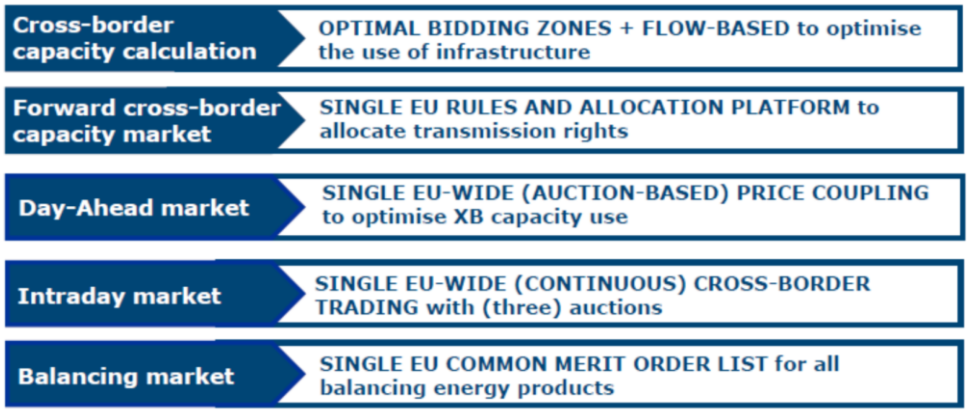
[1] A similar process has taken place in the natural gas sector, even though, partly due to the differences in the physical characteristics of the two energy vectors and partly because of the different geopolitics, the integration of the gas market has proceeded in a different way, although based on very similar high-level principles and rules.

[2] For the liberalisation of electricity sector and its European integration:

- the First Legislative Package included Directive 96/92/EC of the European Parliament and of the Council of 19 December 1996 concerning common rules for the internal market in electricity;
- the Second Legislative Package included Directive 2003/54/EC of the European Parliament and of the Council of 26 June 2003 concerning common rules for the internal market in electricity and repealing Directive 96/92/EC, and Regulation (EC) No 1228/2003 of the European Parliament and of the Council of 26 June 2003 on conditions for access to the network for cross-border exchanges in electricity;
- the Third Legislative Package included Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC, and Regulation (EC) No 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity and repealing Regulation (EC) No 1228/2003;
- the Clean Energy for All Europeans Package included, *inter alia*, the recast of the 2009 Directive and Regulation through, respectively, Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU (recast), and Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity (recast).

In my view, two aspects have been key for the success of the market integration process. The first one was the definition, in the mid- to late 2000's, of a clear vision for the EU Internal Electricity Market: the Electricity Target Model (ETM)[3] . The ETM covered five areas: cross-border capacity calculation, the forward cross-border capacity market, the day-ahead market, the intraday market and the balancing market. The following Figure summarises the main elements of the ETM in these five areas.

The Electricity Target Model for the Internal Electricity Market



For the day-ahead, intraday and balancing timeframes, the ETM defined the way in which markets should operate in the different EU jurisdictions and the integration model to deliver a pan-European Internal Electricity Market. In this respect, it is remarkable that, by the time the ETM was defined in the late 2000's, power exchanges had already been established in most EU Member States. In fact, after the pioneering experience of the Electricity Pool in England and Wales, which, strictly speaking, could not be considered a power exchange, in 1996 the Statnett Marked, launched in Norway in 2003, was extended to include Sweden and renamed as NordPool. Two years later, NordPool was further extended to Finland. It was in that same year, 1998, that OMEL, the predecessor of OMIE, launched the Spanish power exchange, the first one in Continental Europe. By 2007, when the ETM started to take shape from the voluntary cooperation of many stakeholders under the skilful coordination of Asta Sihvonen-Punkka, the then Finnish regulator, and the European Commission tabled the legislative proposals which would later become the Third Energy Package, power exchanges were also operating in the

[3] It is interesting to note that, around the same period, the United States, with a stronger federal governance, attempted to define and implement an equivalent of the EU ETM, the Standard Market Design, and did not succeed, with the result that, still nowadays, the US national market is split into several organised markets.

Netherland, Denmark, Germany, Poland, France Romania, Slovenia, Austria, the Czech Republic, Italy, Belgium, Portugal and in the island of Ireland.

What I find even more remarkable is that, despite these power exchanges having very different ownership structures and operating in very different electricity sector organisational frameworks, they were all developed according to a similar operational model: a two-sided 'pay-as-cleared'[4] auction, trading hourly products the day ahead of delivery. This seems to suggest that there is an intrinsic need to establish a power exchange with certain characteristics as soon as the electricity sector is liberalised.

For sure, there are clear benefits that power exchanges, as characterised above, can deliver in a liberalised electricity sector. First of all, they promote efficient dispatching of resources. Since electricity cannot be easily stored, the outcome of trading significantly influences the pattern of generation and of the provision of other resources. This is not the case for many other traded commodities, which are storable. However, if electricity demand is to be served at least costs, an efficient market outcome is essential. Moreover, power exchanges provide greater transparency and efficiency in the price formation, an aspect which is of paramount importance when national electricity markets are coupled to create the European Internal Electricity Market; I will return to this point below. Finally, power exchanges provide transparency in the relationship between generation and supply, the two potentially competitive segments in the electricity value chain, thus facilitating the entry of new players in the market, which could buy and sell electricity into and from the power exchange at fair market prices, rather than having to trade with the incumbent.

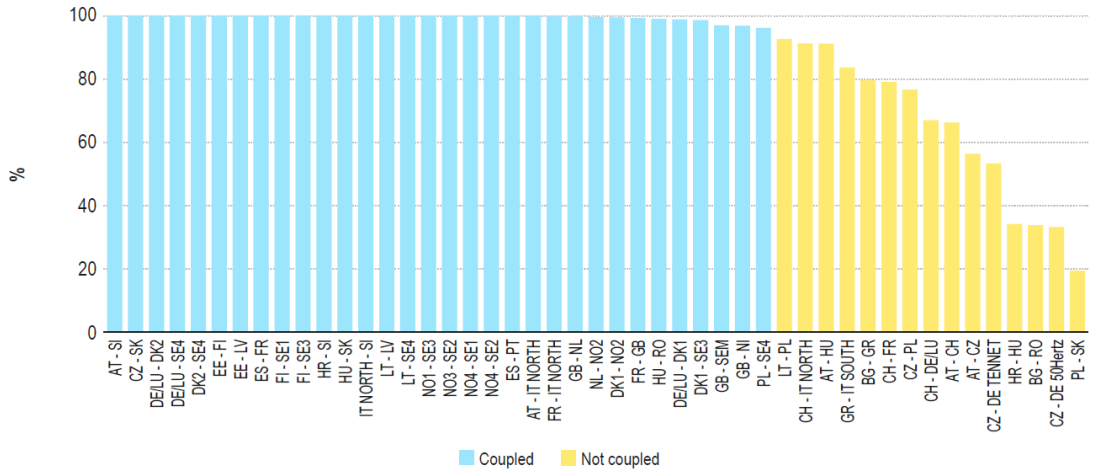
I believe it was these advantages which led to power exchanges been established before their role was envisaged in the ETM, and also before they were mandated by European legislation. In fact, as strange as it might seem, the role of power exchanges was codified neither in the first Electricity Directive of 1996, nor in the second one in 2003. It was only with the Third Energy Package, in 2009, that the role of power exchanges was first mentioned in EU legislation[5]. But, as already indicated, this was way after power exchanges were established in most EU jurisdictions.

[4] In the so-called 'pay-as-cleared' pricing mechanism, all dispatched resources are paid (or pay) the equilibrium market price.
[5] See, for example, Article 15(6) and point 2.7 of Annex I to Regulation (EC) No 714/2009.

Yet, power exchanges have been instrumental not only in promoting efficiency in resource dispatching in liberalised markets where central coordination is no longer feasible, but also in providing the price discovery mechanism on which market coupling for cross-border integration is based. And the benefits of an efficient use of the cross-border interconnection capacity brought about by price-based market coupling, the approach for market integration used in the Internal Electricity Market, are quite evident.

The following Figure shows, for 2020 and for several borders in Europe, the level of efficiency achieved in the use of the cross-border interconnection capacity. Here efficiency is defined as the frequency with which, in the presence of a difference in electricity prices between the two sides of the border, power moved in the right economic direction, i.e. from the lower-price area to the higher-price area.

Efficiency level in the use of cross-zonal capacity in the day-ahead market in 2020



Source: ACER calculations based on ENTSO-E data, as presented in ACER Market Monitoring Report 2020 – Electricity Wholesale Market Volume.

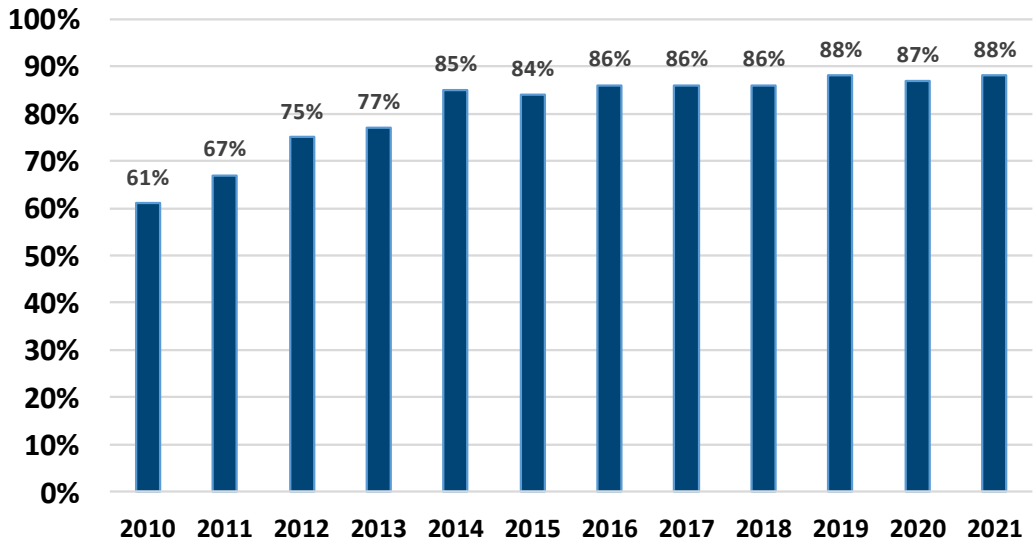
As it is clear from the Figure, full efficiency is achieved on all borders where market coupling is implemented. On the other borders, where, for example, capacity is allocated separately from electricity trading (the so-called 'explicit' allocation), efficiency could be as low as 20%. Note that this Figure refers to a period before the 4MMC[6] market area – encompassing the Czech Republic, Hungary, Romania and Slovakia – was merged into the rest of the European market in June 2022. It is to be expected that the 2023 data,

[6] 4-Market Market Coupling.

when available, will show full efficiency also on the borders between these two previously-separate areas.

The EU Agency for the Cooperation of Energy Regulators (ACER) has been tracking the level of efficiency in the use of the cross-border interconnectors over the last ten years. The following Figure shows that the overall level of efficiency in the use of cross-border interconnectors has increased from 61% in 2010 to 88% in 2021, and that most of the improvement occurred between 2010 and 2014. Interestingly enough, the Guidelines on Capacity Allocation and Congestion Management[7] , containing the provisions requiring markets to be coupled and governing such coupling, were only adopted in 2015, therefore after most of the benefits from the pan-European integration of the electricity day-ahead markets had already been achieved and delivered benefits to European electricity consumers.

Efficiency in the use of cross-zonal capacity in the day-ahead market



Source: ACER Monitoring Report – Electricity Wholesale Market Volume, various years.

And here comes the second aspect which I believe has been instrumental in the success of electricity market integration in Europe and in delivering benefits to European consumers: the decision, back in the mid-2000's, at the same time as the ETM was debated, to promote its voluntary implementation at regional level, in parallel to the development of the formal rules. This was achieved through the establishment of the

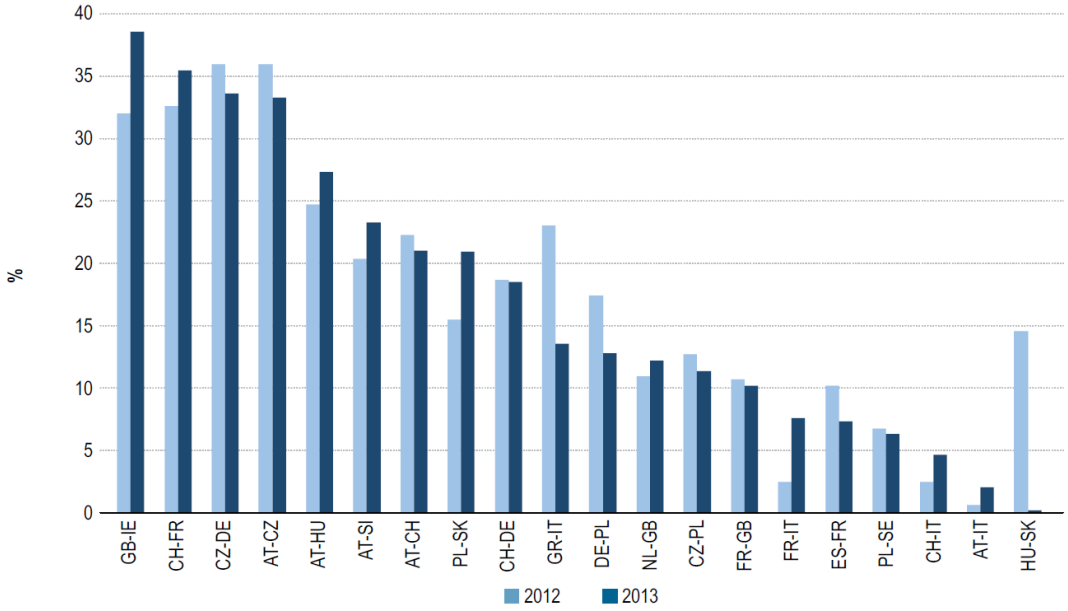
[7] Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management.

Electricity Regional Initiative (ERI), and its seven regions. The ERI was launched in 2006 by the European Regulators Group for Electricity and Gas (ERGEG) and was based on a cooperative approach among national regulatory authorities, transmission system operators, power exchanges and other stakeholders in the different regions. The ERI implemented a bottom-up approach to the integration of the Internal Electricity Market, in the sense that it brought all market participants together notably to test solutions for cross-border issues, carry out early implementation of the EU *acquis* and come up with pilot-projects which could be exported from one region to the others. It was this regional experimentation which provided valuable input for the rules which were being developed at that time. The ERI, and the pilot projects within it, many involving the coupling of markets at the regional level, also allowed the market integration to progress even before the formal rules requiring it were adopted, thus allowing benefits to be delivered to consumers earlier than it would have been otherwise the case.

In fact, more efficiency in the use of the cross-border interconnectors delivered by market coupling means lower costs for electricity consumers, as the cheapest resources are harnessed to meet demand. In this respect, it has been estimated that the improvements in the use of cross-border interconnectors in the day-ahead market timeframe have already delivered gross welfare benefits in the order of 1 billion euro per year, and likely more during the recent crisis.

For example, still in 2012-2013, on many borders which were not 'market coupled', power was flowing in the 'wrong' direction for a sizable proportion of the time, as shown in the following Figure. This was estimated to cost European electricity consumers, in terms of foregone welfare benefits, in the order of 300-350 million euro per year.

Percentage of hours with net day-ahead nominations against price differentials per border in 2012 and 2013



Source: ACER/CEER Annual Report on the Results of Monitoring the Internal Electricity and Natural Gas Markets in 2013.

The success in creating the largest integrated electricity market in the world and in delivering significant benefits to consumers should however not create any complacency on the fact that much still needs to be done. Recent estimates provided by ACER indicates that, over the last years, the market integration process has delivered annual benefits, mostly from cross-border trading, in the order of 18 billion euro a year, rising to 34 billion euro in 2021[8] due to the increase in the electricity prices and the widening of the price differentials. However, further welfare gains could be obtained, in the order of 300 billion euro over the next decade, "from keeping market integration at pace, including coordinated security of supply and increased cross-border capacity"[9] . The latter aspect has been the focus of much attention by European regulators and policy-makers in the run up to the Clean Energy for All Europeans Legislative Package

[8] ACER's Final Assessment of the EU Wholesale Electricity Market Design, April 2022, Section 3.3.1, available at: https://acer.europa.eu/Official_documents/Acts_of_the_Agency/Publication/ACER's%2520Final%2520Assessment%2520of%2520the%2520EU%2520Wholesale%2520Electricity%2520Market%2520Design.pdf.

[9] ACER, Wholesale Electricity Market Monitoring 2021, Progress of European electricity market integration, January 2022, available at: https://acer.europa.eu/Official_documents/Acts_of_the_Agency/Publication/ACER%20Market%20Monitoring%20Report%202020%20–%20Electricity%20Wholesale%20Market%20Volume.pdf, page 2.

and during its implementation. In fact, it has become clear that, despite the progress in coupling national markets in the European Internal Electricity Market, especially in the day-ahead timeframe, thus allocating the capacity made available to the market in the most efficient way, as shown above, only a fraction of the capacity which could safely be allocated to the market is, in fact, made available for commercial cross-border exchanges. One of the main reasons for this limitation has been identified in internal congestion in the different market areas, which, as it cannot be addressed through congestion management procedures[10] , is dealt with by reducing cross-border capacity. Internal congestion also often results in loop flows, which reduce the commercial capacity available to the market in the cross-border interconnectors.

The discrimination of cross-border flows to the advantage of within-area flows is clearly against the principle of the EU Internal Market. There are three main ways for addressing this situation: in the short-term, through remedial actions; in the medium term, through a reconfiguration of market areas (also known as bidding zones); in the longer run, through the expansion of the capacity of the network, including of congested internal network elements. In fact, the optimal approach is probably a mix of all three measures, based on a cost-benefit analysis. However, in the past, transmission system operators and national regulatory authorities often preferred to limit cross-border capacity – thus foregoing potential benefits – rather than incurring the costs of remedial actions or of transmission capacity expansion, and imposing them on consumers, or facing the political opposition, especially in some countries, towards the possibility of different wholesale electricity prices emerging in different parts of the same country[11] . Legislation has now set a 70% target for the share of the cross-border capacity to be made available to the market and a 2025 deadline for this target to be achieved on all borders of all Member States[12] . Therefore, national authorities would have to decide which set of measures, including the ones highlighted above, to adopt in order to comply with the target. A first Bidding Zone Review, carried out in 2017-2018, delivered

[10] It is a defining feature of a market (price) area in the European zonal structure of the Internal Electricity Market that unlimited transmission capacity is assumed within each area as no congestion management procedure is applicable.
[11] Note that Denmark, Italy, Norway and Sweden are already divided in several market price areas, even though in Italy an 'averaging' mechanism ensures that those market participants buying in the day-ahead market face the same wholesale price, irrespective of where electricity is consumed.
[12] Regulation (EU) 2019/943, in particular Articles 15 and 16.

inconclusive results. A second one was initiated in 2019, but it has not yet been completed.

In the meanwhile, the sharp increase in gas and electricity prices, since the summer 2021, exacerbated by the impact on energy markets of the unlawful aggression of Ukraine by the Russian Federation prompted some commentators and policy makers to propose reforms of the electricity market, including in the day-ahead timeframe. In particular, there were calls for abandoning the current 'pay-as-cleared' pricing mechanism in favour of the 'pay-as-bid' mechanism[13] . This is not the first time that this issue is raised, and it has been solved already many times in favour of the 'pay-as-cleared' mechanism, the only one which delivers, under normal competitive conditions, an optimal market outcome. Fortunately, this time again, the debate which has followed those calls has clarified that the higher electricity prices witnessed in the last eighteen months were not due to the pricing mechanism of the day-ahead market. In fact, the electricity market was functioning properly, with the prices reflecting the relationship between demand and supply. It is however true that the current short-term markets – the day-ahead and the intra-day markets – should be complemented by longer-term instruments, to reduce the risk for market participants associated with the variability of short-term prices and for investors associated with the price levels over the investment horizon. But this a topic for another article.

[13] In the so-called 'pay-as-bid' pricing mechanism, each dispatched resource is paid (or pay) the price that it has offered (or bid) into the market.