

# ***Review of the Electricity Market Design in the Context of the Energy Union: The Role of Regions***

***Project report***

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The project, within the framework of which this report has been prepared, has received the financial support of a number of CERRE members. As provided for in the association's by-laws, it has, however, been prepared in complete academic independence. The views expressed in this CERRE report are those of the author(s). They do not necessarily correspond to those of CERRE, to any sponsor or to any (other) member of CERRE.



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## Executive Summary

In this CERRE research project, we have sought to examine the regions aspect of the Energy Union proposals and to assess if a model for regional development is desirable and can be made to work. We have looked at the three main aspects of the Internal Energy Market (system development or infrastructure, system operation and the market itself), the history of regional development to date and the potential for more mandatory regional developments in the future. In order to make the scope of the paper more manageable, we have not looked at specific power production issues such as generation mix, hydro rights or capacity remuneration mechanisms.

Our main recommendations and conclusions can be summarised as follows:

- There is no 'one size fits all' solution to the regions issue.
- Either via the network code obligations, or on the basis of past or future voluntary arrangements, there seem likely to be a range of solutions to the regions question, with the solution differing between the areas of infrastructure, market and system operation. This is partly due to a current lack of agreement on the way forward on a number of areas (for example, capacity calculation zones in the Capacity Allocation and Congestion Management (CACM) Code) but also due to the highly political nature of regional co-operation.
- Whilst the market area in the form of the Market Coupling of Regions (MRC) project can be viewed as the most mature regional development, it is also too big a region to act as a framework for other aspects of the Internal Energy Market (IEM). It is, however, imperative that any regional structures that do emerge do not threaten the on-going development of MRC, which now covers 85 per cent of the EU market and is widely supported by all players and policy-makers.
- The emerging Regional Security Co-ordination (Regional Service Providers or RSPs) organisations, which were first developed on a voluntary basis by TSOs and are now a requirement of the System Operation Guideline, may well offer one possible route to define the regional future. As these groups become part of the EU landscape by 2018, it seems that they could become a focal point for regional co-operation among the TSOs and a key part of facilitating future IEM development, as solutions are found to, for example, the capacity calculation issue, and the outputs the RSCs are charged with become established parts of the IEM. While it is much too early to draw comparisons between Independent System Operator (ISO) type structures and the RSCs, this may well be an area for future CERRE study should policy-makers revisit the ISO question.
- In terms of infrastructure development, we conclude that there is broad support for the current Ten Year Network Development Plan (TYNDP) process and its further development,

but that is not to say there is nothing further to do in this area. For example, the newly reformed North Seas Countries group may be a catalyst for the Member States to make some progress in establishing better regional co-operation in the North Sea basin and identifying what infrastructure is required for these Member States collectively to benefit for greater interconnectivity among themselves. Difficult questions remain here, such as sharing the costs and benefits of such infrastructure developments as major investments between two Member States may offer benefits and costs not just to those two Member States but also some of their North Sea neighbours.

- The lack of consensus and the highly politicised nature of regional co-operation make it unlikely that a clear governance structure can emerge at present from the regional debate. Our analysis on governance considers the position too fluid to make recommendations, seeing some organic development of the current co-operation among national regulatory authorities being more likely than the emergence of regional regulators or a pan-EU regulator. Nevertheless, the Commission's Winter Package (The Clean Energy Package) proposes a regional level of governance that does not exist today, moving responsibilities away from national TSOs to regional ROCs, which will be overseen, not by Member State governance, but by independent NRAs acting in regional groups under the umbrella of ACER. In any case, the most positive regional co-operation, not surprisingly, will emerge from those Member States with more similarities in the challenges they face and with the historic experience of benefitting from regional co-operation.
- The regions question remains an essentially political question to the extent that any regional development of a mandatory nature impacts upon security of supply responsibilities that remain a Member State competence. Unless Member States are prepared to accept some dilution of this paradigm, regional co-operation is likely to remain more voluntary than mandatory in nature, at least in terms of its governance. The fate of the Winter Package governance proposal will therefore be critically dependent on the willingness of Member States to give up competence.



## 1. Introduction

Since the launch of the Energy Union proposals in February 2015, the development of regions within the Internal Energy Market has been seen as a central part of the package. It has been considered a potential bridge between the historic national electricity markets and the EU-wide single Internal Energy Market envisaged by drafts of EU legislation, most recently the Third Internal Energy Market Package of 2009.

Whilst there has been general support across all actors for the Energy Union proposals, more recently significant differences of view have developed over the extent of the regional dimension of the proposals, in particular the issues of responsibility for security of supply (in the sense of real-time operation of the TSO networks in the EU) and the extent of the role of Regional Service Providers (RSPs) launched by ENTSO-E at the end of 2015.

The regional issue involves a number of complex questions. What is the optimal regional structure? Should one aim for a uniform structure, or should there be layers of different structures for various responsibilities and functions? Should regionalisation be seen as “stepping stones” for continued integration (towards the EU wide single Internal Energy Market), or will regionalisation instead put a freeze on further development?

This study takes as part of its backdrop the mandatory Network Codes that are being developed under the Third Package – in other words it assumes the Network Codes continue to develop in parallel with any regional proposal. A number of these codes, notably those relating to Capacity Allocation and Congestion Management (CACM) and System Operation, have significant regional aspects in their implementation that may well interact with any regional proposal.

This CERRE study into the implementation of the review of the market model design at EU level seeks to analyse the regions questions by examining the history of regional cooperation to date, considering the broader rationale for regionalisation and suggesting where more mandatory regional cooperation might be best targeted for the benefit of the EU electricity consumers as a whole.

The finalisation of the CERRE project on the role of regions in relation to the Energy Union proposals has coincided with the launch of the EC Winter Package on 30 November 2016.

The Winter Package is an extremely substantive set of legislative proposals running to well over 1000 pages and ranging from directional guidance to quite detailed proposals. The content – to highlight just a few areas – seeks to link energy policy with the Paris climate agreement, proposes changes to the treatment of renewable generation sources in the market, further develops the electricity target model, foresees a greater role for consumers in the market, enhances powers for ACER and introduces many new responsibilities for ENTSO-E and a new formal EU level body for



DSOs. Furthermore, there is a distinct character of enhanced regional co-operation throughout the package. Given the size of the package, it would be impossible to address it in detail. We concentrate instead on one of the main regional proposals in the package to illustrate how the Commission seems to wish to challenge and develop existing institutional arrangements and the balance between Member State and EU level competences, be the latter at a regional or EU wide level. The proposal we concentrate on is set out across Articles 31 to 44 of the revised Electricity Regulation and aims to introduce Regional Operational Centres (ROCs) to bring about greater regional co-operation in respect of system operation.

The rest of the report is organised as follows. In the next section, we briefly summarise the current Internal Energy Market paradigm, before, in the subsequent section, giving an overview of what has happened 'regionally'. In the three following sections, we provide a principled discussion of gains from integration, criteria for defining regions and various dimensions of the regional issue, including responsibilities, functions and instrument. Taking the current regional structure, as well as the underlying principles, as starting points, we thereafter discuss the prospects for a more mandatory regional future. We end with a section on governance, before providing our conclusions in the final section.





## 2. The Current Internal Energy Market Paradigm

In considering how the Internal Energy Market should move forward it is perhaps best to remind ourselves of the paradigm that underpins today's Internal Energy Market, as that will help us to understand the issues that need to be managed in reforming the market and developing it onto a regional footing.

Looking at the Internal Energy Market at the time of the introduction of the Third Package in 2009, the paradigm was one of a series of national markets, covered by an EU umbrella of rules sitting over them in relation to cross-border trade. Market coupling, which has been seen as one of the major successes of the Internal Energy Market, began with the coupling of the national markets in the Nordic region in the 1990s, before extending into the Central West area of the EU (France, Germany, Belgium, Netherlands, Luxembourg) and then to Great Britain. Whilst this market-coupled area represented some 60 per cent of the EU electricity market (by proportional size of electricity demand), it was still characterised by national regulatory authorities (NRAs) and national transmission system operators (TSOs), with voluntary agreements between these sets of organisations underpinning the extension of the market-coupling project. The market coupling also of course only applied to one timeframe of the so-called Target Model, the Day Ahead timeframe, which, the Nordic area aside, typically accounted for 10-15 per cent of the cross-border capacity trading, with the remainder being traded via explicit capacity auctions albeit with increasingly harmonised rules and principles underlying those explicit auctions.

What impact did the Third Package have on this emerging regional market? In short, it did have a potentially far-reaching and significant impact in terms of introducing a more mandatory set of arrangements that could govern the future development of the Internal Energy Market. By creating ACER and ENTSO-E, the Third Package created obligations on national regulatory authorities and TSOs respectively, to cooperate and coordinate via the two new quasi-EU bodies.

However, since the introduction of the Third Package and its subsequent coming into force in 2011 there have been many differing views, not least among the national regulatory authorities and the TSOs themselves, on the scope and the strength of those obligations, in the sense of how far those should and could go in terms of bringing about a more mandated development of the Internal Energy Market. For example, ACER, despite being an EU Agency whose Director is appointed by the European Commission, is governed by an Administrative Board of Member States and a Board of Regulators composed of the national regulatory authorities across the Member States of the EU.

In summary, even after the implementation of the Third Package in 2011, the Internal Energy Market remained a largely national construct linked together by a set of EU-wide rules which at this time (pending the implementation of the Network Codes) had limited or no mandatory effect other



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than via the coordination and cooperation obligations based on national TSOs and regulatory authorities through their membership of ENTSO-E and ACER.



### 3. What Has Happened ‘Regionally’?

Some may argue that very little has been achieved regionally in the electricity market, an argument which might be regarded as unsurprising given the dominance of a nationally based model in the EU electricity market before and after the implementation of the Third Package. However, we would argue that quite a lot has been achieved in creating what could be considered to be a regional market within the North West Europe footprint and its extensions to the Iberian Peninsula and Italy in recent years. That said, it is mainly in the market areas that a more regional aspect has been successful, although not exclusively so. The area of system development (planning of the networks including cross-border interconnection between the national systems) has seen significant regional cooperation in the production of the Ten Year Network Development Plan (TYNDP) and the production of generation and system adequacy assessments in the longer term as well as for the summer/winter periods each year.

Undoubtedly, as many observers have argued, the Third Package has given an impetus to regional cooperation, even if, as pointed out above and which we will examine further below, that still relies on obligations on TSOs and national regulatory authorities that are open to interpretation. However, ahead of the Third Package, the first major steps towards a regional market in North West Europe (NWE) had already been taken. These took the form of coupling markets together at the day ahead stage.

It began in the Nordic region, as far back as the mid/late 1990s, and then developed across the Central West Europe (CWE) region (France, Benelux, Germany). In 2010, the Nordic and Central West Europe regions came together to create the North West Europe Day Ahead market-coupling region, which was soon joined by Great Britain whose ‘go-live’, after months of preparation, came about in February 2014. By this stage, the North West Europe market covered in excess of 60 per cent of EU demand. Spain and Portugal joined this expanding region in May 2014. Italy joined the region in February 2015, by which time the NWE acronym was changing to Multi-Regional Coupling (MRC) and it now covered 85 per cent of the EU market. The next stage of the Multi-Regional Coupling journey has moved to the Intraday time frame.

Whilst these latter stages of the Multi-Regional Coupling project did occur under the umbrella of the Third Package, they were still largely voluntary developments among TSOs, power exchanges, national regulatory authorities and Member States, with often bilateral agreements between TSOs and national regulatory authorities having to be relied upon for cost recovery of the IT and other system changes required.

The extent of cooperation on a voluntary basis is not just limited to the market arena. In particular, TSOs cooperate on a range of issues, both within and outside of ENTSO-E.



ENTSO is structured around 3 disciplines: System Development, System Operation and Markets. The first two of these are seen as largely technically dominated disciplines, while the third is seen as a discipline that provides the market layer that sits above the technical reality and more readily transcends traditional boundaries than technical matters, which tend to concentrate on national or technical boundaries. Nevertheless, from a market perspective we may see all these three disciplines as ensuring that trade is, respectively, feasible (System Development), secure (System Operation) and efficient (Markets).

The System Development groups are The North Sea, The Baltic Sea, Continental Central East, Continental South East, Continental Central South and Continental South West, while the System Operation groups are Ireland, UK, Baltic, Nordic and Continental Europe.

The Market discipline does not have defined regional groups but is structured around the prevailing market paradigm – North West Europe or Multi-Regional Coupling – and the current major time frames of that market (major in terms of market coupling, that is) namely Day Ahead and Intraday. The other regional aspect of this discipline could be considered as the Bidding Zone review group, another issue, as discussed below, which should be considered when thinking about what are the ‘right’ regions and what makes a region.

What do these groupings tell us about the characteristics of a region and how one might develop the definition of the right regions? Taking the System Development groups first, these are a mix of history and more recent European Commission/Member State initiatives like the Baltic Energy Market Interconnection Plan (BEMIP) and the North Seas Countries Initiative. The North Seas group broadly mirrors the North West Europe market footprint, while The Baltic Sea represents the issues of trying to physically integrate the Baltic countries into the EU electricity infrastructure away from the former Soviet Union infrastructure. The other groups reflect in part the peculiarities of their region: Continental Central East looking at how loop-flow issues around Germany might be managed via investment solutions; Continental South East looking at how the newer systems of the EU can be brought into the more developed regions; and Continental Central South and Continental South West considering the relative weak inter-connectivity of the countries that border Italy and the Iberian Peninsula with the rest of the Continental block. A more simplistic but equally valid explanation of these groupings is that they are just trying to break tasks like the Ten Year Network Development Plan into more manageable groups of countries, many of which were already engaged in regional cooperation of some sort.

Turning to the System Operation discipline, the regional groupings reflect the synchronous areas of the EU transmission network; that is, they are interconnected in general by HVDC cables that enable trade to occur between these systems, but the networks themselves operate in technical isolation from each other (e.g. a fault in UK or Norway will not impact the Continental system). As we return to below, in many respects these can be considered the most obvious (and technically sound, in that



they 'respect the physics') regions but they are also very conservative, as they could be viewed as representing, at best, the status quo or, at worst, a desire to see nothing develop beyond that status quo.

In addition to the cooperation in the ENTSO-E System Operation groups, TSOs have created operational coordination centres to provide more operational co-operation on system operation issues.

The two longest-standing coordination centres are Coreso and TSCNet. Coreso, based in Brussels, was formed in 2008 between the Belgian and French TSOs, with the Great Britain TSO joining a few months later, followed by Italy (Terna) and Germany (50Hz) in 2010, Portugal (REN) in 2015 and Spain (REE) in November 2016. TSCNet, based in Munich, was also formed in 2008, and has TSO members from Germany, Austria, the Czech Republic, Slovenia, Croatia, Denmark, Hungary, Poland, Switzerland and the Netherlands. These organisations perform similar 'ahead of real-time' analysis for their members of system conditions, post-event analysis, wind pattern studies and so on.

In December 2015, these organisations were given an even more meaningful role when ENTSO-E appointed Regional Security Coordination Service Providers (RSPs) as part of its on-going system operation coordination activity. In effect, this step saw the European TSOs (within the framework of ENTSO-E) define the services to be provided by these regional bodies and place obligations on ENTSO-E members to also be members of RSPs.

Whilst this development raises several questions about multiplying the number of organisations involved in TSO coordination, and thus complicating how that coordination is delivered, it does of itself demonstrate a major step forward and one which the TSOs will find it hard to row back from. At a policy level, these developments merit close examination in terms of how the market will evolve as the RSPs could, and do, carry out a range of duties central to the operation of the market.

Other groupings that have been utilised previously include the regional initiatives that ran in parallel with the development of the Third Package. However, it seems that most commentators would agree that things have moved on considerably since then so adopting or developing these groupings of regions no longer appears appropriate.

Regions have also become a feature of the on-going Network Code developments, particularly the code on Capacity Allocation and Congestion Management (CACM) that requires the establishment of Capacity Calculation Regions. In October 2015, ENTSO-E proposed 11 such zones to fulfil this requirement of the network code; in November 2016, ACER determined that there should be 10 zones. We have also seen early implementation projects develop on a regional level as part of the balancing guidelines, such as the Trans European Replacement Reserves Exchange (TERRE) project.



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So to conclude, before considering what a more mandatory regional future might look like, the extent of regional cooperation to date should not be underestimated and, indeed, could well form the starting point in determining how to move forward on a more mandatory basis in the context of the Energy Union and beyond what is already envisaged in network codes.



## 4. Gains from Cooperation and Integration

Before considering ways to realise gains from further cooperation and integration of the European electricity industry, we should remind ourselves what these gains are.

One set of gains relates to generation efficiency. Firstly, integration of technologies with different and complementary characteristics enhances their combined output; an obvious example is different types of renewables, where storable hydro may be used to balance variation in output from intermittent resources. Secondly, a more integrated network allows for locating generation capacity where it is best suited; again, renewables may serve as an example, given the differences in quality (say, wind and sun conditions) across locations in Europe.

A second set of gains relates to security of supply. By pooling resources across a wider geographical area the system becomes more resilient against variations (or failures) in the input or output of individual units. Furthermore, in a more integrated industry, system operators have access to a larger amount of balancing resources and reserves.

A third set of gains has to do with competition. A stronger network effectively expands the market area and brings more players into direct competition with each other, thereby putting a stronger pressure on costs and for efficiency. Also, a larger market with more players provides greater liquidity and trading opportunities.

As far as we are aware, there have been few, if any, attempts at quantifying the overall gains from integration of the European electricity industry. The few studies that exist typically concentrate on either a narrow set of gains or consider only smaller regions. One of the more recent studies, and perhaps also one of the best, is Newbery, Strbac and Viehoff (2016). The authors consider market-coupling across Europe, finding that the annual gains amount to 2.4 billion euros per year, or two-thirds of the current gains from trade across borders.<sup>1</sup> About half of the gains derive from the day-ahead market, whereas most of the rest comes from sharing of balancing resources.

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<sup>1</sup> Measured relative to the population of Europe, the gains amount to EUR 4 per capita per year.



## 5. Criteria for Defining Regions

How can the gains from integration best be realised? To some, the answer may seem obvious: by a complete integration of the whole of Europe, with a single market, a European TSO (or ISO) and a European regulator. Indeed, that is one way of interpreting the (ultimate) goal of the Internal Energy Market and the Target Model.

As we discuss further below, such a completely integrated solution may not be possible, or even desirable, and so the question becomes whether some alternative solution could be achieved, with a regional structure. What would be the criteria for defining such regions? We can think of a least three: technical (synchronisation, interconnection), economic (economics of scale and scope, externalities and competition) and governance (responsibilities and liabilities, regulation and institutions).

From a technical point of view, synchronised areas must to some extent be considered as regions: threats to system security affect the whole synchronous area, but not necessarily those of neighbouring areas. Thus, there may be good technical arguments to suggest that these are the most appropriate regional groupings for the EU networks.

However, while they might respect the physics, the synchronous areas do not correspond to how markets are integrated, as the Nordic Region, and indeed the whole market-coupling process, demonstrates. Moreover, these groupings do not represent the reality of where the EU synchronous networks are headed, namely a much more heavily DC interconnected series of networks with considerably greater impacts upon each other than has been seen before. If we take interconnections in the coming years to and from the UK as an example (the UK being a synchronous island), by the early 2020s DC interconnectivity to and from the UK will have increased from 3 GW to around 10 GW, creating a 'swing' effect of around double that capacity on the Continental and UK systems in a major fault scenario or a scarcity scenario in either network. This physical fact means that the two systems must cooperate more closely in some form to manage this new world, especially when all the interconnector capacity is within the Multi-Regional Coupling market area and will significantly increase the scope for trade in that area. The TSOs could choose to achieve cooperation bilaterally on each interconnector (this happens already on the existing DC links) or on a regional basis within the Multi-Regional Coupling market area. Below we will consider how such coordination might well achieve the outcomes that the European Commission seems to desire.

Another way of defining regions based on technical criteria would be to consider the extent of interconnection. However, basing regionalisation on interconnection would undermine the whole rationale for integration, as the example of France and Spain demonstrate; they would fall into





different regions, although gains could be expected from further integrating them. This is not to say that the characteristics of the network will not play an important “regional” role, for example in defining bidding zones.

If technical criteria do not provide realistic guidelines for defining a regional structure what about economic ones?

As we have already alluded to above, there are gains from integration due to economies of scale and scope. Networks will be better utilised if capacities and safety margins are calculated taking wider network characteristics into account, system balancing will become more efficient with more resources, and capacity planning should consider how individual parts affect the wider network. However, economies of scale and scope may be exhausted before complete integration of the European industry is reached, and there may indeed be diseconomies of scale and scope beyond a certain level. Real-time system operations require local knowledge, and complexity and management costs increase disproportionately when operations and organisations go beyond certain limits.

Externalities – when actions taken in one part of the system affect other parts – may provide another type of economic criteria for defining regions. A prime example of externalities is how intermittent generation in a certain area affect power flows and security of supply in neighbouring areas; another example is how capacity availability in one part of the network influences congestion management in another part. Externalities may be viewed as an argument for overall coordination and control; both network planning and system operation should be undertaken with a view to the performance of the entire system.<sup>2</sup> However, externalities also constitute an argument for local control; for example, when responsibility for system security is vested in Member States, system operators need to protect against incidents in neighbouring systems (a consideration that increases in importance with the extent of interconnection).

Security of supply also has a so-called public-good element; ensuring the integrity of the network and the quality of supply provides a valuable service to all users of the network. To the extent that security of supply is better maintained by more centralised system control, the public good element provides an argument for further integration of system services.

As with economic criteria, criteria based on governance do not necessarily lead to full integration as the optimal solution. One consideration is regulation of the natural monopoly activities related to networks and system operation. Such regulation may benefit from information about the

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<sup>2</sup> In principle, externalities may also be handled by market mechanisms; for example, a negative externality may be internalised by the introduction of a tax on the relevant decision-maker. In practice, however, it is difficult to see that externalities arising in electricity networks can fully be resolved through such mechanisms.



performance of comparable organisations, along dimensions such as quality, efficiency and costs. This type of information may be used for benchmarking exercises (as is to some extent being done in Europe at the moment), or even in the design of incentive schemes (what in the economics literature is termed “yardstick competition”). However, to be of real benefit, the European electricity regions would have to be designed so as to be truly comparable; that would likely be difficult.

An alternative set of criteria based on governance considerations would be what might, perhaps somewhat imprecisely, be termed “similarities” (even if there may be some questions around using such non-objective criteria). As has been argued by ENTSO-E, and as we will discuss in more detail below, it is likely to be easier to establish true cooperation and coordination in regions that consists of Member States that share history, proximity and trust; this is particularly important if regions are to be responsible for more overarching policy issues. Moreover, similarities in market conditions and maturity are likely to foster cooperation, whereas such might be difficult to achieve if markets are at very different stages of development. An obvious danger of basing the regional structure on similarities is that one may encourage a “multi-speed” Europe, thereby also creating obstacles to further integration across “dissimilar” regions.



## 6. Responsibilities, Functions and Instruments

A regional approach to the electricity industry cannot be one-dimensional; at the very least, it has to distinguish between responsibilities, functions and instruments. Responsibilities include both adequacy and security of supply (including liability for compensations); functions necessary to fulfil these responsibilities include capacity calculation, system operation and infrastructure planning and investment; the instruments to perform these functions may include direct interventions (such as demand or supply curtailment), contractual relations (e.g. contracts for interruptible demand or supply) and markets (such as balancing markets).

A first question is how “deep” regionalisation should go. The “deepest” level would involve complete integration of responsibilities, functions and instruments, with an effective merger of TSOs. The shallowest form of regionalisation would be mere cooperation where only instruments are integrated (such as joint balancing markets and sharing of reserves), based on voluntary agreements between independent TSOs. An in-between solution would be coordination, where responsibilities remain with independent TSOs, but regional coordination bodies take over functions and the instruments required to perform these functions.

A second question is whether the same regional structure should apply to all dimensions. As described above, and as we return to immediately below, there currently exist a number of different regional structures, for capacity planning, system operations, markets and overall policy coordination. A set of different regional structures would allow each structure to be tailored to the specific responsibilities, functions and instruments, but might also lead to a complex web of regions that would be difficult to oversee and govern. A “cleaner” solution would involve a single set of regions, albeit at the cost of not necessarily being well matched to any of the underlying responsibilities, functions and instruments.

The question of single or multiple regional structures is closely linked to the question concerning the process of regionalisation. One could argue that the most efficient process would be a “big bang” reform, where one goes directly to the final design; this would free the regional structure from history dependence and mean a one-time realisation of transition costs. A more gradual approach would keep the final design as the defining goal, but would mean disentangling the new design more slowly from the current historical structure, as well as a more continual realisation of transition costs. A third, and completely different, approach would be “organic”, based on voluntary participation, without a defined pace or a final solution, and consequently history-dependent, but perhaps with little or no cost of transition.

A further question concerns the measurement of performance. How should one assess whether or not a region performs well? Ideally, we would want a set of performance indicators that allows us



not only to judge the performance of individual regions, but also to compare performance across regions. Clearly, measures of performance would depend on the regional structure, in particular the allocation of responsibilities, functions and instruments across regions. On the other hand, performance measures should also help in shaping the regional structure itself.

Finally, there is the question of how the regional structure should relate to the structure of regulatory governance. One option would be to keep the current regulatory structure – with national regulatory authorities cooperating and sharing responsibility with a European level regulator – which would mean that, with multi-national electricity regions, there would be more regulators than regions; the Nordic and Irish experiences suggest that this is not an impossible model. Nevertheless, perhaps a more natural model would be direct correspondence between industrial and regulatory structure; that is, one regulator per region. Such a model would require transfer of power from Member States; of course, it would not be compatible with a multi-layered regional structure of the industry. A model with a single, European-level regulator would also require transfer of power, but would be compatible with any regional structure of the industry.



## 7. A More Mandatory Regional Future?

So, where might it be appropriate to make regional integration more mandatory? How “deep” should such regionalisation go? And what should be the regional structure? In considering these questions, we contrast the above principles with the current state of the industry; in particular, we consider what areas regional integration should concentrate on and which criteria should be emphasised when identifying a region.

We start by considering whether mandated regional cooperation is required for further developing the market.

As far as the Day Ahead market is concerned, significant developments have been made, and the coupled region now covers about 85 per cent of the European market. The next stage of the Multi-Region Coupling journey has moved to the Intraday timescale, arguably one of the most important aspects of the electricity Target Model, as more and more intermittent sources of generation join the generation mix and indeed at times dominate it. This intraday project – called XBid – has begun to expose the voluntary nature of the regional market development with some TSOs being asked to absorb the impact of zero-pricing of capacity (or negotiate with local national regulatory authorities how to manage this issue) as the pricing element of XBid will not be introduced in the initial phase of the project.

This is just one example of the absence of a mandatory regime and the related governance to manage such developments, but others would include the role of power exchanges in a project like XBid and how to police or regulate the power exchanges when they sit outside the current regulatory framework as competing entities. The European Commission has therefore had to rely on ENTSO-E leading the project and managing the power exchange problem even if ENTSO-E has little more ability to do so than the European Commission or the national regulatory authorities. It remains to be seen whether this model of voluntary cooperation can achieve the integration of the European wholesale markets, or whether a more mandated approach is required (this can be considered as now happening with the intraday market being embedded within the CACM code).

Second, what could be gained from pushing for more regional cooperation in infrastructure planning and investment?

Policy-makers have made significant efforts to assist greater cooperation in planning and infrastructure development. This ranges from the Ten Year Network Development Plan – one of the major obligations on ENTSO-E and one of its most resource-intensive activities – to the related Projects of Common Interest and the financial assistance available to those projects, to the more recent Juncker plan and related initiatives (e.g. European Fund for Strategic Investments). ENTSO-E has quite settled regions for its planning activity (cf. the regional groups within the network



development topic), and at a high level these seem to be working well. There are many high-profile interconnector projects in development or construction and the problem here does not seem to centre on a lack of desire to cooperate, but rather on more long-term common EU wide problems of permitting and planning issues which seem to impact all major energy infrastructure projects. A push for further regional cooperation in this space does not seem necessary or value adding to what is happening already, as policy-makers would seem to have the tools they require in this area via the Third Package and ENTSO-E continues to progress and develop its Ten Year Network Development Plan (which is already on its fourth cycle).

Third, what of more regional cooperation on system operation?

At first glance, system operations (the within-year up to real-time operation of the TSO networks) seems to be self-evidently a key area for regional cooperation (cf. the discussion above about technical and economic arguments for integration) and, as we have seen, the TSOs have done quite a lot in this space already. However, there remains no mandatory framework save for the rather general obligations in the Third Package to cooperate and coordinate (the recently adopted System Operation Guideline should change this). If the European Commission wishes to push cooperation in this area, one could question the wisdom of this, given the close links to security of supply and the ability of the TSOs (rightly or wrongly) to link developments in the system operation area to a supra-national interference with Member State competences on security of supply.

Indeed, it is important to understand why system operation might be viewed as the area with less obvious regional cooperation than areas such as market development and system and capacity planning. Critics would argue that this is a defensive behaviour among the TSOs, who see system operation as the last bastion of the engineering expertise and a railing against the move away from national markets to regional markets or an EU-wide market and indeed against seeing the long-term planning of the various individual networks within ENTSO-E in a more EU wide context. Whilst it is undoubtedly true that the TSOs are protective of the system operation aspect of their activities there is an obvious reason behind this. Security of supply, which lies at the heart of the system operation activity ("keeping the lights on"), remains a Member State competence within the EU framework no matter how hard (and with some justification) the European Commission may argue that security of supply has an increasing regional or EU-wide context, with issues such as the implications of widespread renewables roll-out or individual Member State decisions on generation mix being difficult if not impossible to manage within a national boundary. Recent decisions in Germany, to phase out nuclear power and at the same time to continue with a renewables programme the results of which cannot be contained within their own network in terms of transferring wind-power to southern German load centres, is an obvious, but not the only, example of this. Yet the fact remains that while Member States remain opposed to any changes to security of



supply remaining a national competence, it is hard to see TSO attitudes changing as those same Member States look to the TSOs to discharge their security of supply obligations.

Nevertheless, the stakeholder community will undoubtedly continue to push the European Commission to do more in relation to increasing the pressure on TSOs to develop their cooperation on all fronts. This will inevitably raise the question of whether some form of Independent System Operator (ISO) should be created at regional or EU level. This is something of a cyclical question: the European Commission examined the ISO question in some depth in the lead-up to the Third Package, initially favouring the model from an unbundling perspective before relegating it to the last option among the unbundling choices when the package was finalised. The national dimension for security of supply means of course that responsibility for system incidents (such as the 2006 incident on Continental Europe) sits at a national level, typically with the TSO. With responsibility comes liability for compensation for the consequences of the incident, whether this relates to end consumers or neighbouring TSOs impacted by the incident. Moving real-time system operation to ENTSO-E or an ISO type entity away from national TSOs means that that new body would also have to take on the liability issue. Both these points seem hard to imagine in an EU model where the Member States individually and collectively tend to strongly defend competences that sit with them.

Despite a lot of commentary in the stakeholder community to drastically review the role of ENTSO-E, and to move for some form of ISO organisation at regional or EU level, it seems unlikely that the European Commission would wish to pursue such a path having rejected ISO as its No. 1 option on TSO unbundling some time ago in the lead up to the Third Package. This is to say nothing of the Member State opposition such a proposal would face, given the clear read across to security of supply issues as outlined earlier. The rather chequered history of ISO developments in the US for example, equally does not point to a strong track record of the ISO model in terms of developing markets, encouraging new entrants or indeed facilitating significant transmission investment of a 'cross-border' or 'interstate' nature.

Should the European Commission then turn its attention away from greater cooperation in system operation entirely given these obstacles? Not necessarily, as clearly more can be done to improve cooperation. However, a more indirect approach may deliver more results than a heavy-handed attempt at mandatory cooperation that will fall foul of more generic Member State concerns on 'scope creep' on the European Commission's part.

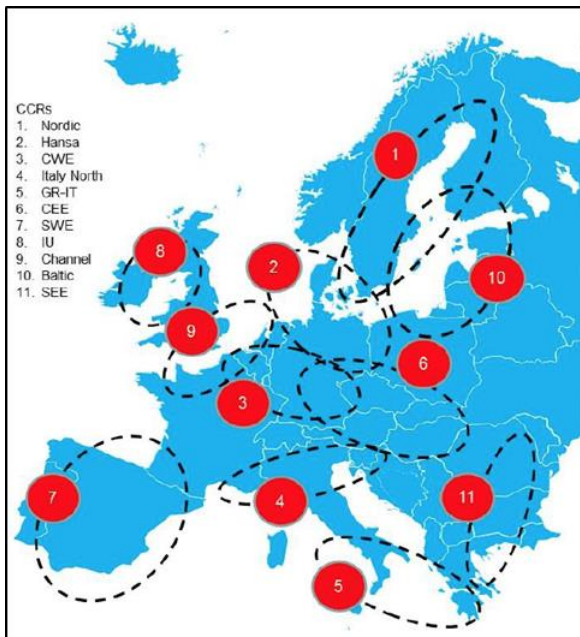
Given the above, it would seem that concentrating on the market area itself could bring the greatest opportunities for real benefits in regional cooperation. As has already been discussed, the Multi-Regional Coupled market can already be considered a 'quasi region', albeit a very large one. It covers up to 85 per cent of EU electricity demand and its on-going development has been supported by successive EU Council conclusions over the years. Member States see a real benefit from a

progressive internal energy market for electricity, ranging from enhanced optionality in security of supply from greater interconnection to reduced wholesale prices from interconnecting with lower price markets.

What other regional constructs could be considered? And what might the characteristics be of such regions?

Two different topic areas offer options for regional constructs, capacity calculation regions and regional TSO co-ordinators. As explained above, in October 2015, as part of the on-going Network Code developments, particularly the code on Capacity Allocation and Congestion Management (CACM), ENTSO-E proposed 11 Capacity Calculation regions zones to fulfil this requirement of the network code. The proposal is illustrated in Figure 1. Could these constitute the new regional framework under the Energy Union proposals? In fact, ACER has recently determined that there should be 10 capacity calculation regions, merging CWE and CEE. Nevertheless we still think it is instructive to look at this experience.

**Figure 1: Capacity Coordination Regions**

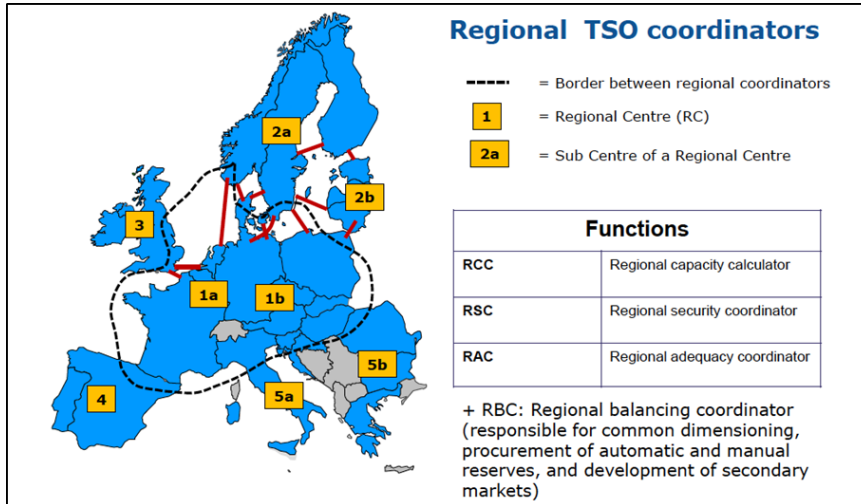


Source: ENTSO-E, 2105b, p.7.

For regional TSO co-ordination, the European Commission has presented a different vision of regions, and a smaller number of regions, as illustrated in Figure 2.



Figure 2: Regional TSO coordinators



Source: Slot, T. and H. Dijk (2015), p.46.

At first glance, these competing proposals from ENTSO-E and the European Commission seem quite different, but are they?

The ENTSO-E proposal can be seen as utilising calculation regions that can be readily made to work today. In essence, these regions will provide the raw data into the market arrangements to determine the capacities used in the market algorithms. Whatever mix of regions emerges from the current debate, the common grid model envisaged by the Capacity Allocation and Congestion Management Code will be used to calculate the capacities for input to the market mechanism.

If one considers the number of new interconnectors that will be built by the early 2020s, it would not be unrealistic to see a development of the Capacity Calculation Regions into a seven-region configuration as follows by 2022: 1. Ireland/UK/Channel/Nordic/Hansa/Continental West, 2. South West (Iberian Peninsula), 3. Baltic, 4. Continental Central East, 5. South East, 6. Italy-Nord and 7. Italy-Greece (GRIT).

The ENTSO-E paper hints at something akin to this set of regions developing in the coming years and indeed also discusses the potential for the current Continental West and Continental East regions to merge (which ACER has now determined should happen), hence reducing the regions listed above to six. The current Multi-Regional Coupling geographic footprint also covers all but three of the seven regions above, so whichever way one looks at this question, the clear direction is to reduce the number of Capacity Calculation Regions as more interconnectors are built and the Multi-Regional Coupling expansion develops.



It is unclear if the regions dimension of the Energy Union is seeking to identify regional groups for the purposes of the Capacity Allocation and Congestion Management Code or regional groups which ACER and ENTSO-E structure themselves around to progress infrastructure, operational or market issues; the latter may themselves become in some way mandatory groupings rather like the original but now defunct, regional initiative areas.

Considering this point, more recently, ENTSO-E has published a paper in response to the regions debate under the Energy Union, in which the TSOs propose regions based on five policy areas, which would run in parallel with the functional groups that already exist. The policy areas would be Market Development and Capacity Mechanism, Renewable Energy Sources (RES) Support Schemes and Energy Mix, Market integration of Renewable Energy Sources, System Adequacy (5-10 years) and Risk Preparedness. Whilst these are clearly all valid issues that need to be addressed as the Internal Energy Market evolves into its next phase, it is not clear how they convert into regional groupings, unless these groupings are to develop based on the criteria set out in the ENTSO-E paper: geographical proximity, interconnections and complementary energy mix, common concerns regarding security of supply and market integrity, market conditions and maturity, manageable size of regions, and, where possible, build on existing regional structures. Similar criteria were applied to the old Member State Regional Initiatives mentioned above. ENTSO-E references the Pentalateral Forum (not hugely different from the Continental Western Europe footprint) and the Nordic region as examples, along with other more recent voluntary cooperation groups mentioned earlier in this paper (such as NSCOGI).

Much of the above also points to the difficulty of establishing stability in regional groupings, an important aspect in the eyes of market players.



## 8. Governance

In terms of potential mandatory governance structures for regions, a model does not exist at present. What should such a model look like? In particular, how should the structure of regulatory governance relate to the regional structure of the industry?

As discussed above, at one end of the spectrum is a structure with national regulatory authorities (possibly cooperating); this model would mean that, with multi-national electricity regions, there would be more regulators than regions. At the other end of the spectrum we have a single, European-level regulator; this model would require transfer of power from national regulatory authorities, but would be compatible with any regional structure of the industry. In between, we have models with, on the one hand, various levels of regional integration and, on the other hand, varying degrees of responsibility sharing between national regulators and a European-level regulator.

With the “patchwork” of regional structures that has developed in various areas – including market integration, network and capacity planning and system operation – and which seems likely to be a feature of the European electricity industry in the foreseeable future, it seems we can rule out a model with direct correspondence between industrial and regulatory structure; that is, one regulator per region. Such a model would not only require transfer of power from national regulatory authorities (i.e. Member States), but would also not be compatible with a multi-layered regional structure of the industry. It seems therefore that the only option would be a development of the current model, based on national regulatory authorities cooperating and sharing responsibility with a European-level regulator.

The current model sees legislation (such as the Network Codes) agreed at EU level (ultimately by the Member States) and implemented nationally. This model leaves a lot of influence with the Member States, influence that one would imagine they would be reluctant to relinquish. This issue combined with the absence of a clear option for more formal regional co-operation would seem to point to the emergence of a clear regional governance model being unlikely at present. Presumably a form of regional governance, were it to emerge, would be based around adapting existing bodies such as ACER and ENTSO-E to have more formal regional groups which mirror each other in some form. To retain the Member State influence some form of overseeing Member State body would also be required. These would be quite significant governance developments which one would imagine would need a compelling benefits case to justify, a case which does not seem apparent at present. Perhaps for this reason the European Commission has proposed that a Member States group – such as the Electricity Co-ordination Group – should be the oversight body for discussing future regional development.



To sum up, there could be a case for arguing that the options in terms of regional structures remain too fluid at present to determine what the mandatory governance requirements might be.

However, the European Commission's Winter Package has now proposed a mandatory model for regional co-operation. Above, we have presented the mandatory requirements in the System Operation Guideline (SOGL) for the TSOs to form Regional Security Co-ordinators, which would be service providers to the TSOs in respect of regional matters. This requirement followed from a TSO proposal in 2015 to develop such bodies on a voluntary basis. We have regarded these RSCs as perhaps the most likely area where further regional co-operation could emerge, as these bodies will be established in the period up to 2018 and then begin to deliver their services to the TSOs in an evolutionary manner. What the Winter Package now seems to propose in its ROC concept is rather more of a revolution than an evolution in relation to the responsibilities of national TSOs, ENTSO-E as the EU body of TSOs and ACER as the EU regulatory body. We will not be arguing for or against the ROC concept, but we wish to examine the governance issues that it raises – as set out in the above discussions on governance – in relation to how this concept might be taken forward at the policy level.

In our discussion on governance, we have been considering how regional co-operation could be developed, looking at options from a single EU wide regulator to looser models where national regulators might co-operate in regional groupings. No regional institutional structure existed in the EU governance model under the Third Package, as the EU wide issues brought in by that package were launched at EU level through legislative proposals approved by Member States and then implemented at national level. The Winter Package – whilst still of course subject to the same legislative process as the Third Package – proposes a significant change to the balance of national and EU level competences. Under the ROC proposal, ENTSO-E must first propose the regions that the ROCs should cover and then the TSOs propose the ROC model for each of those regions. This regional geography is then approved by ACER and mirror regional groupings in ACER effectively regulate the ROCs. The ROCs would be decision-making bodies (not service providers or advisory entities) and would adopt binding decisions on national TSOs in respect of at least the following areas:

- co-ordinated capacity calculation;
- co-ordinated security analysis;
- regional sizing of reserve requirements;
- and the extent of foreign capacity participation in Capacity Mechanisms.

The Winter Package proposal thus introduces a significant shift with regional decisions having precedence over national decisions in respect to a range of matters that closely relate to security of supply. The NRAs (potentially working within the ACER framework) have the potential to extend the



binding decision-making powers of the ROCs. Finally, the NRAs in each ROC have observer status on the management boards of the ROCs.

The ROC proposal thus introduces a regional level of governance that does not exist today. Given the tasks assigned to the ROCs it also moves responsibilities away from national bodies – TSOs – to the regional body. Those regional bodies are overseen not by Member State governance, but by independent NRAs acting in regional groups under the umbrella of ACER. Whilst stopping short of the single EU regulator concept discussed earlier in this paper (something dismissed in the impact assessment of the Winter Package), the ROC proposal seems to come close to this concept in a regional setting.

The ROC proposal remains subject to approval via the legislative process. It does, however, introduce a regional governance concept that has been missing to date and which, if enacted, would represent a fundamental change to the current arrangements. It also places major responsibilities on ACER, a constant theme throughout the Winter Package proposals in terms of shaping the future development of the electricity market. As mentioned previously, this new regional proposal still broadly remains a question of politics, in terms of how much responsibility the Member States are prepared to cede to regional EU structures, as opposed to retaining these competencies at national level.



## 9. Conclusion

In addition to whatever regional proposals emerge from the Energy Union proposals, there are already significant regional dimensions to the main activities that characterise the Internal Energy Market. In the planning area, the Ten Year Network Development Plan process has a regional dimension. The system operation area has regional issues emerging from the Network Codes and notably the System Operation Guideline and the responsibilities it will place on the developing Regional Service Providers or Regional Security Co-ordinators. The market area also has a potentially different set of regional structures in terms of the requirements for capacity calculation regions in the Capacity Allocation and Congestion Management Network Code. This range of regional options leads to not only an issue of overlapping regions but also to the development of multiple regional structures for different activities which undoubtedly poses problems of governance and indeed of the stability of such a regional structure (it is hard to imagine that stakeholders would welcome regional structures which change for example every 2-3 years so the questions of the stability of regions over time is also a key consideration in answering the regional question). Whilst there may be merits in individual analysis of differing regions for differing topics, such a patchwork of regional structures does not at first glance seem a desirable outcome.

Nevertheless, it is clear that there are not only many existing, but also many possible, constructs of regional groupings. What is less clear is which is the best construct to move forward on.

From an infrastructure perspective, it seems the ENTSO-E regional groupings for that discipline work well, and the Ten Year Network Development Plan seems generally well received by the stakeholder community (although some commentators argue it should go further than it does now).

From a system operation perspective, the synchronous area groupings have been strongly promoted by ENTSO-E/the TSOs as the basis of regional co-operation, and portrayed as functional, technical areas that are in some way sacrosanct and critical to security of supply. Whilst this is true to an extent, it is also highly debatable that the regional groupings here can remain in the medium to long term, when the interconnected capacity between them is increasing significantly, driving a growing need to consider DC assets to have similar operating characteristics to AC assets (in other words, to be part of the same active system). However, what is clear from the current debate (see Langen, 2016) is that this discussion has become strongly linked to security of supply (a Member State competence) and hence, the European Commission will be facing a potentially unwinnable battle to push mandatory regional cooperation in this area.

That leaves us with the market area, the very cornerstone of the Internal Energy Market itself. As has been set out earlier in this report, there is no defined regional structure within the Market area of ENTSO-E. That would seem to be because ENTSO-E's market team is supporting the development



of the Multi-Regional Coupling area as the foundation of the Internal Energy Market and an eventual single electricity market area covering the whole EU. Indeed, there are good reasons to believe that the most promising regional initiative is the on-going development of the electricity market based on the successful expansion of the Multi-Regional Coupling area, which can be regarded as the major region in itself, with the Baltic, South East Europe and Italy/Greece regions existing alongside until they join the Multi-Regional Coupling market. All major actors (the Member States, national regulatory authorities, market players and TSOs) see benefits from being part of a larger EU market, so the market-coupling process already enjoys much of the political momentum that other regional initiatives will struggle to achieve.

Is there any reason to believe that Multi-Regional Coupling, and hence the market, therefore should not be the regional structure that more mandatory regional cooperation should be built around?

The size of the region may be a concern when one considers the governance that may be required to sit above such a region, in other words regional structures within ACER and ENTSO-E and even the Member States themselves. However, in order to move forward, Multi-Regional Coupling has to manage a number of topics related to the regional debate. It has to manage issues such as coordinated balancing, capacity calculation and the financial consequences of both of these matters. The Regional Security Coordination Service Providers, or RSPs, collectively will be major service providers to the Internal Energy Market and hence it is hard to see how they will not, consciously or otherwise, develop into the coordination bodies that the European Commission wishes to see. Nevertheless, it is important to have as a pre-condition that any regional proposal must be tested against any potential negative impacts on the progress of Multi-Regional Coupling, rather than seeing Multi-Regional Coupling as the blueprint for a single regional structure.

As can be seen from the variety of options for regional structures that have existed previously and are being examined now, it could be argued that it is perhaps unlikely that one particular regional structure can cover all the developments in the Internal Energy Market. It is also clear that the possibility exists to have something of a 'patchwork' of differing regional structures emerging in the coming years. This also would pose quite a challenge in the sense of governance and is likely to be an impractical outcome for all parties involved in the electricity market. One particular aspect to future developments will be the extent to which Member States might be prepared to accept some dilution of the national paradigm in relation to security of supply. Therefore, the political element of this debate will be as important as having clear governance structures for any regional proposals.



## References

ANDOURA, Sami and VINOIS, Jean-Arnold (2015), From European Energy Community to the Energy Union – a Policy Proposal for the Short and the Long Term, Jacques Delors Institute; <http://www.institutdelors.eu/media/energyunion-andouravinois-jdi-jan15.pdf>.

ENTSO-E (2015a), All TSOs' proposal for Capacity Calculation Regions (CCRs) in accordance with Article 15(1) of the Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a Guideline on Capacity Allocation and Congestion Management, 29 October 2015; [https://www.ENTSO-E.eu/Documents/Network%20codes%20documents/Implementation/ccr/151103\\_CCRs%20Proposal\\_approved\\_updated\\_clean\\_and\\_final\\_for\\_submission.pdf](https://www.ENTSO-E.eu/Documents/Network%20codes%20documents/Implementation/ccr/151103_CCRs%20Proposal_approved_updated_clean_and_final_for_submission.pdf).

ENTSO-E (2015b), Explanatory document to all TSOs' proposal for Capacity Calculation Regions (CCRs) in accordance with Article 15(1) of the Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a Guideline on Capacity Allocation and Congestion Management; [https://www.ENTSO-E.eu/Documents/Network%20codes%20documents/Implementation/ccr/151103\\_CCRs\\_explanatory\\_document\\_approved\\_final\\_and\\_clean\\_for\\_submission.pdf](https://www.ENTSO-E.eu/Documents/Network%20codes%20documents/Implementation/ccr/151103_CCRs_explanatory_document_approved_final_and_clean_for_submission.pdf)

ENTSO-E (2015c), Electricity Regionalisation in Motion, December 2015; [https://www.ENTSO-E.eu/Documents/SOC%20documents/160301\\_ENTSO-E\\_Response%20to%20EC\\_%20on%20ROC\\_study.pdf](https://www.ENTSO-E.eu/Documents/SOC%20documents/160301_ENTSO-E_Response%20to%20EC_%20on%20ROC_study.pdf).

ENTSO-E (2016a), Regional Cooperation and Governance in the Electricity Sector, Policy Paper, April 2016; [https://www.ENTSO-E.eu/Documents/Publications/Position%20papers%20and%20reports/ENTSO-E\\_pp\\_regions\\_1604\\_web.pdf](https://www.ENTSO-E.eu/Documents/Publications/Position%20papers%20and%20reports/ENTSO-E_pp_regions_1604_web.pdf).

ENTSO-E (2016b), Regional Service Coordinators, May 2016 (<https://www.ENTSO-E.eu/major-projects/RSC/Pages/default.aspx>).

Fresa, Siddharth (2015), Multilevel EU Governance in Energy Infrastructure Development – A New Role for ACER?, Working paper, Sapienza University of Rome; [https://www.diw.de/documents/dokumentenarchiv/17/diw\\_01.c.508434.de/fresa.pdf](https://www.diw.de/documents/dokumentenarchiv/17/diw_01.c.508434.de/fresa.pdf).

LANGEN, Werner (2016), Draft Report on “Towards a New Energy Market Design”, Motion for a European Parliament Resolution, European Parliament, Commitment on Industry, Research and Energy 2015/2322(INI); <http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//NONSGML+COMPARL+PE-575.127+01+DOC+PDF+V0//EN>.





NEWBERY, David, STRBAC, Goran and VIEHOFF, Ivan (2015), The Benefits of Integrating European Electricity Markets, Energy Policy 94 (July), 253-63.

SLOT, T. and DIJK, H. (2015), Options for Future European Electricity System Operation, European Commission, December 2015; <https://ec.europa.eu/energy/sites/ener/files/documents/15-3071%20DNV%20GL%20report%20Options%20for%20future%20System%20Operation.pdf>.