Regionalisation in the electricity sector is not about creating new clear-cut borders, but about easing the relationship between the European and national levels. It is about using the advantages of neighbourhood, conducting pilot projects, testing new solutions in regional grounds, and making easier the common work to deliver the Energy Union. Regional actions allow to move faster, to test and spread innovative solutions, and to reach specific conclusions.

The power system is changing fast. The road towards cleaner, reliable and affordable electricity creates new challenges for system development, market participants and grid operators. With a high share of renewables cross-border exchanges have to be developed even more. Regional solutions can add value for the customer by enhancing security of supply and creating economies of scale among Europe’s countries.
Regionalisation is already in motion. EU Member States, their regulators and transmission system operators (TSOs) often use regional approaches to integrate their energy markets and coordinate their system operations and grid planning. With the Energy Union, some ongoing regional cooperation projects will be taken to the next stages, and many new ones will appear.

By presenting some of the most significant regional initiatives and insights about the way to conduct them, this policy paper explains how regional cooperation will contribute to the 2030 EU objectives.

It describes in particular the Regional Security Coordination Initiatives (RSCIs), which will be at the core of the regional strategy of European TSOs for the decades to come. Currently, RSCIs focus on operational planning with a regional to pan-regional view. The very nature of electricity security of supply, located at the interface of markets, operations and planning, leaves room for the RSCIs to evolve over time by providing even more services to the TSOs once they have gained the necessary experience. Each section of this policy paper includes recommendations on the review of electricity legislation foreseen in 2016.
1 THE MULTIPLE SHAPES OF EFFICIENT REGIONAL COOPERATION

DYNAMIC REGIONS

There are dozens of different organisations and initiatives active at regional levels in the European electricity sector. They organise markets, address regulatory issues, support the operation of the grids or test new solutions. Regionalisation pursues a great variety of objectives and forms a broad range of structures, processes and tools. Some regional projects, such as enhancing cross-border system operation coordination or organising pan-European electricity short term markets, require formal structures. Other initiatives, for instance, infrastructure development cooperation, are based on lighter multilateral cooperation schemes. The definition of regions and therefore their governance will have to remain dynamic. There is not a one-size-fits-all solution, neither for the geographical scope of regions nor for adequate tools and structures. It is necessary that energy regions and the EU at large share common objectives and principles and that regions talk to each other, learn from each other, and interact.

A SET OF TOP-DOWN AND BOTTOM-UP APPROACHES

In recent years, regionalisation has gained momentum from two ends: top-down and bottom-up. In some cases, a European view was delivered by organising the joint work of regional groups. In other cases, European countries took joint initiatives that, when successful, could be replicated throughout Europe.

For instance, intra-day and day-ahead market coupling started as regional projects and are now forming a European platform, delivering huge benefits to Europeans.

Top-down approaches guided by a common European view have also proved efficient. The remaining work ahead to fully implement the European Internal Energy Market, in particular through the network codes, will make extensive use of the regional level to enhance European integration. For instance, Member States agreed to develop regional target models as a step towards fully integrated balancing markets, which will save billions of Euros for European consumers each year.

FINDING THE RIGHT FORMULA

Regionalisation of selected services related to grid and market operations should be considered process innovation.

The electric power system is characterised by strong interdependencies between countries, markets and operations. Unexpected events in one part of the grid may in extreme situations impact the economies of several European countries. Bringing nationally performed services to the regional level requires careful attention and close collaboration with all stakeholders, including policy-makers who shape national energy strategies.
Transformations need to be conducted in a cost-efficient way without putting the security of supply in Europe at risk. This is why service regionalisation may require in-depth feasibility studies, R&D through pilot projects, cost-benefit analysis and mapping of the impacts on grid operation and other market or grid operational services. In some cases, the delicate balance between cost efficiency and system security may also lead to long implementation phases, leaving time for system and market operators to develop tools and processes matching their high reliability standards.

In all cases, transformations can only be achieved with an adequate legal and regulatory framework that allows for appropriate governance.

**ENHANCED REGIONAL COORDINATION AT MEMBER STATES’ AND REGULATORS’ LEVEL**

Coordination at Member States and regulators’ level is crucial to enable the right investments where they are more cost effective. ENTSO-E sees a need for more regional coordination of Member States and welcomes the existing regional Member State initiatives. Several European countries are teaming up through voluntary inter-governmental approaches such as the Pentalateral Energy Forum. The latter brings together ministries, TSOs, the European Commission, regulatory authorities and a Market Parties Platform of Central Western Europe to improve market integration and security of supply. Other examples are the North Seas Countries’ Offshore Grid Initiative (NSCOGI), the Baltic Energy Market Interconnection Plan (BEMIP) and the regional groups defined in the 2013 Infrastructure Regulation to prioritise Projects of Common Interest.

There is also a need for redeveloped cooperation of national regulatory agencies (NRA) at the regional level, particularly to facilitate the common work with TSOs regional initiatives. Although a new administrative layer should be avoided in addition to the national and European layers, there is a need for structured exchange about the way regional structures blend in national and European regulatory frameworks.
2 REGIONAL SECURITY COORDINATION INITIATIVES: TSOs STAND UP TO THE CHALLENGES OF THE FUTURE

More than ever, national TSOs need constant information about the evolutions and possible perturbations of neighbouring countries’ power flows. TSOs must also more closely coordinate their actions, which have increasing consequences on other countries’ grids.

System operators are experiencing strong short-term changes in regional power flows that can neither be forecasted nor managed securely at the national scale, particularly due to increased international electricity exchanges and the rise of non-controllable renewable energy sources.

To tackle these operational challenges, TSOs have been voluntarily developing Regional Security Coordination Initiatives (RSCIs) since 2009, with CORESO and TSC being the pioneers in this respect in continental Europe.

HOW DO SYSTEM OPERATORS WORK WITH RSCIs?

RSCIs are service providers and were not built with live system operations capabilities. The way TSOs use the input of RSCIs to operate their grid differs between these five core services. For example, for operational planning security analysis (1) and outage planning coordination (3), RSCIs perform regional calculations that are important to the national TSOs’ decision-making, but TSOs still need to consider several other national factors not captured by regional calculations. The final operational decision-making by the national TSO cannot be delegated.

For the other three core services (coordinated capacity calculation, short- and medium-term adequacy forecasts and individual and common grid model delivery), the result of the regional calculation is a sound product on which many TSOs and market parties can base their decisions. The decision-making power of the TSOs in such joint regional calculations consists largely of checking for errors and giving authorisation for the calculation result to be used (e.g., for the calculated capacities to become the basis for allocation of congested interfaces).
Regional Network Security Cooperation Initiatives (RSCI)

RSCIs already reach an area covering over 80% of European citizens. Following the expected adoption of the “System Operations Guideline” Network Code and an ambitious development plan proposed by ENTSO-E, all TSOs in Europe will contract five fundamental services from an RSCI, in most cases by becoming a full member of one RSCI.1) A multilateral agreement will be signed before the end of 2015 by all interconnected TSOs.

In November 2014 in its policy paper on “Future TSO Coordination for Europe”, ENTSO-E pledged to develop RSCIs throughout Europe and expand the scope of their activities, which will cover five core services: 2)

- operational planning security analysis
- coordinated capacity calculation
- outage planning coordination
- short- and medium-term adequacy forecasts;
- and
- individual and common grid model delivery.

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1) All TSOs under the network code refers to ENTSO-E members but also to TSOs which are not member of ENTSO-E, e.g., certified TSOs in the UK. These other TSOs may not subscribe to all five services.

2) See the paper “Future TSO Coordination for Europe” for detailed explanations on these five services.
These functions combine and ensure coherence between operational security analysis and market support functions. They define an ambitious timeframe for regional coordination: from hourly and even lower time steps for intraday capacity calculation, security analysis, and remedial actions identification for security risks, all the way to seasonal forecasts.

Enhancing TSO coordination will benefit consumers through improved security of supply by minimising the risk of wide area events. RSCIs will contribute to reducing network costs by increased efficiency in system operation and will contribute to market efficiency, for instance, by maximising the availability of transmission capacity to market participants.

### BEYOND THE FIVE CORE SERVICES

Operating an increasingly complex grid is a sensitive task in which an error can have enormous consequences for European consumers and the European economy. Regional collaboration through RSCIs represents an important shift from the national system operations. To deliver full benefits while keeping transition costs and risks at reasonable levels, RSCIs should be managed carefully. All parties involved (TSOs and their RSCIs, ENTSO-E, national regulators and market participants) need to learn how to work together under this new formula.

Once this is ensured and the five core services are available across Europe, next steps could follow. Detailed cost-benefit analysis could identify how the services that are potentially better conducted at regional level could be further developed and how an efficient, secure and cost-effective service structure between TSOs and RSCIs can be achieved. ENTSO-E and TSOs are currently working to identify which services are best delivered at regional levels rather than by each TSO individually from longer term to as close to real time as possible. Because the final responsibility for security of supply lies within Member States and their TSOs, technical constraints due to the time necessary for TSOs to perform real-time operations based on RSCIs input and issues related to local security analysis draw a line between what can and cannot be delivered by RSCIs.

Future enhancement of the operational coordination of TSOs may see RSCIs play even stronger roles in ensuring security of supply, notably by coordinating aspects of risk preparedness plans and delivering enhanced short- and medium-term adequacy forecasts.

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**REINFORCE RSCIs COLLABORATION AND INTER-OPERABILITY THROUGH ENTSO-E**

ENTSO-E has a major role to play in the regional cooperation of TSOs. ENTSO-E is the platform for all overarching pan-European questions. This is particularly important in the context of implementing network codes by which TSOs agree upon all their pan-European tasks within the framework of the association. Network codes set deadlines and principles for common standards as well as interoperability of RSCI. The coordination and monitoring role of ENTSO-E for network code implementation makes the association the natural place for ensuring RSCIs interoperability. ENTSO-E also handles com-

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1) See the vision paper “Where Markets meet Security of Supply”.
munication and consultation. The network codes also set the required regulatory oversight for the different services that RSCIs supply to the TSOs. In some cases, these will consist of ACER opinions, while in other cases of joint decisions, they will be made by all NRAs Europe-wide or regionally. ENTSO-E welcomes the intention of all NRAs to utilise the working structures or meetings of ACER for facilitating effective all NRAs approval processes.

RECOMMENDATIONS

1. Member States and the European Commission should adopt the System Operations Guideline as soon as possible.

2. RSCIs and TSOs should implement the five core services throughout Europe and reinforce their collaboration through ENTSO-E.

3. Once the five core services are available across Europe, analysis should be performed to identify how services that are potentially better conducted at regional level could be further developed.
3 REGIONAL COOPERATION TO IMPLEMENT THE INTERNAL ELECTRICITY MARKET AND THE EUROPEAN GRID

Planning new interconnections for the European grid and laying out the rules of pan-European integrated markets are only a beginning. Implementation of market mechanisms and construction of new physical lines present major challenges, some of which are well addressed through regional approaches.

BUILDING THE EUROPEAN GRID THROUGH TOP-DOWN REGIONAL APPROACHES

Planning new interconnections to reach the EU 2030 objectives is a collaborative process driven from the European level. ENTSO-E is mandated to produce every two years the Ten-Year Network Development Plan (TYNDP), which presents and assesses all relevant pan-European infrastructure projects.

The TYNDP is an example for pan-European solutions developed through a top-down regional approach. The TYNDP, which is already in its third edition, starts by a pan-European assessment of the capacity needs border by border. Regional groups within ENTSO-E’s System Development Committee are tasked with refining the European calculations, inter alia for the cost-benefit analyses of proposed infrastructure.

The TYNDP is the starting point to identify Projects of Common Interest. The PCI list is updated every two years by the European Commission through a process that makes a similar top-down use of European regions.¹

Beyond grid planning, regional cooperation also has an important leading role to play in the actual implementation of new grid infrastructure. Voluntary regional approaches bringing together Member States, NRAs, TSOs and other stakeholders can ease regulatory negotiations, technical discussions and public acceptability efforts necessary to build new overhead lines. For example, NSCOGI was set up by North Sea countries with such objectives. Similar or even stronger structures should be set up across Europe to push for the faster permitting procedures that the 2013 Infrastructure Regulation imposes.

¹) See the vision paper “Regulatory Governance for the Energy Union: Implement and Update” for details on how the PCI process should be further improved.
The Internal Energy Market is not completed yet. European network codes lay out the way towards full market integration and often use regional approaches to facilitate its implementation.

Day-ahead and intra-day markets have been coupled in large parts of Europe already: **Coupled markets have grown organically and have been merged together.** Software and processes involving both TSOs and power exchanges have been designed with a view...
on pan-European coverage. Capacity calculation regions are currently being created to facilitate the implementation of the flow-based capacity calculation methodology in Europe. The Network Code on Electricity Balancing sets out an ambitious plan towards a fully integrated European market. To do so, solutions are currently being experimented with through several regional pilot projects. Regional balancing target models will be defined to allow a smoother transition from the current heterogeneous framework towards full European integration.

Reinforcing regional regulatory cooperation is necessary in light of these new developments. Although a new administrative layer should be avoided to keep the system as simple as possible, regulators should put in place sound and effective sets of coordinated activities, framework and good regulatory practice to facilitate market and the security of European electricity supply.

**RECOMMENDATIONS**

4. Member States should reinforce their regional collaboration to facilitate the implementation of new grid infrastructure.

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From regions to Europe: a bottom-up approach to build the integrated electricity market.

These maps illustrate the organic growth towards the coupling of European intra-day electricity markets. The journey started as voluntary projects in some Member States. The European Network Codes will formalize the approach, and facilitate its expansion to cover all Europe.
4 **POLITICS TO COMPLEMENT MARKET, SYSTEM OPERATIONS AND INFRASTRUCTURE REGIONAL COORDINATION**

**REGIONAL COOPERATION AMONG MEMBER STATES**

The regional level is an efficient one for political leaders to meet and discuss the coordination of their respective energy policies. The Pentalateral Energy Forum has set direction in this sense. Such coordination helps preventing market distortions or systemic difficulties due to diverging political choices and therefore allows Member States to develop policies that best serve their consumers. For instance, if some Member States decide that their security of supply concerns legitimate the development of capacity mechanisms, they should do so as far as possible in close collaboration with their neighbouring countries to mitigate the risks of market distortions and define effective cross-border participation. Likewise, Member States that consider that they do not need to implement dedicated market solutions to secure their security of supply should discuss it with their neighbours to prevent disruptions from affecting the whole region. Renewables support mechanisms should also be discussed by Member States at regional levels to avoid market distortions.

Regional coordination groups can be used as a platform for Member States to discuss in an informed manner and to coordinate further their decisions related to the cross-border effects of their energy mix. The ENTSO-E adequacy assessment and methodology as well as the common definitions and indicators will provide a consistent basis for these discussions and a level playing field.

**POLITICAL COOPERATION IN CASE OF WIDE SCARCITY AND OF EMERGENCY SITUATIONS**

The network codes, especially the Emergency & Restoration Code, define emergencies and the tools that can be applied to manage them to prevent blackouts. However, there can be widespread scarcity situations that do not meet the conditions for declaring an emergency and that therefore need to be handled by the electricity markets. The more flexible the power system becomes, e.g., with smart grids and demand response, the more the relative national price levels intraday and for imbalances will determine where the scarce electricity is delivered. In its position paper “Where Markets Meet Security of Supply”, ENTSO-E suggests Member State discussions on regional and Europe-wide scale of the results of ENTSO-E’s adequacy analyses based on future common definitions of reliability indicators. With ENTSO-E’s new, improved adequacy methodology, these discussions will for the first time have a firm quantitative basis.

**RECOMMENDATIONS**

5. Member States should use regional coordination groups to discuss and coordinate their energy policy with potential trans-national effects, including cross-border consequences of their energy mix decisions, market design and RES support mechanisms.