

REGIONAL SECURITY COORDINATORS



Why do we need regional coordination to operate the electricity grid?

Electricity does not stop at borders. What happens in one country's power system affects its neighbours and vice-versa. Cooperation is thus a natural thing for the transmission system operators, TSOs, and regions have always been the natural place for the TSOs to cooperate in Europe. ENTSO-E was created by merging several pre-existing regional associations of TSOs.

Pan-European cooperation of TSOs has allowed huge progress such as the 10-year network development plan (TYNDP) and the EU network code and guidelines. But there are certain things which are better performed at an intermediate level between countries and Europe. [ENTSO-E vision paper on regions](#) and its position paper on regional coordination and governance in the EU explain where regions can help support the Energy Union.

What do TSOs actually need to coordinate?

The European power system is operated by national entities, the TSOs, that are responsible for security of supply and act as market facilitators. Every day, TSOs take executive decisions to ensure that each European can access electricity at any time and that markets run smoothly.

Concretely, and in within the framework of national and EU legislation, TSOs make:

- long-term decisions, like planning new high voltage power lines to make sure that the grid is reliable in the years to come;
- mid-term decisions, for instance to make sure that planned outages of large power plants do not threaten the system stability;
- and real-time decisions, requiring actions from the supply and demand side or taking actions on the physical elements of the grid. These actions called remedial actions (actions taken by the TSOs to relieve a physical congestion) are aimed at optimising the electricity flows, ensuring system security notably by making sure that, at any time, the quantity of electricity produced is equal to the quantity consumed.

A large part of these decisions benefit from being coordinated between TSOs. Coordination allows in fact TSOs to take better decisions. For instance, TSOs cooperate to decide which remedial actions close to a national border is the most efficient (measures such as ordering a power plant to start or stop in order to maintain operational security). Further cost reduction can be induced by more TSO coordination. For instance, TSOs can decide to use a common IT system to perform a certain task, leading to substantial economies of scale.

Before EU network codes, TSOs have jointly developed harmonised technical rules that laid the basis for TSO regional cooperation. They already were aimed at maximising security, minimising cost and supporting market integration. The EU network codes have largely taken on board these TSO developed harmonised rules.

Why is regional coordination of power grid operations changing now?

Increasing shares of renewable energy sources and decentralised generation raise the level of uncertainty. In parallel, increasing interdependencies between the different transmission systems and shorter market timeframes create new challenges for the TSOs. A much deeper coordination between operators close to real-time is a prerequisite to integrate more renewables into the grid and reduce carbon emissions cost-effectively and in all security.

This is why regional coordination of power grid operation is stepping up through the new developments of Regional Security Coordinators (RSCs). Initiated by TSOs seven years ago, these regional companies are about to extend both geographically and in terms of responsibilities

How will European consumers benefit from more regional coordination of TSOs?

Consumers have an interest in enhanced TSO coordination through the RSCs because it increases efficiency in system operation, minimises risks of wide area events, such as brownouts or blackouts, and lower costs through maximised availability of transmission capacity to market participants.

RSCs provide a common approach to key elements in operational planning, operational security planning, security of supply, and market integration.

Costs and benefits

The financial and social impact of wide area security breaches is enormous. The cost of a disconnection of 20 gigawatts during a large brownout (a drop in voltage in electrical power supply) is estimated to cost €800 million per hour (that is €40/kWh). Blackouts have an even higher impact.

Enhanced TSO coordination minimises the need of costly re-dispatching, especially costly emergency actions. RSCs and TSOs use state-of-the-art data exchanges methods and security analysis. The geographical scope of RSCs is also optimal for security analysis.

What is a Regional Security Coordinator or RSC?

RSCs are companies owned by their clients, the TSOs. They perform services for the TSOs, such as providing a regional model of the grid or perform advanced calculations to tell TSOs which remedial actions are the most cost-efficient, without being constrained to national borders.

Currently, there are three existing RSCs in continental Europe. Their offices are based respectively in Munich (TSC), Belgrade (SCC) and Brussels (Coreso).

The offices of RSCs look like TSOs' control rooms. Engineers work in a secured room facing a giant screen representing in real-time the power flows between different countries, and other information such as the quantity of wind or solar power produced in a region.

However, RSCs are not equipped to take direct control of the grid. This is an essential aspect because it allows RSCs to remain light and efficient structures and limit the need for regulatory oversight and regulatory harmonisation. Taking real-time executive decisions requires an extremely heavy infrastructure, especially as security concerns keep on growing. It also involves advanced IT systems and highly trained staff. Above all, one needs a sound knowledge of specific characteristics of each geographic area. This is why grid are better operated at national level. The fact that RSCs do not have actual grid control limits also the risk of pan-European incidents including cyber-attacks.

Operating the power grid in real-time remains the responsibility of TSOs, but TSOs will more and more perform this task by relying on the information and strategies provided by the RSCs. The regional coordination services and the overview of electricity flows at European and regional level complement the TSOs' own data. The RSCs enable them to better identify threats to secure system operations arising from large-scale, regional power flows and adjust measures to mitigate these risks.

How RSCs created and how will they develop?

The RSCs will be at the core of the regional strategy of European TSOs for decades to come. They have been pioneered and developed pro-actively by TSOs to respond to the need for further operational coordination across borders in light of the increasing interdependencies between countries, markets and operations.

The first RSCs were set up on a voluntary basis since 2008, with Coreso (based in Brussels) and TSC (Munich) as pioneers in Continental Europe. In 2015, one RSC was created in South East Europe, SCC, in Belgrade. In 2016, the Nordic TSOs started discussing the creation of a Nordic RSC. By the end of 2017, the whole European population should be covered.

Overtime RSCs have proven to be an essential feature of the European power system. Their role in implementing the Third Energy Package and supporting the Internal Energy Market is registered in the EU network codes and guidelines. This is especially true of the System Operation Guideline adopted in comitology in 2016. This guideline defines in a standardised way what core services will be performed by RSCs.

Prior to the System Operation Guideline, European TSOs and ENTSO-E signed a Multilateral Agreement on Participation in RSCs end 2015.. It requires ENTSO-E members to participate in RSCs or to contract five essential services from them. The agreement ensures also that RSCs develop in a harmonised, interoperable and standardised way under ENTSO-E's coordination, tools, standards, and methodologies. Today, RSCs in operation already play a key role in the coordinated planning of TSOs' operations across a large part of Europe, covering nearly 80% of Europe's citizens.

Currently, RSCs focus on operational planning with a regional view. RSCs have the potential to evolve and to provide even more services to the TSOs as they gain more experience. A system-wide cost-benefit analysis will assess which additional services can offer further benefits if conducted centrally without compromising system security.

So in practice, what does a typical day look like in a RSC?

In the RSC model:

1. TSOs provide data to the RSCs;
2. RSCs perform analyses and provide results to TSOs;
3. TSOs take the final decisions: full decision-making responsibility remains with the TSOs based on the real-time operational conditions. Usually, TSOs directly implement the recommendations of RSCs. Particular collaboration processes are defined for the rare occasions where TSOs estimate that an action recommended by a RSC is incompatible with their own system safety constraints. These events will be registered and their list will be publicly available.

RSCs perform regional calculations that are crucial for the national TSOs' decision-making. The role of RSCs is focusing on operational planning, up to one hour before real-time, providing support to TSOs in finding solutions for ensuring system security.

Determining which of these solutions are most beneficial for secure operation as well as most economically efficient, requires a detailed, comprehensive knowledge of the transmission system as well as the regional and national market characteristics. 24 times a day, every day of the year, RSCs collaborate with TSOs to update this representation of the grid in real-time. This process relies on intensive communication between RSCs, TSOs and grid users. RSCs also establish in real-time evolution scenarios for the grid, for instance to take into account a possible upcoming storm or demand spikes.

What are the five core services performed by RSCs?

RSCs are engaged in a development plan to soon provide five types of services to each TSO:

- (1) operational planning security analysis (also known as coordinated security analysis);
- (2) outage planning coordination;
- (3) coordinated capacity allocation;
- (4) short- and very short-term adequacy forecasts;
- (5) individual and common grid modelling and data set delivery.

RSCs are companies, they are not regions with fixed borders. Each RSC can provide a given service to more than one region, while a TSO can choose to procure certain services from different RSCs (although TSOs take into consideration geographical consistency of the RSCs coverage).

1 - Operational planning security analysis (also known as coordinated security analysis)	
Objective	<ul style="list-style-type: none"> To identify risks of operational security in areas close to national borders To identify the most efficient remedial actions in these areas and recommend them to the concerned TSOs, without being constraint by national borders
Geographical area	The task is performed by RSCs for areas close to national borders, which are known as "RSCs observability areas". TSOs perform this task, which requires a detailed knowledge of the grid, for the rest of their control area.
What do RSCs do?	RSCs receive real-time information from TSOs, perform advanced analysis and recommend to TSOs relevant remedial actions for cross-border exchanges. They also coordinate with other adjacent RSCs, especially for the short timeframes.
What is the role of TSOs?	<p>TSOs provide data in real time to RSCs, which allow them to make calculations.</p> <p>TSOs receive recommendations from RSCs, analyse the advice to make sure it is compatible with their own safety constraints and implement it from their control room. TSOs will provide public reports listing occasions where they chose not to comply with the RSCs recommended actions.</p>
What do RSCs need to perform this task?	<p>Common security analysis methodology defined in the network codes are applied.</p> <p>RSCs base their calculation on the Common Grid Model, updated every hour (see Service 5).</p>
What is the added value of RSCs?	TSOs have been collaborating on cross-border remedial actions for a very long time. Before RSCs, and in areas where RSCs are not yet developed, TSOs on both sides of a border inform each other bilaterally and share measurements. This approach allows to manage the grid in a secure way but can lead to inefficiencies. RSCs represent a significant improvement. They will allow to take the most efficient actions, across all of Europe.
When and where will the service be available?	Existing RSCs already perform this service, although it will improve in the coming years thanks to a more detailed grid model and new security analyses methodology. TSOs which do not yet outsource this service to a RSC should do it by 2017.

2 – Outage planning coordination	
Objective	<ul style="list-style-type: none"> • Create a single register for all planned outages of grid assets (overhead lines, generators, etc.) • Enhance governance of assets' maintenance
Geographical area	The task is performed by RSCs for areas close to national borders, which are known as "RSCs observability areas".
What do RSCs do?	RSCs receive information on planned maintenance by TSOs and maintain a register. They allow TSOs to collaborate when necessary to optimise the maintenance plans.
What is the added value of RSCs?	Before RSCs, TSOs collaborated informally on this task through ENTSO-E regional groups. RSCs will allow for a more systematic and formal approach. It will directly contribute to diminish the overall costs of grid operations by allowing to optimise maintenance of assets across borders. For instance, a TSO may accept to delay or advance a planned outage if other significant works are planned across the border. It will prevent dangerous situations linked to incompatible outages.
When and where will the service be available?	The service is already well developed by TSC, while CORESO has only recently started to develop this service. TSOs which do not yet outsource this service to a RSC should do it by 2017.

3 – Coordinated capacity calculation	
Objective	<ul style="list-style-type: none"> • Calculate available electricity transfer capacity across borders (using flow-based or net transfer capacity methodologies) • Maximise the capacity offered to the market
What do RSCs do?	RSCs provide markets with a regularly updated estimation of available cross-border capacity. Two methodologies exist: the historical method, called Net Transfer Capacity. It analyses capacity border by border, based on system evolution scenarios provided by TSOs. It is a simple method, used until recently in all of Europe, and which will continue to be used in regions with less meshed grids, like South West Europe.
What is the added value of RSCs?	The new method, called Flow-Based Capacity Calculation will be performed in highly meshed regions, like Central and Western Europe. The calculations are made not border by border, but by looking at a full modelling of the grid. This method is more complex but can provide better results where appropriate.
What is the added value of RSCs?	Coordinated capacity calculation is a direct fruit of the European network codes. The use of RSCs will allow the development of the flow-based methodology, which is in most regions more efficient and more reactive to actual system conditions rather than border by border calculations.
When and where will the service be available?	The service is already well developed in some regions, but should be extended to cover all of Europe in the coming years, as network codes are implemented.

4 – Short and medium term adequacy forecasts	
Objective	<ul style="list-style-type: none"> • Providing market participants with consumption, production and grid status forecasts up to several weeks ahead
What do RSCs do?	RSCs will provide analyses on different timeframes (from day-ahead to weeks ahead) based on information sent by TSOs. ENTSO-E will keep providing longer term adequacy forecasts for Europe.
What is the added value of RSCs?	Currently, TSOs collaborate informally to coordinate their respective short and medium term adequacy forecasts. These forecasts will help ensuring that there is enough generation available to meet demand, and that a dangerous situation cannot get worse. Market participants who participate in cross-border markets will also benefit from single regional views rather than needing to gather information from several TSOs.
When and where will the service be available?	This is currently the least developed of the 5 key services. TSOs are currently discussing the exact form of this service. As part of the multilateral agreement, it should be started in all Europe at the latest in 2017.

5 – Common Grid Model	
Objective	<ul style="list-style-type: none"> • Providing a regional dynamic view of all major grid assets (generation, consumption, transmission) updated every hour
What do RSCs do?	RSCs maintain a large data set representing the regional grid. Each hour of the year, RSCs receive updated data from TSOs on the evolution of generation, demand, and transmission capacity availability. This round the clock service requires each hour a human control. This grid model is used by RSCs to perform each of the 4 other services, and can also be used by TSOs.
What is new?	Historically, TSOs had a very fine representation of their own network, but a limited view of the grid beyond their borders. These models were interoperable and allowed for some regional cooperation. With the RSCs, a new common grid model is currently being developed. It will allow a much finer representation of the network, bringing system operations in the era of big data.
When and where will the service be available?	RSCs and TSOs already use a common grid model (called the UCTE model). The future, more detailed Common Grid Model will be available for use by RSCs by 2017.

What is ENTSO-E's role with regard to RSCs?

ENTSO-E is the platform for ensuring interoperability of RSCs. ENTSO-E provides project management support, standards (methodologies and rules) for IT tools, IT-governance organisation and ensures compliance monitoring for RSCs to support their set up Europe-wide.

Network codes, drafted by ENTSO-E in cooperation with stakeholders, standardise the five services provided by RSCs, set deadlines and principles for common standards and interoperability of RSCs, tackle the required regulatory oversight associated with them and include where necessary opinions by ACER and oversight or decisions by NRAs at European or regional level.

The rollout and implementation of the five core services provided by RSCs will be completed throughout the whole of Europe by the end of 2018. The RSCs and the corresponding multilateral agreement for all TSOs allow to add further services where needed.