
ENTSO-E POLICY PAPER FUTURE TSO COORDINATION FOR EUROPE

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1 KEY POINTS

- TSOs within ENTSO-E have decided to implement and enforce a higher level of coordination among the TSOs for operating the European transmission system, as an answer to the challenge of the transformation of the European electricity system.
- ENTSO-E's approach is based on an all-TSOs Multilateral Agreement to be developed in 2015, making participation in Regional Security Coordination Initiatives (RSCIs) mandatory for interconnected TSOs.
- This agreement together with the network codes will create a Europe-wide harmonised power system operation framework with cross-regional and pan-European geographical coverage, setting up the fastest, most efficient, secure and reliable way to ensure the highest security of electricity supply standards in Europe.

2 TSO COORDINATION AND ITS CHALLENGES

The secure operation of the interconnected European electricity system and the functioning of the existing cross border market schemes are the result of close TSO coordination based on widely harmonised technical rules. They were developed over a long period of time based on initiatives for security of supply of ENTSO-E members and of its TSO predecessor associations.

The European electricity system is highly complex, and more and more influenced by wide area phenomena spreading over several TSO grids. Systems in larger countries work with several area control centres. The experience of managing such complex interacting systems shows that not all processes can be automatized. Furthermore TSO cooperation in Europe covers both a wide geographic and cultural area. Despite the harmonisation that network codes bring, its efficient design must take into account differences in grid structure, generation mix as well as varying regulatory and legal frameworks.

Today TSO coordination already spans a wide spectrum of topics such as outage planning, capacity calculation, load-frequency control and coordinated remedial actions. It involves the use of tools of existing RSCIs and the ENTSO-E Awareness System ¹⁾. An increasing volume of data is currently being exchanged between TSOs to support the different activities including network models and real-time measurements.

Increasing shares of variable Renewable Energy Sources (RES) and decentralized generation raise the level of uncertainty in the operational planning phases. This evolution, along with increasing interdependencies between the different transmission systems and shorter market time intervals create new challenges for the TSO community and require much deeper coordination between operators close to real time.

¹⁾ ENTSO-E 2013 annual report pp. 40 (https://www.entsoe.eu/Documents/Publications/ENTSO-E%20general%20publications/140415_ENTSO-E_Annual_Report_2013_Final.pdf)



3 SUCCESS OF REGIONAL SECURITY COORDINATION INITIATIVES (RSCIs)

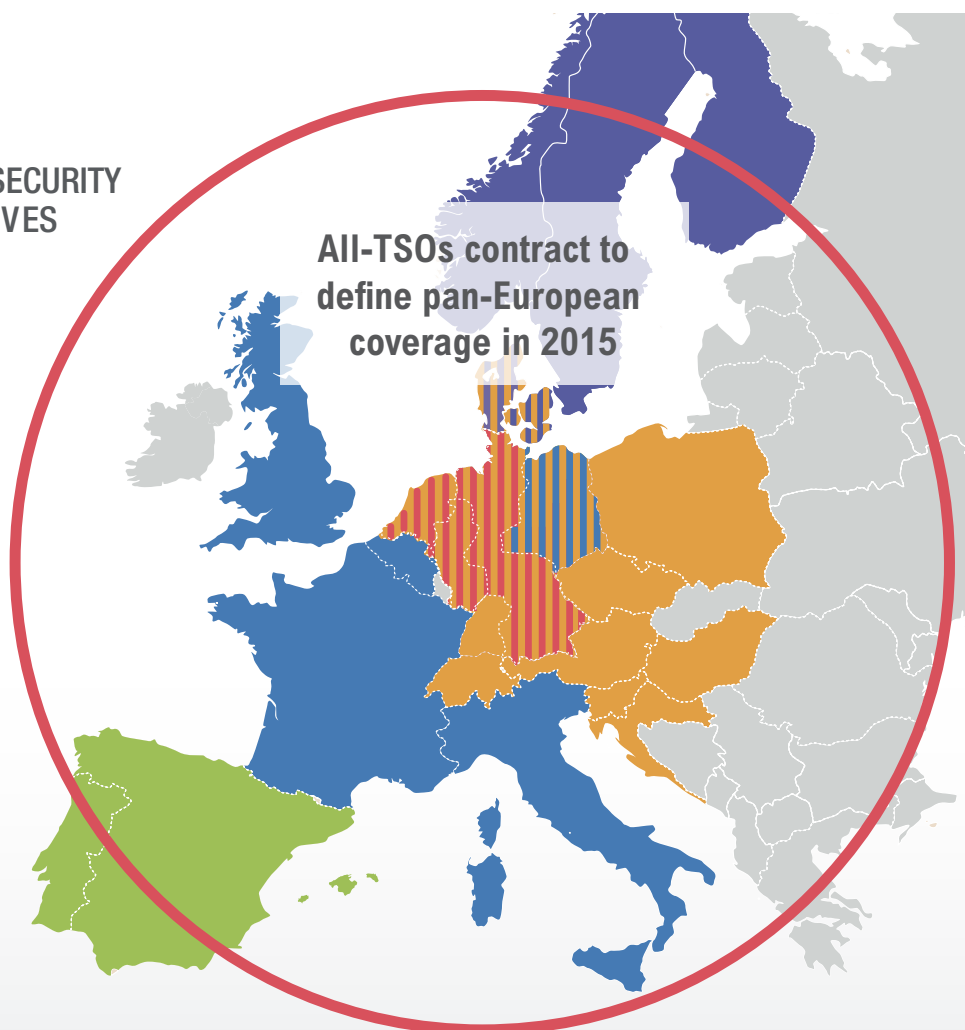
RSCIs are key actors in enabling TSO coordination in parts of continental Europe to tackle the new challenges¹⁾. They already count several years of experience, cooperate with each other and are recognised as important contributors to the security of the overall network; see the map of their current geographic coverage and contractual relations in the same format as displayed in ENTSO-E’s 2013 Annual Report:

The RSCIs have been pioneered and developed pro-actively by TSOs. They offer regional coordination services and provide TSOs with an overview of electricity flows at European regional level to complement their own system data. This enables them to identify and manage potential threats to secure system operations arising from large-scale, regional power flows. RSCIs play an increasingly important support role for operators in the control centres, however, full decision making responsibility remains with the TSOs.

¹⁾ ENTSO-E 2013 annual report pp. 45, as above.

REGIONAL NETWORK SECURITY COOPERATION INITIATIVES

- Coreso
- TSC
- TSC + Coreso
- TSC + SSC
- Nordic
- Nordic + TSC
- MIBEL



4 DESIGN OF FUTURE TSO COORDINATION

Despite the success so far of RSCIs, TSOs need to implement further steps in operational coordination in the European electricity system. A thorough analysis of the underlying operating conditions across Europe dictates a solution that strikes a balance between regional flexibility (to allow for solutions tuned to the needs of this region) and a centralised approach (to ensure cross-regional coordination). A combination of these approaches guarantees minimum operational risks and a pragmatic transition to a stronger coordination framework.

To make this happen, ENTSO-E has decided to proceed to a wider application and further development of the RSCI model and ensure full European coverage. A coordination strategy based on the existing RSCI model is the way forward to manage system complexity, ensure full geographical coverage and minimize operational risks. Based on the RSCI concept and the draft network codes, the TSOs have decided in ENTSO-E to establish the following key principles for the framework to enhance operational coordination:

ESSENTIAL COORDINATION FUNCTIONS WILL BE ORGANISED BY EXISTING OR NEW RSCIs. THESE FUNCTIONS ARE:

- 1. Coordinated Security Analysis (including Remedial Actions-related analysis)**
- 2. Short and Medium Term Adequacy Forecasts**
- 3. Coordinated Capacity Calculation***
- 4. Outage Planning Coordination**
- 5. Improved Individual Grid Model / Common Grid Model Delivery.**

* For one Capacity Calculation Region (as defined in CACM) with more than one established RSCIs, at a given point in time, one RSCI will be responsible for assuming the function of the Coordinated Capacity Calculator; other RSCIs having responsibilities within this Coordinated Capacity Calculation Region can assume this function at any time, as a back-up option. This scheme ensures consistency between coordinated security assessment and coordinated capacity calculation.

These functions cover but also go beyond the coordination services provided today by the established RSCIs. They combine functions for operational security analysis and supporting the market in a very efficient way, ensuring the best possible coherence between them.

Moreover, they clearly define the ambitious timeframe the regional coordination will cover, from hourly and even lower time steps for intraday capacity calculation, security analysis and identifying remedial actions to manage security risks, all the way to seasonal forecasts, analyses and joint decisions.

- All TSOs will be procuring the relevant services from these RSCIs.
- An all-TSOs Multilateral Agreement will be the contractual instrument to be developed already in 2015.
- The operational cooperation between TSOs within one RSCI will be based on a contract between these TSOs (RSCI contract).
- The coordination between different RSCIs will be ensured by methodologies and processes defined in the network codes, by regional needs and by a framework for compatible implementation agreed by all TSOs.

ENTSO-E will provide the organisational platform for implementing and developing the framework for future TSO coordination. In ascertaining the optimum number of RSCIs, ENTSO-E's vision is to keep the balance between regional needs and a centralised approach as described above.

Establishing RSCIs for existing synchronous areas would deliver a solution that ensures fast and stable security coordination over time. However, for the large and relatively heterogeneous synchronous area Continental Europe (CE), characterised by a large number of TSOs with varying needs and starting conditions, a step-wise approach to enhancing coordination is required. Enforced structural changes on the side of the TSOs (e.g. merging or other forms of deeper integration) or legal reallocation of their rights and obligations are not suited to provide improvements against the coordination framework above.



5 BENEFITS FOR EUROPEAN CONSUMERS

Enhancing TSO coordination as outlined above will benefit consumers through improved security of supply (by minimising the risk of wide area events), and lowering costs through increased efficiency in system operation and maximised availability of transmission capacity to market participants.

The financial and social impact of wide area security breaches is enormous; the cost of a 20 GW load disconnection during a large brownout is estimated to 800 M€ per hour (i.e. 40€/kWh¹⁾). Blackouts have an even higher impact.

¹⁾ This is the value of load non-supplied in Italy, see ENTSO-E report titled "Cost Benefit Analysis Methodology for Projects of European Significance," 2013.

Significant savings are also expected by the fact that enhanced TSO coordination minimizes the need of re-dispatching, especially costly emergency actions. Given the achievable savings over time, the implementation and operational cost of RSCIs is small compared to the cost of these emergency actions.

The methods for data exchange and joint security analysis are worldwide state of the art, and so is the geographic size of this European TSO coordination. For example, one of the foremost Regional Transmission Organizations in the USA, PJM, covers 61 million people and 165 GW peak load. This is comparable to the coverage the European TSOs foresee on average for the approximately five RSCIs (existing or new) which together will cover well over 500 million people and a peak load of about 530 GW.

6 IMPLEMENTATION ROADMAP

After taking the decision on the contractual architecture of the future operational cooperation and the ambitious coverage of tasks, ENTSO-E is now working towards the detailed implementation plan with

a target date of Quarter I, 2015. The next priority on the fastest possible implementation of the coordination framework will be the Multilateral Agreement between all TSOs to be developed in 2015.

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