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Operational planning and security management in modern power systems under regional coordination conditions

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Abstract—**Deregulation of the electricity market has brought not only numerous benefits but also significant challenges in the domain of operational planning and management of the power system. The increase in cross-border trade required improved coordination and data exchange among Transmission System Operators (TSOs). In response, Regional Security Coordinators (RSCs) were established to centralise the coordination of TSOs' operations and provide forecasts of the power system state over short- and medium-term time intervals. This paper aims to provide insight into the key aspects of RSC operations, emphasizing their significant role in planning, coordinating, and implementing security strategies at the regional and Pan-European level. Although the data presented in this paper is mainly theoretical due to the confidentiality of information managed by RSCs, this paper nevertheless serves as a valuable resource given that the concept of RSCs has been insufficiently addressed in professional literature and scientific studies.**

Keywords - component; operational planning; security management; regional coordination

I. Introduction

Operational planning represents a key segment of power system management, due to the fact that a well-planned operation of the power system forms the foundation for efficient and reliable real-time functioning. The model of operational planning applied in modern power systems is the result of transformations in the electricity sector through a series of significant technical, legal, organisational, and market changes, which have ultimately had a substantial impact on the planning process itself.

Before the initial deregulation measures, the model of state monopoly prevailed. Under the new conditions, the responsibility for operational planning was transferred from vertically integrated electricity companies to the independent, non-profit entities—Transmission System Operators (TSOs) and Distribution System Operators (DSOs) - whose establishment and functioning is a direct result of the deregulation process.

The elimination of monopolies in the electricity sector enabled increased productivity of electricity producers and a rise in the number of transactions, which was very difficult to coordinate. The growth of cross-border electricity trading increased the risk of power system security, requiring enhanced information exchange and better coordination between TSOs. The need for certain tasks to be carried out in a coordinated and centralised manner led to the formation of new specialised companies such as Regional Security Coordinators (RSCs). RSCs are companies owned by their clients - the TSOs - from whom they have taken over part of the operational planning tasks prior to the real-time operation. TSOs provide data based on which RSCs conduct analyses with a goal to identify potential threats to the system security and to give recommendations to TSOs, who then make final operational decisions.

In European legislation, alongside RSCs, the term Regional Coordination Centre (RCC) is also used, denoting an entity with a broader set of responsibilities compared to RSCs. Currently, there are six regional entities - five with RCC status and one with RSC status - depending on the EU membership status of the founding country or countries.

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II. Establishment and role of RSCs/RCCs

A. *Overview and Establishment of RSCs/RCCs*

The results of the European investigation into the 2006 disturbance, during which more than 15 million consumers were left without electricity, along with the continuous growth of cross-border trade and the unmanageable production from renewable energy sources (RES), prompted certain TSOs to improve mutual coordination. This eventually led to the establishment of Regional Security Coordination Initiatives (RSCIs).

In 2008, the first two RSCIs were formed on a voluntary basis: **Coreso** in Western Europe and **TSC** in Central Europe, as the precursors of today's RSCs/RCCs. The legal framework for establishing RSCs was provided by the EU's Third Energy Package [1], [2].

In early 2015, European TSOs signed a Multilateral Agreement on participation in Regional Security Coordination Initiatives (the so-called MLA RSCI) [3], in accordance with [2].

In July 2015, the third RSCI - **SCC** - was established in the Southeast Europe region. Taking into account the provisions of [3], during 2016, Nordic and Baltic TSOs initiated the formation of **Nordic RSC** and **Baltic RSC**, respectively. The last RSC, **SEleNe CC**, was established in May 2020 and covers the part of Southeast Europe that includes TSOs operating within the European Union (Figure 1)."

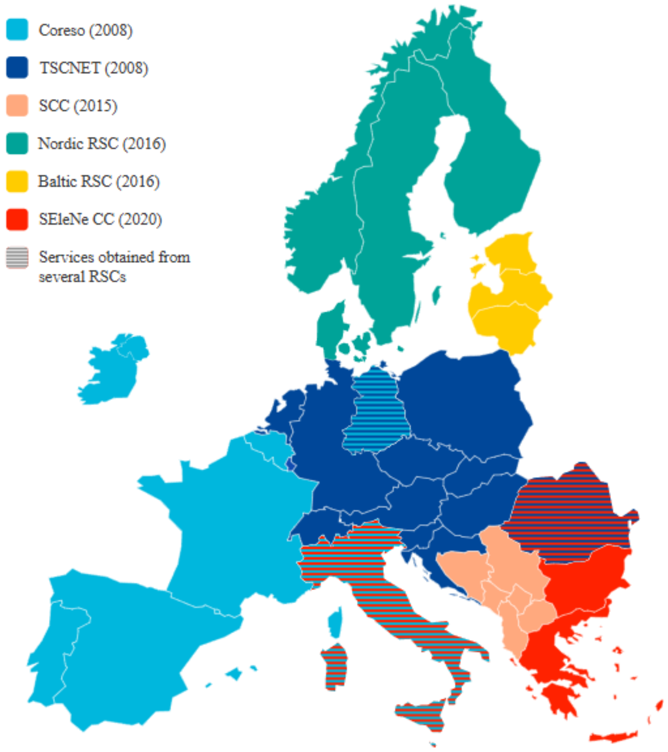

Figure 1. Overview of RSCs/RCCs with Their Corresponding Regions [4]

B. *Role and Responsibilities of RSCs/RCCs*

The services of RSCs/RCCs cover all ENTSO-E (European Network of Transmission System Operators for Electricity) member TSOs. TSOs provide the data used by RSCs/RCCs to carry out detailed analyses. These analyses aim to identify potential risks and threats to the secure operation of the power system. Based on the results of these analyses, RSCs/RCCs issue recommendations to TSOs, which then make the final operational decisions regarding system management.

Regulation 2017/1485/EU [5], known as the Guideline on Electricity Transmission System Operation (SO GL), defines the core activities of both RSCs and TSOs. Additionally, EU Directive 2015/1222/EC (Capacity Allocation and Congestion Management – CACM) [6] introduced guidelines for capacity allocation and congestion management in intraday and day-ahead timeframes. Regulation 2019/943/EU [7] established requirements for regional coordination, including the rights and obligations of RCCs and TSOs regarding their mutual cooperation.

III. Core Services of RSCs/RCCs

The core tasks of RSCs, as defined in [5] and [6], and later assigned to RCCs under Article 37 of EU Regulation [7], include:

- Validation and merging of Individual Grid Models (IGM) and creation of a Common Grid Model (CGM);
- Coordinated Capacity Calculation (CCC);
- Coordinated Security Analysis (CSA);
- Outage Planning Coordination (OPC);
- Short-Term Adequacy forecast (STA).

The tasks of RSCs/RCCs related to the security and reliability of the power system are carried out in timeframes ranging from a year ahead to day-ahead, intraday, and near real-time (Figure 2). The security analyses conducted before real-time operation enable TSOs to plan the operation of the power system with a minimal level of balancing reserves, as opposed to the extensive reserves that would be needed without effective management and planning. If security and reliability criteria are found to be violated during the planning stage, TSOs are able to take preventive actions instead of facing potentially significant problems in real time. This directly contributes to the more efficient operation of the power system and enhances the reliability and security of electricity supply.

Figure 2. The activities of operational planning related to different time intervals [8].

A. Validation of IGMs and Creation of CGM

IGMs created by TSOs play a key role in ensuring stable and reliable operation of electrical power grids. They represent a mathematical and alphanumeric representation of the power system, and are used by TSOs and RSC/RCCs to simulate and analyse the operation of the grid. The data required for creating an IGM includes forecasted data on power plant engagement, consumption, exchanges with neighbours, and network topology, as well as information on the electrical parameters of the grid that are necessary for the mathematical modelling of power system elements.

Each TSO provides IGMs and submits them to a centralised repository. These models are then retrieved by the responsible RSC/RCCs, validated, and merged into the CGM. Validation of IGMs is the process of checking the models against structural, syntactic, semantic, and convergence criteria for power flow calculations. The data used for creating the models must be accurate, reliable, and up to date. ENTSO-E requires model validation as part of its standards and procedures. Currently, each TSO submits its IGMs related to the transmission grid, which should contain all elements at voltage levels of 220 kV and above. Elements at lower voltage levels can be modeled partially or fully, if they significantly affect higher voltage levels or can be equivalent.

The **UCTE** (Union for the Coordination of Transmission of Electricity) format and the **CGMES** (Common Grid Model Exchange Standard) format are used for model creation. The UCTE standard uses older data formats, focusing on the basic data needed for static load and stability analyses, covering fewer details compared to CGMES, particularly regarding dynamic processes and market data.

As part of the coordinated activities performed by RSC/RCCs, the creation of a CGM is one of the most important tasks. The main purposes of the CGM are:

- Analysis of (pre)loading and power flows,
- Calculation of cross-border capacities,
- Network planning and development,
- Network security and stability assessment,
- Emergency response,
- Integration of RES,
- Short-circuit analysis and setting of protection devices,
- Provision of market information and transparency, etc.

Typically, regardless of the standard, minimum that each IGM/CGM contains is the data about: nodes, branches, generators, consumers, transformers, compensating equipment, electrical values (voltages, currents, and loads in the grid, reactances and capacitances, active and reactive power, etc.). IGMs, and thus CGMs, are created for different time intervals depending on planning and operational needs.

B. Coordinated Calculation of Capacities

The coordinated calculation of transmission capacities is performed at the regional level, where multiple TSOs collaborate via RSC/RCCs to optimise the operation of their transmission networks. This is a key process in the electricity market, enabling optimal use and distribution of transmission capacities between different market zones (Bidding Zones). A market zone represents the largest geographical area within which market participants can exchange energy without the allocation of capacity, where wholesale electricity prices are uniform [6]. The goal of this process is to ensure secure, reliable, and efficient electricity transmission across market zone boundaries, reducing network congestion and maximising the use of available capacities.

Determination of transmission capacities in advance and their allocation to the market participants is the most economically feasible and technically achievable way to manage congestion. Depending on how the offered capacities are determined, the methods for calculating cross-border capacities can be divided into the two basic methods:

- **Net Transmission Capacity** (NTC) method, which calculates the maximum exchange of electricity between two neighbouring market zones, and
- **Flow-based Allocation** (FBA) method, which calculates the cross-border capacity where the exchange of electricity between market zones is limited by the power transfer distribution factors (**PTDF**).

C. Coordinated Security Analyses

Coordinated security analyses represent the process of jointly assessing and managing security risks in the power system, aiming at ensuring the safety and reliability of the transmission network. After the allocation of transmission capacities, where cross-border exchanges are known, a security analysis is performed on the integrated model, including **congestion forecasting**. This process involves collaboration between multiple TSOs and RSC/RCCs, using a common methodology for regional operational security analysis (Regional Operational Security Analysis – ROSC).

It is clear that the quality of each forecast improves as it gets closer to real time. The most realistic results are provided by the Intraday Congestion Forecast (IDCF), which is updated with data on consumption, production, and exchanges closer to real time. In the absence of such data, models from the nearest available time interval, typically a day ahead (Day Ahead Congestion Forecast – DACF), are used for security analyses. The universal steps for the DACF/IDCF process are as follows (Figure 3):

- All TSOs submit their IGMs to a centralised repository.
- RSC/RCCs then retrieve the IGMs and validate them based on the rules predefined by ENTSO-E.
- Through fictitious X nodes (interrupted interconnection lines at the electrical midpoint), with injection removed and exchanges balanced, RSC/RCCs create the CGM.
- In the first phase of coordination on the merged model, RSC/RCCs perform power flow calculations, verify the fulfilment of the N-1 security criteria, and identify congestion based on combined contingency lists and monitored element lists.
- After completing the security analysis, if security limits in the network are violated, the next step is the

remedial action optimisation (RAO), which involves finding the best possible corrective actions to resolve identified network issues, taking into account various factors such as the effectiveness of the proposed measures, costs, and availability of resources.

– Once corrective measures are optimised, remedial action coordination (RAC) is needed between neighbouring control areas or regions to ensure synchronised implementation of the proposed solutions at the regional level.

– The second phase of coordination is performed to evaluate the combined effects of all corrective actions preliminarily agreed upon in the first phase. This phase includes updating the CGM and reanalysing security (including RAO and RAC if necessary).

– RSC/RCCs submit validation reports, merged models, and security analysis results to the corresponding TSOs.

– At the end of the process, TSOs and RSC/RCCs consolidate the results of the entire process in a joint teleconference.

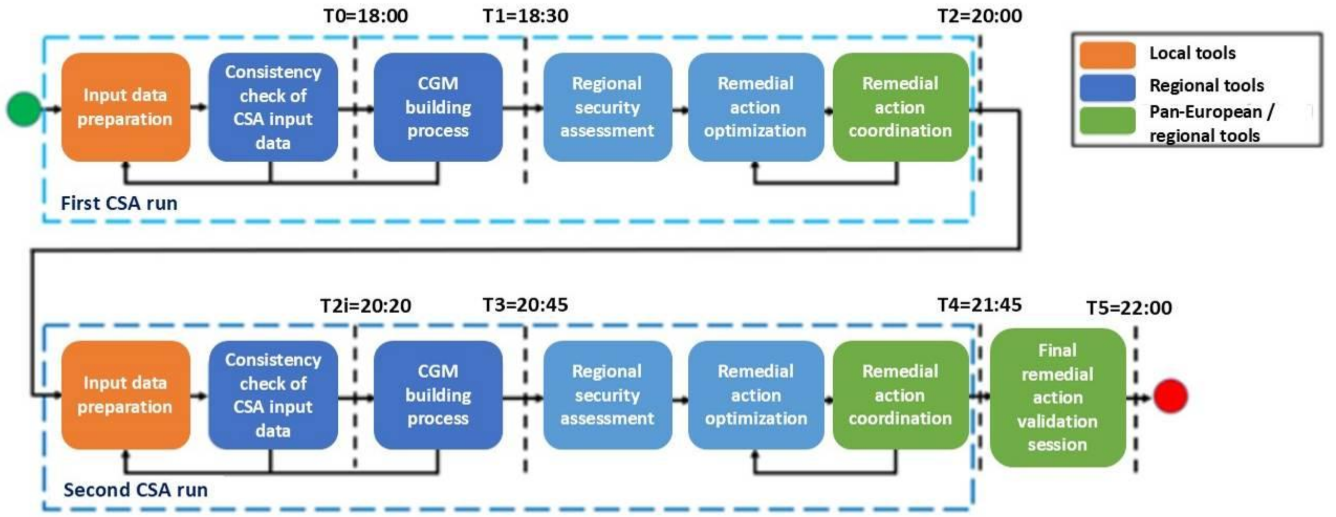

Figure 3. ROSC process, steps, and timings [9]

D. *Coordination of Outage Planning*

RSC/RCCs implement the process of coordinating outage planning (OPC process) across different time intervals. These intervals include weekly (W-1), monthly (M-1), and annual (Y-1) periods, with each having specific tasks and activities. This multi-temporal approach allows RSC/RCCs to respond promptly to changes in network topology and continuously manage planned outages (Figure 4). The comprehensive OPC process consists of two processes: the coordinated outage planning process at the pan-European level and the regional OPC process.

During the pan-European W-1 OPC process, there are four automated processes for merging outage plans. The W-1 OPC process covers a planning period of seven days, starting from Saturday and ending on the next Friday. Before the first process of merging outage plans, TSOs are required to submit input files to the pan-European OPC tool: Element list and **U**n**A**vailability **P**lan (UAP file). The Element list is a database with all the elements that the TSOs report in the OPC process. The UAP file contains information about the planned outages of elements from the Element list file for the upcoming period. After the merging process is completed, RSC/RCCs automatically receive following information from the OPC tool: a merged pan-European list of elements whose outages are coordinated (OPC Merged Element list), a pan-European file with merged outages (OPC Merged UAP file), and an OPC report (OPC Report).

The results of the second outage plan merging process are used by the RSC/RCCs as input data for the regional OPC. The regional OPC process is carried out by each RSC/RCC for the region under theirs responsibility. This process involves the calculation of security analysis on models with considered outages. In normal conditions, the system is stable. However, if the outage of an element results in a violation of the N-1 security criterion as a result of the OPC process, a so-called **OPSC** (Outage Planning Security Constraint) or **OPI** (Outage Planning Incompatibility) situation occurs.

– OPSC refers to a situation where the N-1 criterion is violated during outages, but if certain corrective actions are implemented, the system will return to a secure state.

– OPI indicates a critical situation in the network as a result of planned outages. A detected OPI is a final condition, meaning that there is no corrective action that could prevent the system from entering an insecure state, except for cancelling the outage.

After the calculation is completed, the results are sent to the TSOs, who use them for the final approval of the planned outages. Every Thursday, all RSC/RCCs participate in discussions about the results of the W-1 regional OPC process, inconsistencies on interconnecting power lines, and the quality of input data. Every Friday, RSC/RCCs, together with the TSOs from their region, participate in the weekly operational teleconference (WOPT), where the outage plans for the next week are confirmed, and any disagreements and OPSC situations are resolved before the final merging of the outage plans.

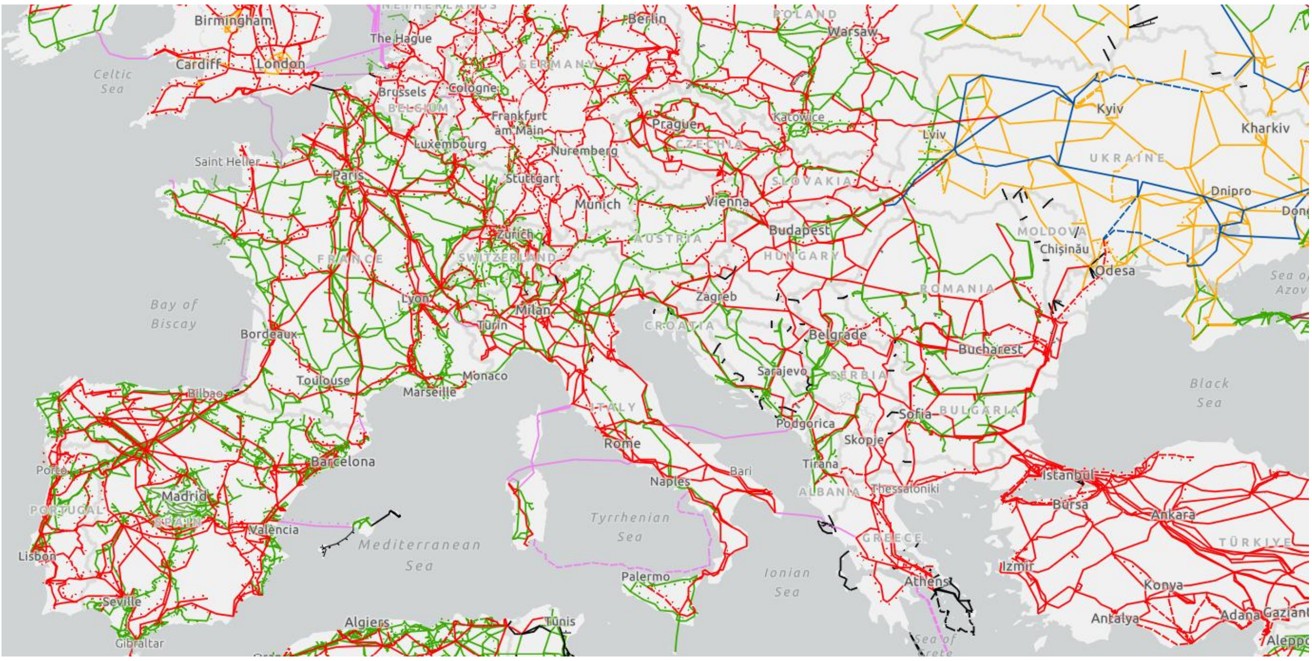

Figure 4. ENTSO-E map of the power system whose outages are coordinated [4]

E. Short-Term Adequacy Assessment

The adequacy of the power system is a measure of the system's ability to meet its own consumption using available production and imports from the neighbouring systems. As part of strategic planning, adequacy assessments are conducted on a long-term basis, while on short-term and medium-term levels, they are part of the operational planning process. The Short-Term Adequacy Assessment (STAA) is a process carried out to evaluate whether the power system is adequate in a short-term period, typically from a week to at least one day ahead.

The overall adequacy assessment is consists of two processes:

– Cross-Regional (pan-European) Adequacy Assessment (CRAA),

– Regional Adequacy Assessment (RAA).

RSC/RCCs, through the pan-European STA tool (Figure 5), perform a short-term CRAA assessment daily for the next 7 days. Each TSO provides necessary information for the adequacy assessment in its control area by submitting files to the STA tool. The task of the RSC/RCCs is to monitor the process and ensure the results of the STA calculations.

The STA process begins automatically every day at 9:00 CET and consists of the following steps:

1. **Input Data Validation**: the minimum that TSOs submit is a Load file (forecasted consumption) and a Gen file (availability of production capacities by type of power plants, including expected variations in intermittent renewable energy sources). In addition to the data from the Gen and Load files, the STA tool retrieves data from the ENTSO-E Transparency platform about agreed energy exchanges in the form of the NTC file.
2. **Deterministic Calculation**: This calculation considers the data submitted by TSOs and is based on a power balance calculation at a peak load time. When sorting production, the algorithm prioritises power plants based on a predefined weighting factor for each type of plant.
3. **Probabilistic Calculation**: The algorithm runs 10,000 deterministic calculations (Monte Carlo simulation) in which each scenario varies consumption, generation from solar and wind, generator outages, DC cables, etc. Based on these 10,000 scenarios, the algorithm estimates the adequacy of the system for the next 7 days.
4. **Reporting**: The results of the calculations are processed, a report is generated, and the results are sent to TSOs and RSC/RCCs.

Once the STA tool completes the CRAA calculation, the RSC/RCCs check whether any adequacy issues are detected in the region of interest. If an inadequacy is detected in the deterministic results for up to 3 days ahead for any TSO, the RSC/RCCs initiate the RAA process. The RSC/RCCs inform the TSOs via email that the RAA process has been initiated and organises a preliminary teleconference. When the system is inadequate, the entire observable area and its TSOs are considered. During the teleconference, it is discussed whether the adequacy issue is real or due to input data. If an inadequacy is detected, a deadline for submitting corrective actions is set. The RSC/RCCs review the corrective actions and initiates the RAA calculation tool. After completing the calculation, the RSC/RCCs conduct a final teleconference to demonstrate the process results and agrees with the TSOs on the final set of corrective actions.

All RSC/RCCs, on a rotational basis, serve as the main or backup entity responsible for monitoring the quality of the pan-European STA calculation and the STA tool in accordance with the obligations set out in [3] and the predefined schedule.

Similarly to the STA process, RSC/RCCs also monitor the pan-European OPC tool and the OPC process.

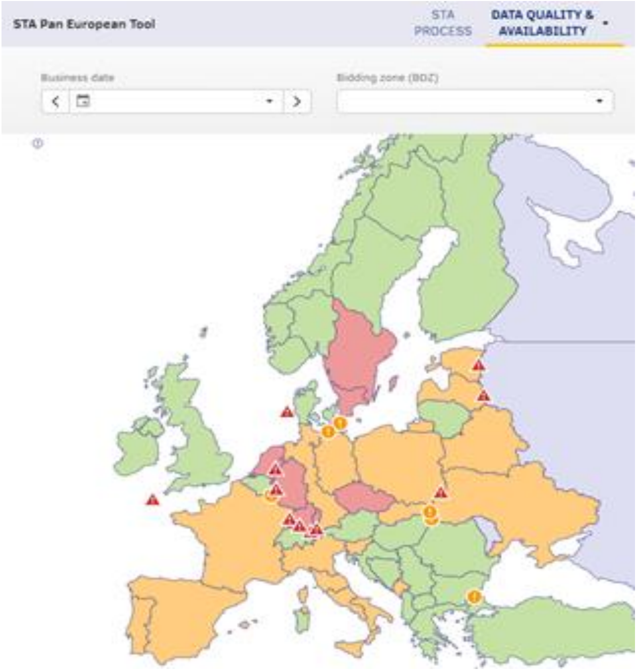

Figure 5. Pan-European STA tool

F. Additional Tasks of RSC/RCCs

In addition to the core RSC tasks defined by the EU Third Energy Package, Regulation (EU) 2019/943 (Article 37) [7] establishes a number of new functions aimed at further enhancing the security and sustainability of Europe's power system and at improving the quality of information exchange, coordination and cooperation between RSC/RCCs and TSOs. These new tasks are:

- Supporting the consistency assessment of transmission system operators' defence plans and restoration plans in accordance with the procedure set out in the emergency and restoration network code adopted on the basis of Article 6(11) of Regulation (EC) No 714/2009;
- Training and certification of staff working for regional coordination centres;
- Supporting the coordination and optimisation of regional restoration as requested by transmission system operators;
- Carrying out post-operation and post-disturbances analysis and reporting;
- Regional sizing of reserve capacity;
- Facilitating the regional procurement of balancing capacity;
- Supporting TSO, at their request, in the optimisation of inter-transmission system operators' settlements;
- Carrying out tasks related to the identification of regional electricity crisis scenarios if and to the extent of they are delegated to the regional coordination centres pursuant to Article 6(1) of Regulation (EU) 2019/941;
- Carrying out tasks related to the seasonal adequacy assessments if and to the extent of they are delegated to the regional coordination centres pursuant to Article 9(2) of Regulation (EU) 2019/941;
- Calculating the value for the maximum entry capacity available for the participation of foreign capacity in capacity mechanisms for the purposes of issuing a recommendation pursuant to Article 26(7);
- Carrying out tasks related to supporting transmission system operators in the identification of needs for new transmission capacity, for upgrade of existing transmission capacity or their alternatives, to be submitted to the regional groups established pursuant to Regulation (EU) No 347/2013 and included in the ten-year network development plan (TYNDP) in Article 51 of Directive (EU) 2019/944.

The Electricity Coordination Committee, established under the referenced Directive [10], plays a key role in issuing opinions on assigning these new tasks to RSC/RCCs. Upon receiving a proposal, the Committee issues its opinion; if positive, the RSC/RCCs assume the new tasks in accordance with the proposal drafted by ENTSO-E and approved by ACER.

IV. Challenges for TSO Coordination at the Pan-European and Regional Levels

RSC/RCCs face a range of complex challenges in their operations, requiring innovative solutions and continuous cooperation among various stakeholders in the energy sector. These challenges are shaping the future of RSC/RCCs and driving a series of strategic initiatives that lead to the continuous expansion and transformation of their roles.

One of the most significant challenges is the integration of a growing share of RES, whose variability and unpredictability demand advanced planning and management methods. With the increasing penetration of RES, RSC/RCCs must adopt advanced technologies to improve predictive security analyses. The implementation of smart grids is expected to facilitate real-time management and rapid response to changes in supply and demand.

Cyber (digital/IT) security is becoming increasingly important due to the growing threat of attacks on computers, networks, and IT infrastructure, which can disrupt the operation of critical infrastructure. Emphasizing cybersecurity, secure data exchange among system entities, and resilience to crises ensures the protection of critical infrastructure and quick recovery in the event of disruptions or cyberattacks. Crisis management, natural disasters, and extreme weather events require the development of robust strategies and contingency plans for prevention, rapid response, and recovery of the power system to ensure continuous and reliable electricity supply, even under the most challenging conditions.

The coordination of TSOs' activities is hampered by differences in regulatory frameworks, technical standards, practices, and language barriers. Financial and economic challenges also pose significant obstacles for both TSOs and RSC/RCCs. In addition to these technical and economic aspects, political uncertainty and the need to align with and implement EU directives and regulations further challenge the work of RSC/RCCs. Overcoming technical and administrative barriers, strengthening regional cooperation, and harmonizing legislation at both the EU and non-EU levels will contribute to improved coordination and system operation.

Information systems and data management are crucial for the successful functioning of RSC/RCCs. The large volumes of data generated daily by TSOs and RSC/RCCs require efficient management and storage. Moreover, ensuring the interoperability of different information systems and platforms is necessary to enable seamless data exchange among power system entities. This aspect requires the development of standards and protocols that allow different tools to work together and support an integrated approach to data management, which is essential for achieving high efficiency and operational security in power grids.

Continuous training and education play a key role in the development of the electricity sector. Providing ongoing training for professionals enables them to stay up to date with the latest technological, informational, and regulatory developments, which is critical for effective power system management. Additionally, raising public awareness of the importance of energy efficiency and sustainability is vital for promoting responsible electricity use. Educational efforts aimed at both end-users and professionals in the field contribute to a better understanding and acceptance of new technologies and practices, which is crucial for achieving long-term goals in the energy sector.

Addressing these challenges requires continuous cooperation and interaction among governments, academia, industry, and electricity consumers to ensure all parties work together toward sustainable solutions. Innovation and new technologies are key for progress. Furthermore, aligning policies and regulations at the EU and international level is essential to establish a unified legal framework that encourages innovation and allows the smooth integration of new technologies into existing systems. Only a comprehensive approach can help overcome these challenges and achieve the long-term objectives of the power sector.

V. FUTURE ROLE OF RSC/RCCS

In mid-2024, ENTSO-E published a draft of the document Future Vision for RCCs [11], which outlines the envisioned future role of RCCs in the management of Europe's power system. This document defines RCCs' future functions in line with the need for even greater coordination both inside TSOs and between TSOs and other sectors, as well as for improving the quality of existing tasks within operational processes. It forms the shared vision for RCCs within ENTSO-E and the basis for ongoing discussions and decisions about their roles and responsibilities. The key conclusions of this document are:

- **TSO responsibility retained**: TSOs continue to bear responsibility for real-time operation of the power system, while RCCs remain planning-service providers. RCCs may act on behalf of TSOs only when explicitly mandated.
- **New tasks and adaptation to challenges**: RCCs could take on new tasks and/or adapt existing ones to address the challenges arising from increased integration of variable renewables and the decarbonisation of the power system.
- **Enhanced coordination**: Closer coordination among TSOs at both regional and pan-European level is essential for efficient network use, and may require a re-allocation of roles between TSOs and RCCs, with clear definitions of their respective responsibilities.
- **RCCs' future role**: RCCs will play an increasingly important support role for TSOs, but existing RCC tasks must be adapted to meet new operational needs.
- **Next steps**: It is advisable that ENTSO E initiate a project aimed at developing a unified long-term vision for RCCs, encompassing operational, market, and regulatory or legal dimensions throughout the organisation.

The overall conclusion is that RCCs have the potential to make an even greater contribution to a more reliable, secure, and efficient European power system, but their roles and responsibilities vis-à-vis TSOs must be clearly defined.

VI. CONCLUSION

In modern power systems, numerous factors contribute to the improvement of the overall electricity sector and to better meet the needs of consumers and society at large. Modern systems are quicker to adopt new technologies due to increased competition and greater motivation to invest in RES and other sustainable technologies. Deregulation has brought about clearer and more transparent regulatory frameworks. The liberalised electricity market has stimulated increased competition and trade volume, as well as a trend toward lower prices for consumers.

However, the model of a deregulated and market-oriented power system also requires a high level of coordination and communication to ensure that initial gains do not turn into losses. In this context, RSC/RCCs play a crucial role.

RSC/RCCs provide a coordinated approach among various TSOs to ensure synchronisation of activities and effective system operation. They facilitate timely and accurate information exchange among all relevant stakeholders in the power sector. They conduct detailed analyses and risk assessments, identify potential issues, and develop strategies to address them before disruptions occur. RSC/RCCs support TSOs in final decision-making by offering recommendations for resource optimisation, implementing preventive or corrective actions, and proposing improvements into the operational procedures.

The management and planning of the modern power system bring numerous challenges, such as the variability of RES, which complicates balancing generation and consumption, system instabilities, and market fluctuations. The role of RSC/RCCs is becoming increasingly important in overcoming those challenges. Their involvement in operational planning coordination is essential, as only a well-planned system can function efficiently in real time. Planning is a key to problem prevention, resource optimisation, system flexibility, activity coordination, and effective response to emergencies. Without proper planning, the system is exposed to a higher risk of disruptions, inefficiencies, and high costs.

This paper presents an analysis of the role of RSC/RCCs in the context of power sector deregulation. It reviews the historical development, responsibilities, and core services of RSC/RCCs, including IGM validation, CGM creation, coordinated capacity calculation, security analysis, outage planning, and adequacy assessment. It also describes additional tasks, challenges, and future directions in the development of RSC/RCCs.

The document primarily aims to provide a comprehensive overview of the key aspects of RSC/RCCs operations, emphasizing their role in planning, coordination, and implementation of security strategies at the regional level. Secondly, it will serve as a valuable resource for academic institutions by offering students and professionals in the field of power system security a detailed and structured approach to analysing and solving security challenges in the operational planning process. It will also support the improvement of university curricula by enabling students to gain deeper insight into the practical aspects of medium- and short-term power system planning.

Finally, the publication of this document represents an important contribution to both the academic community and professionals in the field of security, ensuring that knowledge and experience in operational planning and security coordination are consolidated, expanded, and applied in practice.

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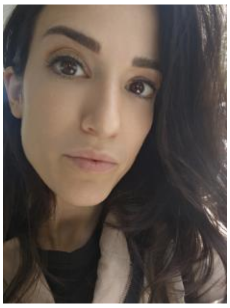

Marta Gačić is an experienced engineer with nine years of employment at Security Coordination Centre SCC Ltd Belgrade, with an active role as the leader of the development department. Experienced in managing energy projects, coordinating team work and improving quality in business processes. A capable engineer with a Master's degree in Electrical Engineering and Computing from the Faculty of Electrical Engineering, University of Belgrade.

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