

ENTSO-E SOC StG ReC – Working Group Monitoring and Reporting

Regional Coordination Assessment Annual Report 2024 (ARTICLE 17 of SO GL)

September 2025



Foreword

ENTSO-E, the European Network of Transmission System Operators for Electricity, is the association of the European transmission system operators (TSOs). The 40 member TSOs, representing 36 countries, are responsible for the secure and coordinated operation of Europe's electricity system, the largest interconnected electrical grid in the world.

Before ENTSO-E was established in 2009, there was a long history of cooperation among European transmission operators, dating back to the creation of the electrical synchronous areas and interconnections which were established in the 1950s.

In its present form, ENTSO-E was founded to fulfil the **common mission** of the European TSO community: to power our society. At its core, European consumers rely upon a secure and efficient electricity system. Our electricity transmission grid, and its secure operation, is the backbone of the power system, thereby supporting the vitality of our society. ENTSO-E was created **to ensure the efficiency and security of the pan-European interconnected power system** across all time frames within the internal energy market and its extension to the interconnected countries.

ENTSO-E is working to secure a carbon-neutral future.

The transition is a shared political objective through the continent and necessitates a much more electrified economy where sustainable, efficient and secure electricity becomes even more important. **Our Vision: "a power system for a carbon-neutral Europe"**^{**} shows that this is within our reach, but additional work is necessary to make it a reality.

In its Strategic Roadmap presented in 2024, ENTSO-E has organised its activities around two interlinked pillars, reflecting this dual role:

- › "Prepare for the future" to organise a power system for a carbon-neutral Europe; and
- › "Manage the present" to ensure a secure and efficient power system for Europe.

ENTSO-E is ready to meet the ambitions of Net Zero, the challenges of today and those of the future for the benefit of consumers, by working together with all stakeholders and policymakers.

^{*} <https://vision.entsoe.eu/>

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Executive Summary

ENTSO-E publishes this annual report on regional coordination assessment to fulfil the obligations from Article 17 of Regulation (EU) 2017/1485 on establishing a guideline on electricity transmission system operation (hereafter the “SO GL”). The goal of the report is to document the successful implementation and operational monitoring of the tasks of the Regional Coordination Centres (RCCs) and make this information available to the public. It contains Key Performance Indicators (KPIs) for the tasks performed by the RCCs.¹ As long as a legally mandated task is not fully implemented, RCCs can use this report to show whether a legacy task is in place, what this task comprises, and whether the RCC has started working towards the task based on the regulatory framework.

For the complete 2024 reporting year, the Outage Planning Coordination (OPC), Short-Term Adequacy (STA) and Common Grid Model (CGM) tasks were in operation. In the pan-European OPC sub-task, all outages on relevant assets are merged, and Tie Line Inconsistencies (TLIs) are solved. In the regional OPC sub-task, the RCCs detect the Outage Planning Incompatibilities (OPIs) and recommend corresponding remedial actions to solve them. In the regional STA sub-task, RCCs support the Transmission System Operators (TSOs) in the resolution of adequacy issues detected in the pan-European sub-task. All RCCs are continuing work on implementing the CGM based on the Common Grid Model Exchange Standard (CGMES). In some regions, regional merged models based on CGMES are already used in regional tasks, while in other regions merged models based on the Union for the Co-ordination of Transmission of Electricity Data Exchange Format (UCTE-DEF) are used. The Coordinated Security Analysis (CSA) task according to the requirements set out in the SO GL and the CSA methodology (CSAm) is split into the three layers of Coordinated Operational Security Analysis (COSA – TSO level), Coordinated Regional Operational Security Assessment (CROSA – regional level) and Coordinated Cross-Regional Operational Security

Assessment (CCROSA – cross-regional level). The regional CSA layers (CROSA and CCROSA) are being introduced in all Capacity Calculation Regions (CCRs), in addition to the tasks according to the Regional Operational Security Coordination methodologies (ROSCm), namely CGM building, regional STA, and regional OPC.

There are already legacy versions of CSA (hereafter referred to as Security Assessment; SA) and grid model merge tasks implemented in operational practice, based on the voluntarily organised regional security cooperation of the TSOs. This report describes the implementation status of the legally mandated tasks and the best practices applied thus far.

RCCs in rotation performed the merging of IGMs on an hourly basis, each covering the remaining hours from the next target time to the end of the relevant business day. Article 17.1 of the SO GL requires ENTSO-E to report any interoperability issues in the system operation coordination. Given that no interoperability issues related to regional coordination were identified in 2024, this report does not contain any proposed changes to improve effectiveness and efficiency in the system operation coordination.

¹ The naming of RSCs is derived from the SO GL definition. The RSCs located in EU countries changed to RCCs according to Article 35 of Regulation (EU) 2019/943. Given that SCC is placed in a non-EU country, it remains an RSC. However, for simplicity, the term RCC is used throughout this report, and it shall be considered that this also includes SCC as an RSC.

1 Introduction

Under Article 17 of the SO GL, ENTSO-E is obligated to publish an annual report on regional coordination assessment. The report aims to document the implementation and operational monitoring of the RCCs' tasks. The legal basis for the report is Article 17 of the SO GL:

Annual Report on regional coordination assessment (Article 17 of SO GL)

1. By 30 September, ENTSO for Electricity shall publish an annual report on regional coordination assessment based on the annual reports on regional coordination assessment provided by the regional security coordinators in accordance with paragraph 2, assess any interoperability issues and propose changes aiming at improving effectiveness and efficiency in the system operation coordination.

2. By 1 March, each regional security coordinator shall prepare an annual report and submit it to ENTSO for Electricity providing the following information for the tasks it performs:

(a) the number of events, average duration and reasons for the failure to fulfil its functions;

(b) the statistics regarding constraints, including their duration, location and number of occurrences together with the associated remedial actions activated and their cost in case they have been incurred;

(c) the number of instances where TSOs refuse to implement the remedial actions recommended by the regional security coordinator and the reasons thereof;

(d) the number of outage incompatibilities detected in accordance with Article 80; and

(e) a description of the cases where the lack of regional adequacy has been assessed and a description of mitigation actions set in place.

3. The data provided to ENTSO for Electricity by the regional security coordinators shall cover the preceding year.

ENTSO-E prepared this report based on input data provided by the RCCs. Unless otherwise specified, the terms used in this report are defined as set out in Article 3 of the SO GL. A glossary of the terms used with the relevant source of definition is provided at the end of this report.

Some of the tasks that RCCs are required to report on under Article 17 of the SO GL remain in the process of being implemented, in accordance with the relevant methodologies. This report distinguishes between the following two categories of tasks:

- › Legally mandated tasks, namely those based on the regulatory framework (OPC, STA, CGM).
- › Legacy tasks, namely tasks implemented on a voluntary basis according to operational needs (SA or regional merged model in UCTE-DEF format). This is the case because some RCCs were operational even prior to the entry into force of the SO GL.

Regarding the regional CSA task—which comprises CROSA and CCROSA—the legally mandated tasks are not yet in operation but currently in the development phase. Meanwhile, RCCs have legacy tasks in place to different extents, supporting the TSOs in ensuring operational security during the operational planning processes. In this document, we refer to these legacy tasks as SA.

Coordinated Capacity Calculation (CCC) is among the tasks assigned to RCCs under Regulation (EU) 2019/943. However, it is not addressed in this report as it does not fall within the scope of the SO GL requirements.

The report consolidates data received from all RCCs that are subject to the SO GL, namely the Baltic RCC, Coreso, Nordic RCC, SEleNe CC, and TSCNET Services (TSCNET). The Security Coordination Centre (SCC) has been included on a voluntary basis.

It is also important to consider the geographical scope of each task. For instance, the CGM is a pan-European task, and the CGMs produced will support other RCC activities. The OPC and STA tasks have both pan-European and regional dimensions. By contrast, the CROSA is a regional task carried out per CCR, with CCROSA expected to address cross-regional aspects in the future.

2 Common Grid Model

The pan-European CGM is created by merging the Individual Grid Models (IGMs) of European TSOs while considering reference data programmes (PEVF or CGMA files) and boundary sets (BDSs). It is created for different time-frames² and will serve as the basis for all other tasks subsequently described.

In most of the CCRs, grid models based on the UCTE-DEF are used as input for legacy tasks, although Nordic CCR, Baltic CCR, and SWE CCR use regional merged models based on CGMES format for either task development purposes or regional legally mandated tasks.

The CGM will serve as the main data input for performing further analysis through the processes in the STA, OPC, CSA, and CCC tasks.

In the reported year until September 2024, all RCCs taking part in the pan-European CGM building process performed pre-emptive exclusion of some IGMs known to have blocking quality issues and late delivery of the CGM (after gate closure time) to increase the probability of successful CGM creation and limited implementation of the substitution and replacement strategy resulting in partial CGMs (CGMs that might not model all parts of the network). This approach was used to avoid blocking the CGM building process with the input data affected by known issues (e.g. critical warnings according to Modelling group QoCDC classification, load-flow non-convergence, causing QoCDC error at the CGM level, etc.).

After alignment with other RCCs and the TSOs, Coreso and TSCNET changed this approach on 23 September 2024, and SEleNe CC joined on 3 November 2024. Baltic RCC and SCC performed manual data quality interventions during the entire reporting period. This was undertaken by Baltic RCC due to the testing of the new EMF tool, as testing was not possible owing to lacking IGMs in the acceptance environment. The main purpose was to show the readiness of the CGM building process for the subsequent tasks (e.g. CSA) by respecting the process execution as described in referential documents, as well as focusing the available resources on the data quality investigations.

Since the quality of the CGMs (as defined by the Quality of CGMES Dataset and Calculation document) is not yet at the expected level, and combined with non-readiness of regional processes, the CGM created during the reporting period was not used in regional operational processes. However, as mentioned at the beginning of this chapter, some CCRs already used regional merged models in CGMES format to perform certain regional tasks. Nevertheless, those regional merged models are beyond the scope of this report.

2.1 Scope: Pan-European

The CGM is created based on the relevant input data (IGMs, PEVF/CGMA, BDS) obtained via OPDE, in a process that started in January 2022. According to the SOC decision number 11 from 4 December 2019, the CGM is created on a rotational principle, organised in groups based on time-frames (e.g. Group 1 takes care of the Day-ahead (DA) and Two-Day-ahead (2D) time-frames, Group 2 takes care of the Intraday (ID) time-frame and Group 3 takes care of the Year-ahead (YA) time-frame) and roles (main and backup roles). One RCC takes one role of one group at a time and performs the CGM creation accordingly.

The rotation takes place every four weeks (once a year for the YA time-frame), after which each RCC takes the next rotational step according to the agreed schedule. The main and backup roles mean that for the same time-frame, there are always two RCCs in parallel creating CGMs, thus guaranteeing that at least one CGM is always available. The agreed-upon rotational calendar and handover templates process ensure that the process remains efficient, and no extra effort is wasted. Where relevant, KPIs presented in this report shall refer only to the main and backup RCC responsible for the CGM building task according to the rotational schedule.

² As per the SO GL, only Year-ahead, Week-ahead, Day-ahead and Intraday are considered in this report, as well as related operational tasks of CSA, OPC, and STA. Any other capacity calculation time-frame as referred in CACM and FCA is not part of this report.

2.2 Time-frames

During the 2024 reporting year, CGMs were built in the following time-frames:

- DA (one run of the CGM building process to provide 24 models for each day³)
- ID (24 Intraday runs of the CGM building process to provide 24 models for each day,⁴ resulting in 300 models for each day)

The CGM for the Week-ahead (WA) time-frame was not part of the CGM building task in 2024, and related KPIs will be provided in further reports.

The YA time-frame is currently not operationally viable due to insufficient input quality. Unfortunately, the process still requires several iterations of IGM creation by TSOs to CGM merging by RCCs to achieve an adequate and complete CGM. Consequently, the YA time-frame is considered to be in the test phase during the reporting period. Conducted by the ENTSO-E Task Team Network Modelling and Forecasting Tool (NM&FT) under the Steering Group Regional Coordination,

it has focused on creating the Winter Peak 1 scenario for CGM rather than creating the eight required scenarios. The NM&FT Task Team is ensuring that the collection of CGMES-based IGMs via OPDE and RCCs in rotation proceeds according to the agreed-upon calendar, merging those as needed. The merged published IGMs are then used to create the corresponding CGM. Despite several issues (data quality as well as IT issues) observed during the YA merging process, 35 out of 41 TSOs published their IGMs. The RCCs responsible for merging the agreed scenario successfully created a CGM that included 32 of the 35 IGMs published by TSOs.

2.3 CGM KPIs

Due to the missing IGMs, manual interventions within the process, and incomplete implementation of the substitution and replacement strategy, the resulting CGMs might model only parts of the network (partial CGMs).

The CGM task delivery KPIs – as presented in the following paragraphs – are an aggregation of the processes performed with and without manual intervention as of 23 September 2024, in the case of some RCCs. On the other hand, the presented KPIs provide a picture only of the final product delivered by RCCs in rotation (CGMs), without reference to the inclusion ratio of IGMs.

CGM KPI1: Percentage of successful CGM building processes

Description: CGM KPI1 represents the percentage of successful CGM building processes (successful merged CGMs published on OPDE) compared to all CGM building processes performed at a pan-European level. This KPI1 considers any ratio of IGM included in each CGM and measures successful merge and publication on OPDE. It includes all timestamps for which at least one RCC (main or backup) was able to run the CGM building process⁵ within a specific time-frame.

In 2024, a slight decrease in the successful CGM building process has been observed, leading to fewer CGMs published by both the main and backup RCCs.

As expected by the TSOs and RCCs, stopping the manual intervention by the RCCs had a negative impact on the CGM convergence and completeness.

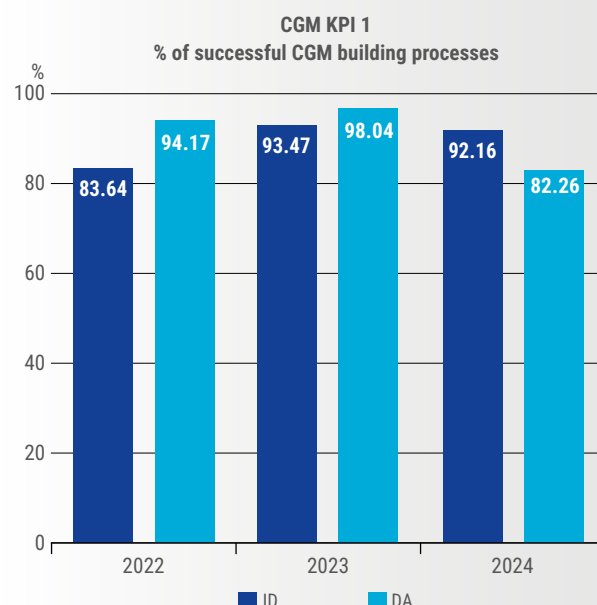


Figure 1: CGM KPI 1 – Percentage of successful CGM building processes

³ Or 23/25 models due to daylight saving time.

⁴ Or 23/25 models due to daylight saving time.

⁵ Based on the number of published CGMs during the data collection phase of this report, accounting as successful also CGMs published after gate closure time, with the implementation of manual data quality interventions

CGM KPI2: Percentage of failures and reasons for failures

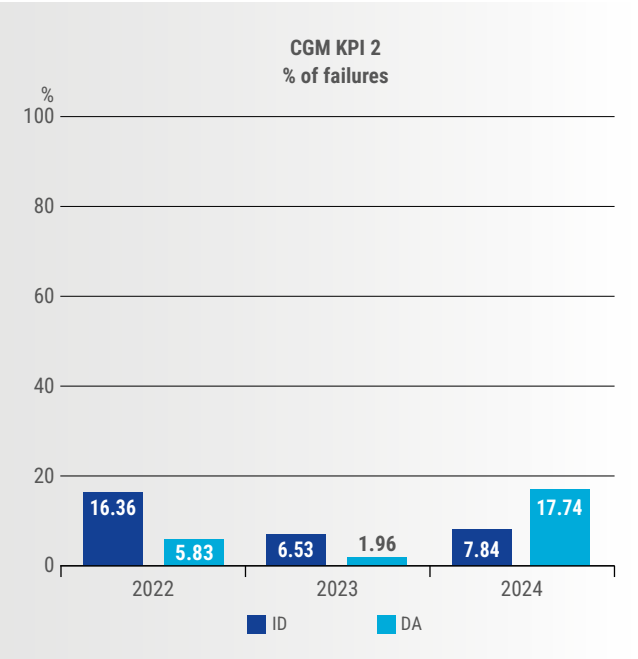


Figure 2: CGM KPI 2 – Percentage of failures

Description: CGM KPI2 represents the percentage of missing CGMs for both the main and backup RCCs compared to the total number of merge processes that were scheduled to run at a pan-European level and per time-frame.⁶

We can associate these missing CGMs with the percentage of causes, which are categorised as data quality issues, IT issues on the service provider (SP) side, IT issues on the RCC side, or Operational Planning Data Management (OPDM) client issues (see Table 1 for details).

The figures associated with the missing CGM building process in Table 1 below shall be applicable to CGM KPI2 for the corresponding time-frame.

Following the decline observed in 2023, an increase in Intraday and Day-ahead CGM creation failures was recorded in 2024. The primary causes of this increase are poor data quality and downtime related to the IT infrastructure or tools at RCCs.

In addition to these issues, RCCs observed an unfortunate interruption in the monitoring, leading to missing information. This interruption is reported in the last row of Table 1 and affected only 7% of the IDCF failures, and thus altogether around 0.5% of all timestamps.

RCCs, TSOs, and ENTSO-E are working together to increase the data quality and reliability of the IT infrastructure and process.

Reason for failures

Causes associated with CGM KPI 2	ID		DA	
	Main RCC	Backup RCC	Main RCC	Backup RCC
Data quality	79.25 %	15.09 %	58.15 %	49.10 %
IT issue on SP side	2.18 %	0.44 %	22.72 %	1.09 %
IT issue on RCC side	10.89 %	84.33 %	16.56 %	33.12 %
OPDM client issue	0.73 %	0.15 %	2.57 %	15.79 %
Unknown	6.97 %	0.00 %	0.00 %	0.90 %

Table 1: Reasons for failure associated with CGM KPI 2

6 Based on the number of CGMs published during the data collection phase of this report, accounting as missing CGMs those CGMs that are still not published after the implementation of manual data quality interventions.

CGM KPI3: Percentage of instances when the main RCC performed the merge

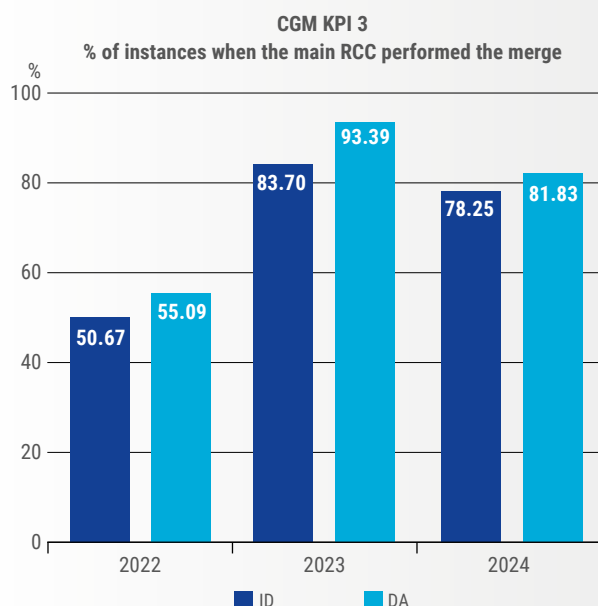


Figure 3: CGM KPI 3 – Percentage of instances when the main RCC performed the merge

Description: CGM KPI3 represents the percentage of successful CGM building processes compared to all CGM building processes performed at a pan-European level when performed by the main RCC for each time-frame.⁷

Figure 3 shows a decrease in the main RCCs' ability to deliver CGMs in 2024 compared to the previous year. One of the main influencing factors is the new merging approach (described in the introduction paragraph) without RCCs' manual intervention. This tightening had an expected negative impact on the CGM completeness and convergence.

The remaining CGM building process results were covered by the backup RCC, according to the rotational calendar.

CGM KPI4: Percentage of successful CGM building processes for the backup RCC

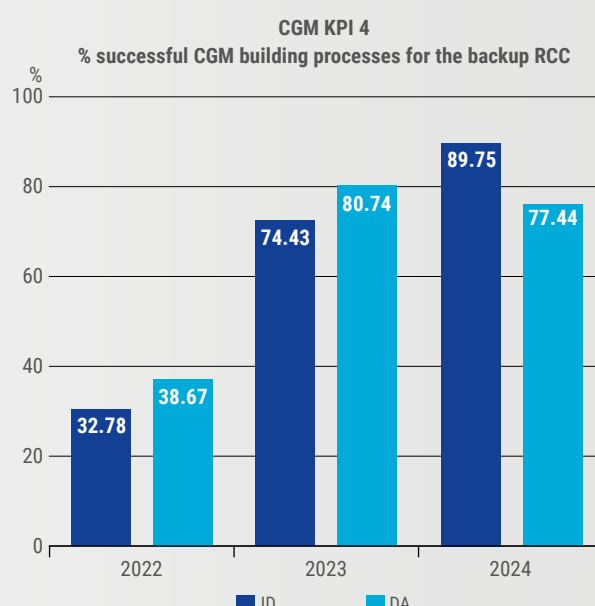


Figure 4: CGM KPI 4 – Percentage of successful CGM building processes for the backup RCC

Description: CGM KPI4 represents the percentage of successful CGM building processes compared to all CGM building processes performed at a pan-European level when performed by the backup RCC for each time-frame.⁸

Figure 4 shows an increase in Intraday CGM availability in 2024, while Day-ahead CGM availability slightly decreased for the CGM building process operated by the backup RCC.

The remaining CGM building process results were covered by the main RCC, according to the rotational calendar, with the exception of cases where both the main and backup RCCs failed to publish a CGM.

⁷ Based on the number of CGMs published during the data collection phase of this report, accounting as successful also CGMs published after gate closure time, with the implementation of manual data quality interventions.

⁸ Based on the number of CGMs published during the data collection phase of this report, accounting as successful also CGMs published after gate closure time, with the implementation of manual data quality interventions.

3 Regional Coordinated Security Analysis

The CSA task is performed to ensure operational security, meaning that operational security violations must be managed in normal operation conditions and under N-1 or even N-k conditions. The CSA task is based on the CGM input, which includes additional specific CSA inputs such as a list of planned outages, assessed elements, contingencies, and available Remedial Actions (RAs). RCC operators – with the support of RCC tools – then run a load-flow and contingency analysis followed by optimising remedial actions and coordinating the most efficient and effective RAs proposed.

3.1 Scope

The regional CSA task comprises CROSA and CCROSA, in accordance with Article 76 of the SO GL and the CSAm, developed in accordance with Article 75 of the SO GL. Consequently, regional coordination assessment reporting

(Article 17 of the SO GL) is also provided in accordance with the CCR. Reporting about COSA in accordance with Articles 72–75 of the SO GL and Articles 23–24 of CSAm is beyond the scope of this document.

3.2 Legacy Security Assessment

Even prior to the legal obligation of the SO GL, TSOs organised themselves on a voluntary basis to develop common security analyses, frequently including the creation of regional merged grid models in UCTE-DEF format. In some areas, this coordination occurred on a bilateral basis (between two TSOs across a shared border) or through regional initiatives. However, these voluntary initiatives were not implemented based on a shared methodology and hence they are not comparable with each other. In the following sections, we will detail the currently applied processes for managing congestion.

For instance, at TSC (TSO Security Cooperation, a voluntary cooperation of Central European TSOs) a basic security assessment process has been running since 2011. The service was designed by TSC TSOs and TSCNET, with the primary objective of enhancing coordination in the TSC region, including some neighbouring TSOs. The service relies on the common tool used by TSC TSOs, providing them with a unified overview of the process results. Since then, the process has undergone major developments, particularly in terms of the number of hours investigated. At present, the security assessment is performed for the Day-ahead and Intraday time-frame.

Another example is Coreso, a voluntary cooperation of European TSOs that performs Day-ahead and Intraday SA as

a legacy service of the CSA process since 2009. The service has been designed, developed, and set up in collaboration with several Coreso TSOs, considering the need for a cross-border view of security studies. These coordinated studies rely on a dedicated tool and interaction between Coreso and TSOs' operators to ensure a common overview of the process results, as well as associated RAs.

SCC also performs an SA for the Day-ahead and Intraday time-frames, using a dedicated tool since 2015. Based on the SA results for the Day-ahead time-frame, SCC creates regular statistical reports concerning the detected security constraints to the service user TSOs.

At SEleNe CC, the SA process has been implemented since September 2022 and is executed daily using grid models in UCTE-DEF format. The process for SEE is carried out in two phases. In the first phase, SA is conducted considering all possible N-X situations to identify current and voltage violations, which TSOs then assess. In the second phase, if necessary, TSOs propose non-costly RAs to resolve congestion and voltage issues, and the SA is repeated. This phase follows an iterative process and terminates when all TSOs agree that the RAs applied ensure the security of their power system. The improved CGMs resulting from this process are used in the subsequent capacity calculation process.



3.3 Regional Coordinated Security Analysis – according to SO GL requirements

RCCs shall perform CROSA and CCROSA on the CGM to detect potential violations of operational security limits on cross-border relevant network elements (as defined in Article 2.8 of CSAm), requiring coordination between TSOs and RCCs. For each detected violation, RCCs are expected to recommend the most effective and economically efficient RAs. All TSOs affected by a recommended RA shall be included in the coordination process, allowing them to evaluate the impact of the recommended RA on their grid before agreeing to activate it. Following this, a cross-regional coordination process between these CCRs shall be initiated to ensure that the minimum overlapping elements are not overloaded (as defined in Article 27 of the amendment to CSAm).

TSOs must provide them with several inputs to enable RCCs to perform the CROSA task, including a list of assessed elements, contingencies that need to be simulated, and available RAs that can be used to solve identified violations.

The legal framework behind the CROSA and CCROSA tasks has been defined at the CSAm and ROSCm level. CSAm defines the high-level principles and the main steps of the CSA

process, and it [was amended](#) in 2021 with rules for cross-regional coordination, RA inclusion in IGMs, and cross-regional cost sharing. At the regional level, each CCR has developed a ROSCm, further detailing the regional specificities while respecting the CSAm. The main points that are regionally determined are the principles for RA optimisation and coordination, as well as the conditions and frequency of Intraday coordination. The expected go-live dates of the CSA processes at the CCRs are regularly reported to the Agency for the Cooperation of Energy Regulators (ACER) and the National Regulatory Authorities (NRAs).

The currently applied processes for managing residual congestion shall be maintained in the period after the implementation of regional ROSCs and before the implementation of CCROSAs. As the CSA task was not operational in 2024 according to the SO GL requirements, no KPIs can be calculated for 2024.

The sections below show the implementation status of the SO GL-compliant tasks.



3.3.1 Baltic RCC – Baltic CCR

The initial implementation of the Baltic ROSC methodology went live on 1 April 2024, covering the Day-ahead and Intraday time-frames on a daily basis. The implemented scope encompasses the CROSA process within the Baltic SOR, ranging from the provision of input data by Baltic TSOs to N-1 contingency simulations on a merged Baltic SOR and Poland IGMs in CGMES format, and the selection and coordination of RAs in the Baltic SOR.

Data exchanges in the implemented solution are aligned with the specifications of regional coordination processes and Network Code profiles. However, CCROSA processes were not included in the initial scope as their implementation depends on:

- › the full implementation of ROSCm in the CCR;
- › the use of the CGM model in operational planning within the CCR;

- › the establishment of standardised data exchange frameworks.

In conjunction with the CROSA go-live, Baltic RCC transitioned to a suite of new, in-house-developed tools for service delivery within the Baltic CCR. These tools are based on widely adopted open-source projects within the energy community, aiming to avoid vendor lock-in while enabling more efficient service development and faster progress.

The delivery of CROSA processes in 2024 served as both a practical milestone and preparatory groundwork for the Baltic states' synchronisation with the Continental European transmission network. Current efforts focus on expanding the implementation scope to achieve a comprehensive target solution, with a particular emphasis on automating the Remedial Action Optimisation (RAO) process and enhancing data exchanges for improved accuracy and efficiency.

3.3.2 Coreso and TSCNET – Core CCR, Italy North CCR

Coreso and TSCNET (working together in a rotational schedule) have been appointed to perform the CROSA^{9,10} processes for Core CCR and Italy North CCR. The timeline for implementing the regional CSA processes in each CCR is defined at the regional level, while the implementation of cross-regional coordination follows no later than 18 months after the last among the concerned CCRs applies the implementation of the target solution of the ROSC methodology, pursuant to Article 76 of the SO GL.

In the Core CCR, a stepwise implementation of the CROSA¹¹ task is foreseen. The first implementation step of the Core ROSC methodology involves the implementation of Day-ahead CROSA, including a RAO for at least the optimisation of redispatching and countertrade resources, as well as phase shifting transformers, and the implementation of cost sharing for Day-ahead CROSA in accordance with the cost sharing methodology.

The first implementation step might include some further simplification of the ROSC methodology.

In the Italy North CCR, the target version as defined in the Italy North ROSC methodology will be implemented directly, skipping the intermediate first implementation step.

For Core CCR and Italy North CCR, Coreso and TSCNET initiated the cooperative CorNet programme to ensure efficient and effective tool development and prepare future operations.

⁹ [ACER Decision 33-2020](#)

¹⁰ [CORE ROSC Methodology Article 38.3](#)

¹¹ [CORE ROSC Methodology Article 37.2–3](#)



3.3.3 Nordic RCC and TSCNET – Hansa CCR

Given that the implementation of the Hansa ROSC process is dependent on the Nordic and Core ROSC implementations, the process go-live follows the Nordic and Core ROSC go-live dates.

For Hansa CCR, the specific CROSA processes will involve providing relevant input (RAs, cross-border network elements, etc.) to the TSOs of Core and Nordic CCRs, and participating in the coordination of RAs as necessary.

The go-live date is 12 months after the Core and Nordic target solutions go-live, while the implementation of the CCROSA follows no later than 18 months after the last among the CCRs concerned applies the implementation of the target solution of the ROSC methodology pursuant to Article 76 of the SO GL.

3.3.4 Nordic RCC – Nordic CCR

Since 4 September 2024, Nordic RCC has performed a simplified CSA task for the DA time-frame in the Nordic CCR named “CSA light”.

This first version delivers the core functionality of performing a regional security assessment comprising a base case and N-1 contingency analysis based on the Nordic DA CGM. At the end of 2024, three out of four Nordic TSOs are using the security analysis, with internal approvals pending for the remaining TSO.

The regional security assessment comprising base case and N-1 contingency analysis is expected to be implemented for the intraday time-frame in 2025 following Nordic TSOs

specifications in the Nordic ROSC methodology. Furthermore, Nordic RCC is planning to initiate the transition to ENTSO-E Network Code profiles for regional coordination processes,¹² which will gradually replace the custom data formats currently used. This is expected to improve the interoperability of input data and software applications, thus laying the foundation for the future deliverables of the CSA task.

More scoping work must be undertaken by and with the Nordic TSOs for RAO and the full CROSA process to be implemented.

Further details the performance of the CSA task of Nordic RCC can be found in the [Nordic RCC Annual Report](#).

3.3.5 SEleNe CC – SEE CCR

In December 2024, under the legacy CSA process, the coordination was extended from the Day-ahead time horizon to also include the Intraday time horizon, further enhancing operational security closer to real time. During the CSA coordination process, RAs that resolve identified congestion and voltage violations are applied, resulting in improved common grid models that incorporate these corrective measures. These improved models are then utilised in the

subsequent capacity calculation process, ensuring that market values are determined based on updated grid models that incorporate RAs to ensure operational security, thereby contributing to a more stable and secure power system.

In relation to the future ROSC implementation, SEE TSOs are preparing to amend the ROSC methodology to propose a new timeline for the service’s implementation.

12 <https://www.entsoe.eu/data/cim/cim-for-grid-models-exchange/>



3.3.6 SEleNe CC – GRIT CCR

A security analysis process based on the ROSCm for the Day-ahead time-frame has been performed daily since September 2022. It is conducted on regional merged models (grid models in UCTE-DEF format) to ensure compliance with operational security limits for grid elements in both the Italian and Greek power systems. To achieve this, N-1 security analyses are conducted to identify current and voltage limit violations, in conjunction with a RA selection procedure. The process will be extended to the Intraday time-frame in accordance with the implementation timeline of the regional methodology.

3.3.7 Coreso – SWE CCR

Coreso – appointed to perform the CSA process for the SWE region – mostly relies on the developments realised in the CorNet programme to deliver the first version of the CSA process for the Core and Italy North regions. However, due to SWE regional specificities, some of these developments require adaptation. This is why Coreso is ensuring that the SWE needs are properly onboarded into the CorNet design and implementation of the CGM and CSA modules, whereas a dedicated RAO will be developed separately. The challenge is to absorb developments made for CorNet and SWE and integrate the RAO with them.

The implementation of the RAO and other features of the CSA process progressed in 2024, and a first version of the SWE CSA tool was delivered for testing. Due to delayed deliveries from the CorNet programme, not all of the expected scope has been integrated. However, progress has been made in input data readiness, as the final Network Code profiles standard was integrated into TSOs models. The plan for 2025 is to receive upgraded versions of the CSA software that correspond to the minimal regulatory requirements (Day-ahead and Intraday CSA) and then to be independent of the CorNet programme deliveries. A testing period will verify the integration and quality of the process, enabling the start of the parallel run in 2026, prior to the planned go-live in 2027.

3.4 Non-EU SEE TSOs signatories of SAFA

The development of ROSC methodologies, as well as the design and implementation of the ROSC process and its daily operation, is a legal obligation of all EU TSOs, in addition to their respective RCCs, executed at the SOR level, pursuant to Regulation (EU) 2019/943.

In accordance with Article 75 of the SO GL, all TSOs developed a common proposal for a CSAm. In accordance with Article 76 of the SO GL and based on CSAm, the TSOs of one CCR should develop a common proposal for the business process of the ROSC methodology, which would be applied in the framework of the given region.

On the other hand, non-EU TSOs in the synchronous area of Continental Europe that are signatories to the Synchronous Area Framework Agreement (SAFA) can participate in the activities listed above by developing the methodology, implementing, and executing the ROSC process in their non-EU region. However, despite SAFA being signed in 2019 and several initiatives launched from different sides (energy community, ENTSO-E, West Balkan TSOs), there remains no clear understanding of how SAFA TSOs will be organised in terms of SOR and CCR.

SCC is the RSC for non-EU SEE TSOs signatories of SAFA who have agreed to develop and implement the ROSC process.

3.4.1 SCC

All non-EU TSOs in the synchronous area of Continental Europe signed the SAFA in April 2019, thereby committing themselves to applying all the provisions of the SO GL Regulation in a timely manner.

At the beginning of 2021, in accordance with Article 76 of the SO GL, SCC and TSOs that are simultaneously SCC service users and signatories of the SAFA document (CGES, EMS, MEPSO, NOSBiH, and OST) began activities towards developing the SAFA West Balkan Regional Operational Security Coordination (SAFA WB ROSC) methodology.

These six entities defined three phases for establishing SAFA WB ROSC:

- › **Design of the SAFA WB ROSC methodology**, finalised in September 2021.
- › **Creation of the SAFA WB ROSC business process**, finalised in June 2022 by updating the methodology and creating an explanatory note that describes the business process and additionally explains certain requirements derived from the SAFA WB ROSC methodology.
- › **Implementing the SAFA WB ROSC methodology and business process**. In January 2023, an agreement for the implementation of the SAFA WB ROSC methodology and business process was prepared, although unfortunately it was not signed by SAFA WB TSOs (CGES, EMS, MEPSO, NOSBiH, and OST) and SCC.

Although SAFA WB TSOs recognise the importance of the ROSC process for the secure exploitation of the power system, due to ongoing political issues in the region and a lack of will for political structures to provide an affirmative framework for ROSC implementation in WB6 with resources. As a result, they have decided to postpone implementation until Decision 2022/03/MC-EnC is transposed into national regulations across all WB6 energy community contracting parties, which is currently not feasible.

Coordinated actions from the Energy Community Secretariat, ENTSO-E, and ACER could help to speed up this process due to the unaligned implementation process in WB6 national laws and the absence of a final decision regarding the SOR and CCR structure.

4 Outage Planning Coordination

The pan-European OPC establishes an outage planning process based on the requirements described in SO GL. The pan-European OPC tool facilitates the coordination of outages by sharing the element list and maintaining a database of relevant assets. A coordinated procedure ensures the quality and consistency of the data; for example, through validating information regarding the planned status of the cross-border lines of the TSOs. All RCCs perform the pan-European OPC process on a rotational basis.

On the foundation of the pan-European OPC process, regional OPC processes – commonly referred to as regional OPI assessment processes – are also conducted by RCCs. Its goal is to determine whether the outage planning of European TSOs is feasible in terms of operational security. In case it identifies

potential congestions, it shall suggest RAs and validate if the coordinated unavailability plan is feasible in terms of security limits, as well as recommending mitigating any potential detected OPIs with the issuing of recommendations.

4.1 Scope

— OPC: Pan-European

— OPI: Regional

The OPC task is performed at the pan-European and regional level. The pan-European process is performed by the RCCs on a rotational basis, using the centralised pan-European OPC tool managed by ENTSO-E. Each rotational cycle has a duration of 2 months, during which one main and one backup RCC are allocated. The two-month alternation minimises disruptions and promotes continuity in process execution considering the WA time-frame. For the YA time-frame, there is annual rotation among RCCs, considering it is executed at the end of each year, with main and backup roles, respectively. The nomination of a main and backup role ensures seamless coordination in case of a failure at the main RCC's side (e.g. connectivity issues, power outage), whereby the backup RCC can take over to complete the process successfully.

4.2 Time-frames

Both pan-EU OPC and regional OPI processes are performed for WA and YA time-frames. YA KPIs for the pan-EU OPC and regional OPC are related to the processes performed in the reported year. This report covers the YA process performed in 2024 for 2025.

Each YA and WA process comprises a number of sub-processes. In each sub-process, the pan-EU OPC Tool merges the unavailability plans from all participating TSOs for the respective time-frame, and the relevant procedures are performed, such as coordination of outages, the regional OPC process, and the inclusion of proposed RAs. All OPIs shall be solved before the final merge.

4.3 Specificities of regional OPC processes per RCCs

As a general background, it is relevant to note that the Regulation (EU) 2019/943 clearly states that “*Regional Coordination Centres should have the flexibility to carry out their tasks in the region in the way which is best adapted to the nature of the individual tasks entrusted to them*”.¹³ In line with this, the different regions are subject to varying interpretations of the regional OPC process, which affect specific regional KPIs.

Nordic RCC provides an expert assessment based on the planned outages in the region to avoid outage incompatibilities, covering the WA and YA time-frames.

Baltic RCC provides expert assessment for the WA time-frame. In 2024, Nordic RCC performed an expert-based assessment on incompatibilities. RCC and TSO resources needed to be prioritised for important go-lives of regional tasks (DA FB and CSA light) and could not be used for a data-based calculation.

The regional OPC processes exhibit significant differences among the RCCs, reflecting the requirements of the TSOs and the corresponding RCC’s responsibilities. The main characteristics of these OPI processes are summarised in Table 2.

Regional characteristics of the OPI process

	Time-frame	Baltic RCC	Coreso	Nordic RCC	SCC	SEleNe CC	TSCNET*
Calculation method (SA)		Manual		Not performed in 2024	Automatic		
RA selection method		Manual identification based on expert knowledge and operational rules					Automatic MIQCP (Mixed integer quadratically constrained program) based optimisation
What is considered OPI in this report?		OPI cases confirmed by the respective TSOs.					All OPI cases identified by the OPI calculation
Number of time-stamps calculated in 2024	Week-ahead OPI	N/A	52 (1/week)	0	52 (1/week)	2.184 (42 time-stamps/ week)	2.184 (42 time-stamps/ week)
	Year-ahead OPI	10	52 (1/week)	0	52 (1/week)	52 (1/week)	52 (1/week)

*TSCNET and SEleNe CC perform the OPI assessment sub-task in two cycles per time-frame, namely an initial OPI assessment and final OPI assessment. Coreso and SCC perform one cycle per time-frame and a second cycle upon request from TSOs.

Table 2: Regional characteristics of the OPI process

¹³ Recital 54, Regulation (EU) 2019/943

4.4 OPC and OPI KPIs

Input data are collected and considered for the WA and YA time-frames.

The KPIs for both the pan-European OPC (OPC KPIs) and the regional OPC process (OPI KPIs) are:

- › **OPC KPI1:** Percentage of process failures and reasons for failures
- › **OPC KPI2:** Average merge duration per process time-frame
- › **OPI KPI1:** Average duration of OPI calculation
- › **OPI KPI2:** Percentage of process failures and reasons for failures
- › **OPI KPI3:** Percentage of instances when OPI assessment results in identified outage planning incompatibilities

4.4.1 OPC KPIs

OPC KPI1: Percentage of process failures and reason for failures

Description: The percentage of failed processes compared to all processes performed at a pan-European level. These cases were classified by their cause, which is usually related to data quality issues, IT tools, and infrastructure. Anything else that does not fit into this category is covered in the “other” class.

Starting in 2023, a process is classified as failed when completion time exceeds the timings provided in Table 3.

Merge	Failure
W-1: 1 st	After 3 h of initial scheduled time
W-1: 2 nd , 3 rd , 4 th	After 4 h of initial scheduled time
Y-1: Pre, 1 st , 2 nd , 3 rd , 4 th	After 4 h of initial scheduled time

Table 3: Timings for classification of failed merges

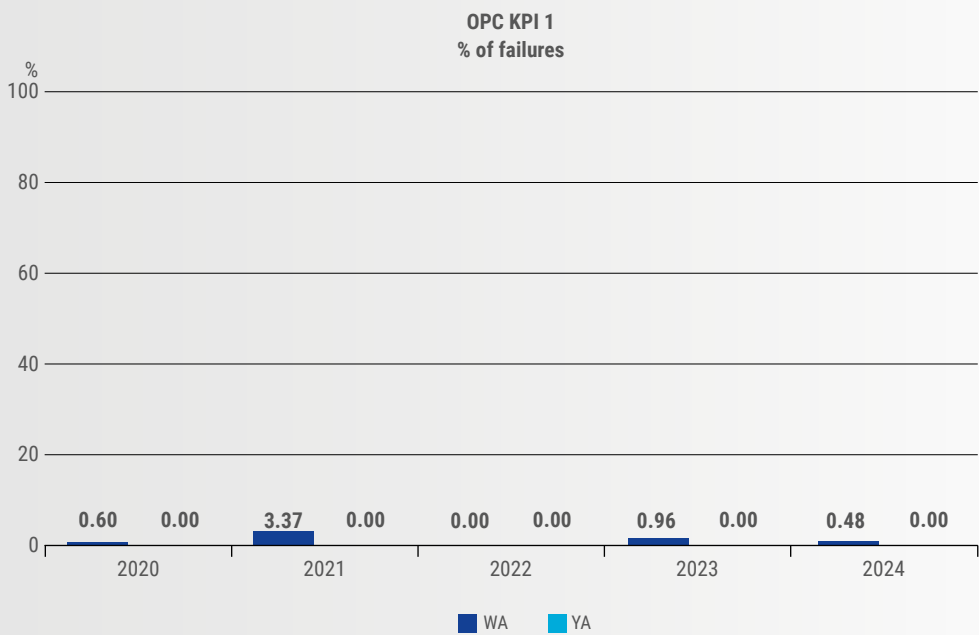


Figure 5: OPC KPI 1 – Percentage of process failures per year

Reason for failures

Number of cases in 2024	Week-ahead	Year-ahead
Data quality	0	0
IT – Tool	0	0
IT – Infrastructure	1	0
Other	0	0

Table 4: OPC KPI 1 – Number of process failures per reason classification

One incident was recorded in WA process in 2024 due to the infrastructure failure (Table 4). No incidents were recorded in the YA process.

OPC KPI2: Average merge duration per process time-frame

Description: The average duration in minutes of each individual merge performed at the pan-European level

The longer duration of the YA merge compared to the WA one is due to the higher number of outages resulting from

a larger number of elements and subsequent unavailability considered in the longer time-frame. Results are higher after 2021 due to the tool being used more actively and the larger amount of data provided compared to 2021. For details, please refer to the [Annual Assessment Report 2021](#).

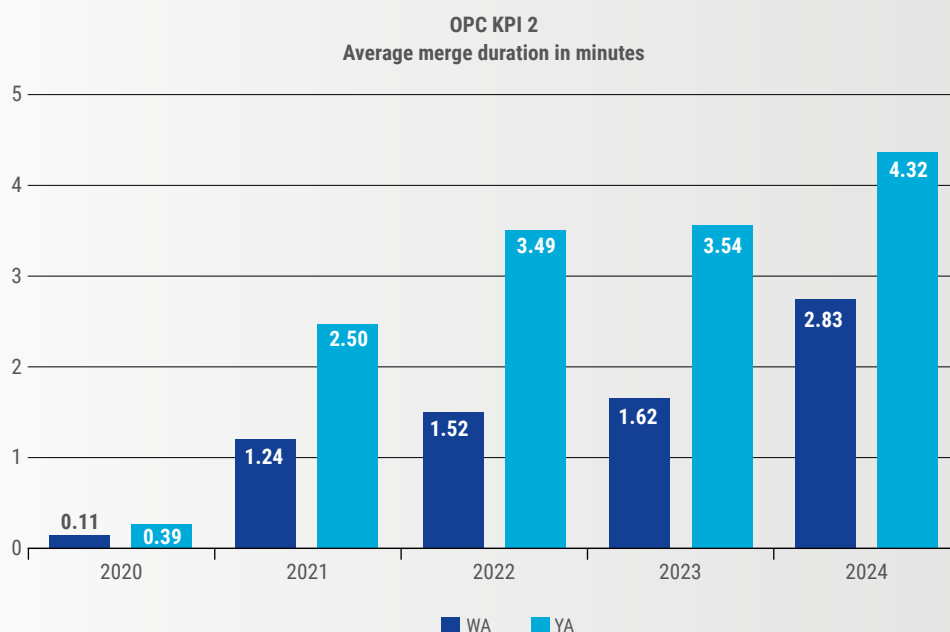


Figure 6: OPC KPI 2 – Average merge duration in minutes

4.4.2 OPI KPIs¹⁴

OPI KPI 1: Average duration of OPI calculation

Description: The average duration of each OPI calculation at the regional level.

The regional OPC process is already performed by some of the RCCs, calculated for their shareholder TSOs, and the results are discussed with the TSOs and the RCCs during regular teleconferences. The process was provided based on the RCC Outage Responsibility Area (RORA) regions for

the Coreso and TSCNET RCCs. The switch from RORA to the Outage Coordination Region (OCR) definition is currently under development by both RCCs. Differences between process durations among the RCCs originate from differences between manual and automatic calculation methods.

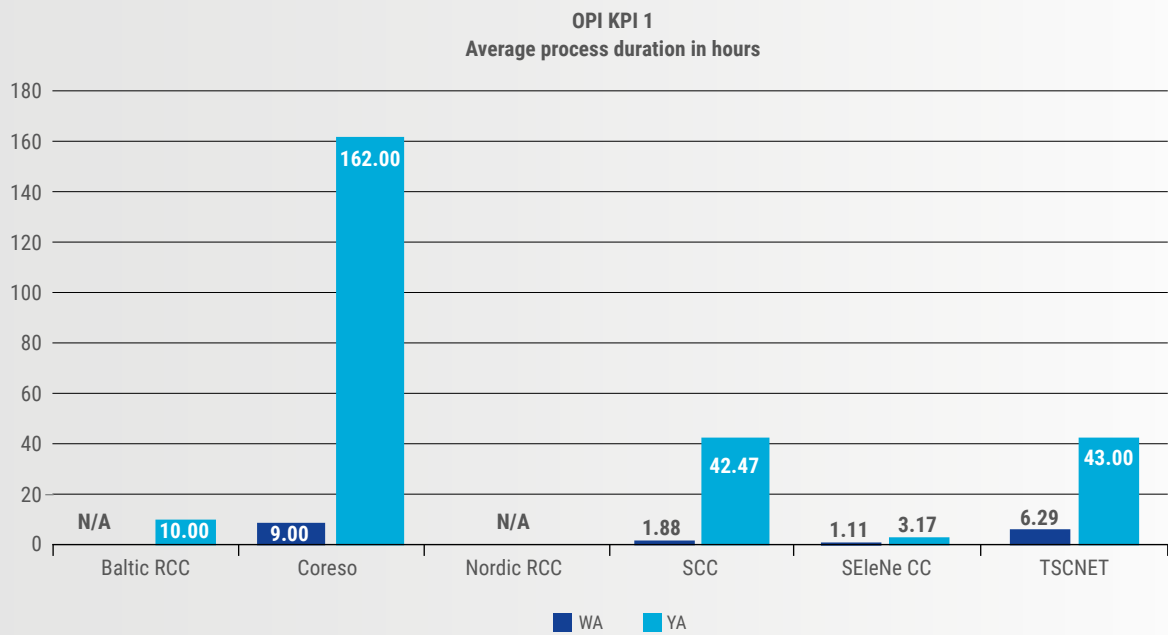


Figure 7: OPI KPI 1 – Average process duration in hours

OPI KPI 2: Percentage of process failures and reason for failures

Description: The percentage of failed processes compared to all processes performed at the regional level. These cases were classified by their cause, which is usually related to data quality issues or the IT tool or infrastructure. Anything else that does not fit into this category is covered in the “other” class.

In 2024, some failures were observed in the OPI process in two regions, mostly caused by data quality issues. In these regions, the OPI calculation is performed using an automated method, which is more sensitive to data quality than manually performed processes.

For TSCNET, two failures were detected in the 2024 WA OPI process due to data quality issues. In the YA OPI process, there were three failed timestamps due to input data quality.

The failed timestamps do not have a significant impact on the final regional coordination, as regional coordination calls are performed on a weekly and yearly basis, and manual backup procedures are available in case of failure of the automated processes.

¹⁴ Coreso, TSCNET, SCC and SEleNe CC perform a regional OPC assessment using input reference models in UCTE format. Baltic RCC and Nordic RCC provide an expert assessment based on the planned outages in the region to avoid outage incompatibilities

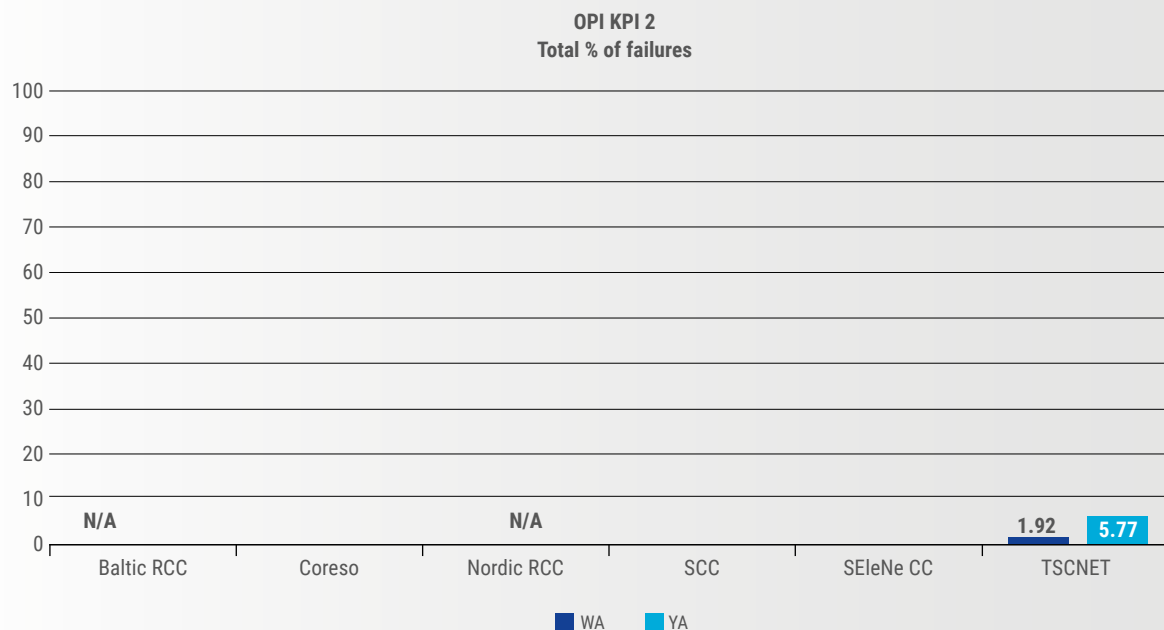


Figure 8: OPI KPI 2 – Percentage of total failures

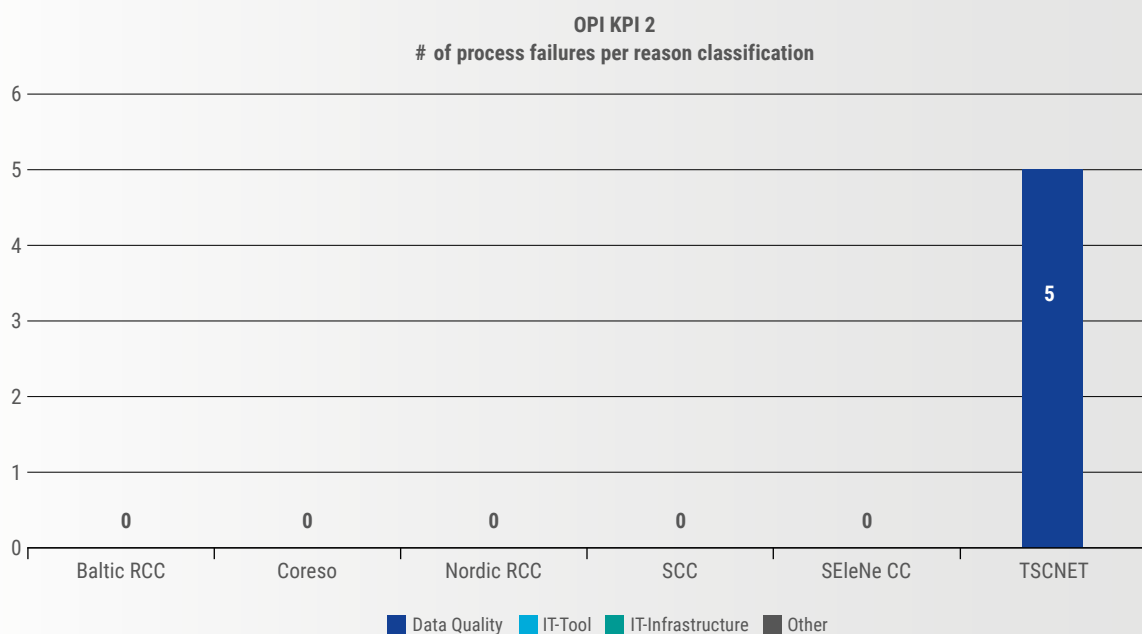


Figure 9: OPI KPI 2 – Number of process failures per reason classification

Reason for failures

Number of failures in 2024	Baltic RCC	Coreso	Nordic RCC	SCC	SEleNe CC	TSCNET
Data quality	0	0	N/A	0	0	5
IT – Tool	0	0	N/A	0	0	0
IT – Infrastructure	0	0	N/A	0	0	0
Other	0	0	N/A	0	0	0

Table 5: OPI KPI 2 – Number of process failures per reason classification

OPI KPI 3: Percentage of times when OPI assessment results in identified outage planning incompatibilities

Description: The OPI assessment can result in an OPI either being detected or not for any given planned outage. The OPI KPI3 indicates how frequently OPIs were detected during the weekly/yearly regional OPC sub-task.

Given that the OPI process and definition of OPI varied among the RCCs in 2024, the KPIs are hardly comparable. The principal reason for this is that Coreso, SCC, and SEleNe CC reported those OPIs that the TSOs also confirmed, whereas the OPIs reported by TSCNET represent the identified violations that result directly from the regional security analysis.

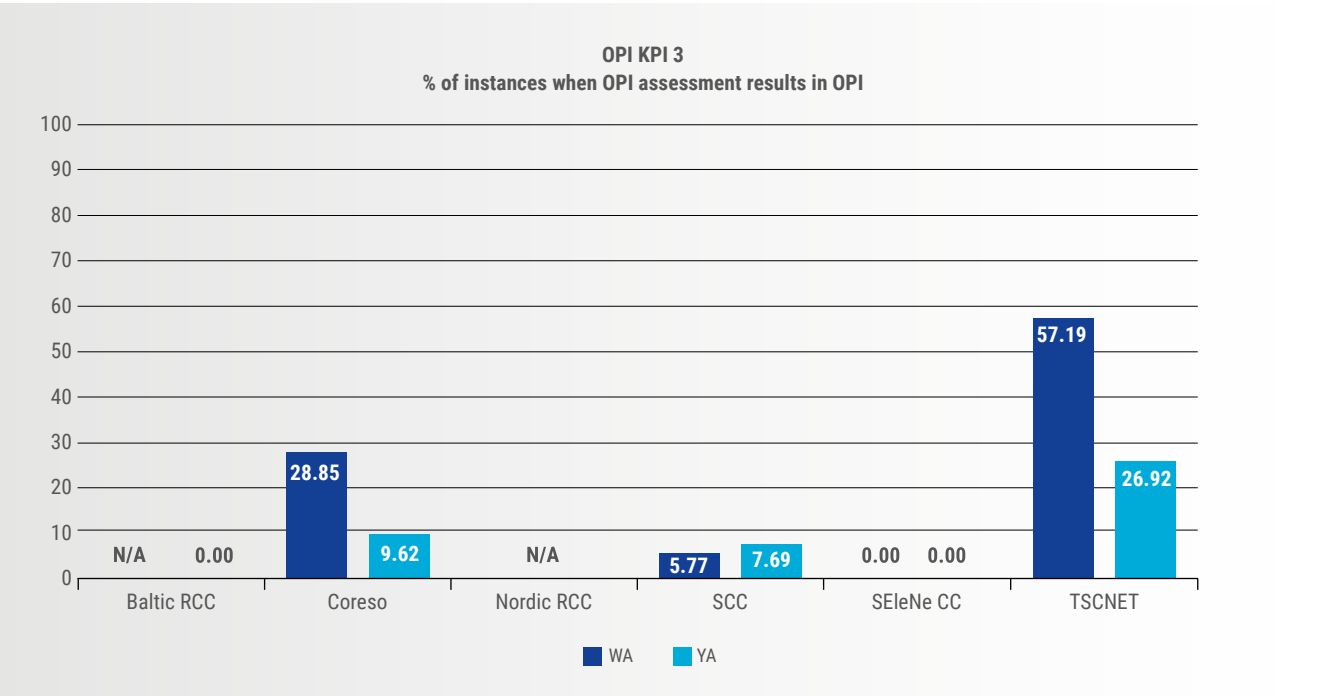


Figure 10: OPI KPI 3 – Percentage of instances when OPI assessment detects an OPI



5 Short-Term Adequacy

The goal of STA is to detect situations where a lack of adequacy is expected in any of the control areas or at the regional level, considering possible cross-border exchanges. Based on this assessment, when a lack of adequacy is expected, the regional STA process is triggered, in which RCCs provide recommendations to TSOs to resolve the potential adequacy issue identified.

In the pan-European STA process during 2024, calculations were monitored (and operational tasks such as communication with TSOs and the IT tool provider, data upload, etc. were performed) by Baltic RCC, Coreso, Nordic RCC, SEIeNe CC, and SCC on a rotational basis. For the 2 weeks of the rotation cycle, there is one main and one backup RCC, which replaces the main RCC in the event of an issue with any part of the STA process.

In the event of inadequacy at the pan-European level, the regional STA process should be performed under the leadership of the RCC that is responsible in the region where inadequacy is detected (RCC leader). Regional processes should cover the affected TSO and the neighbouring TSOs, whereby the list of neighbouring TSOs for each affected TSO (forming a dynamic region for each specific TSO when affected) is defined based on a dynamic matrix.

5.1 Scope

— **Pan-European STA: Pan-European**

— **Regional STA: Regional**

5.2 Time-frames

The pan-European STA process is performed daily for the following 7 days by a central tool managed by ENTSO-E, based on a rotational principle among RCCs. Each cycle has a duration of 2 weeks, and one main and one backup RCC are allocated for each cycle. This ensures that in case of a technical failure at the main RCC's side (e.g. IT issue, power cut), the backup RCC can take over to complete the process successfully.

The time-frame of the regional STA process is determined by the timestamp that is foreseen as most critical based on pan-European results. A regional STA is triggered automatically for timestamps with a scope of the next 3 days. However, any TSO can trigger a regional STA process whenever it identifies the need, regardless of the time-frame.

5.3 STA KPIs

The STA KPIs are:

- › **STA KPI 1:** Percentage of failures of the pan-European STA process;
- › **STA KPI 2:** Average STA pan-European process time; and
- › **STA KPI 3:** Description of cases where the lack of regional adequacy has been assessed and mitigation actions agreed.

STA KPI 1: Percentage of failures of the pan-European STA process

Description: The percentage of failed processes compared to all processes performed at the pan-European level. The pan-European STA process runs once every day, and an additional run can be requested by any TSO(s). Thus, the total number of runs would be a maximum of 365×2 (or 366×2 in leap years). In 2024, a total of 393 runs were executed. Among these, calculation failures occurred five times, while the reporting process failed six times.

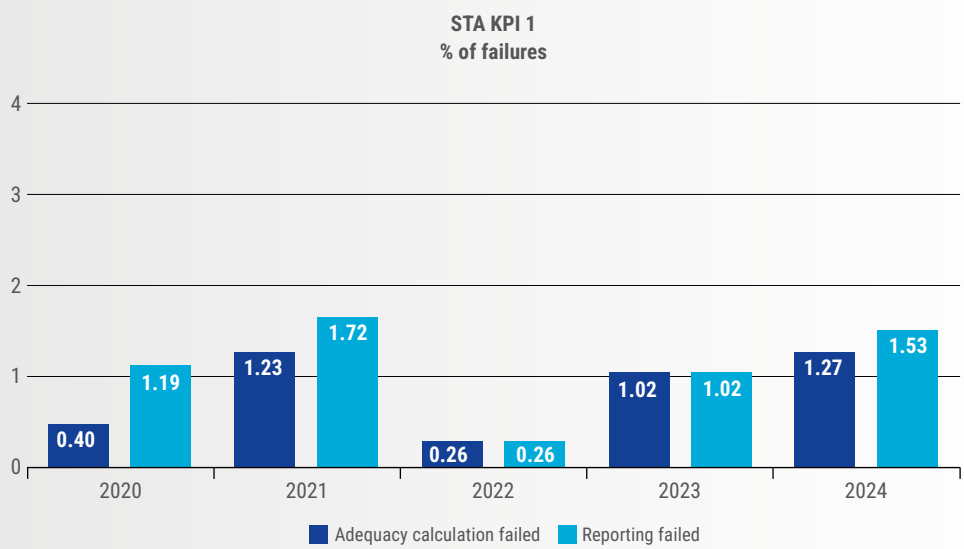


Figure 11: STA KPI 1 – Percentage of failures

Reason for failures

Number of cases in 2024	STA calculation	STA results reporting
IT – Tool	4	5
IT – Infrastructure	1	1
Other	0	0

Table 6: OPC KPI 1 – Number of failures per reason classification

STA KPI 2: Average STA pan-European process time

Description: The average time of all pan-European STA computations performed during the year. Data for STA KPI2 are obtained from the ENTSO-E STA tool.

The primary reason for the increase in average computation time in 2023 is the consideration of flow-based constraints for Core region TSOs rather than Net Transfer Capacity (NTC) values within the DA time-frame. In 2024, a slight improvement was observed due to the decoupling of deterministic and probabilistic calculations in the process.

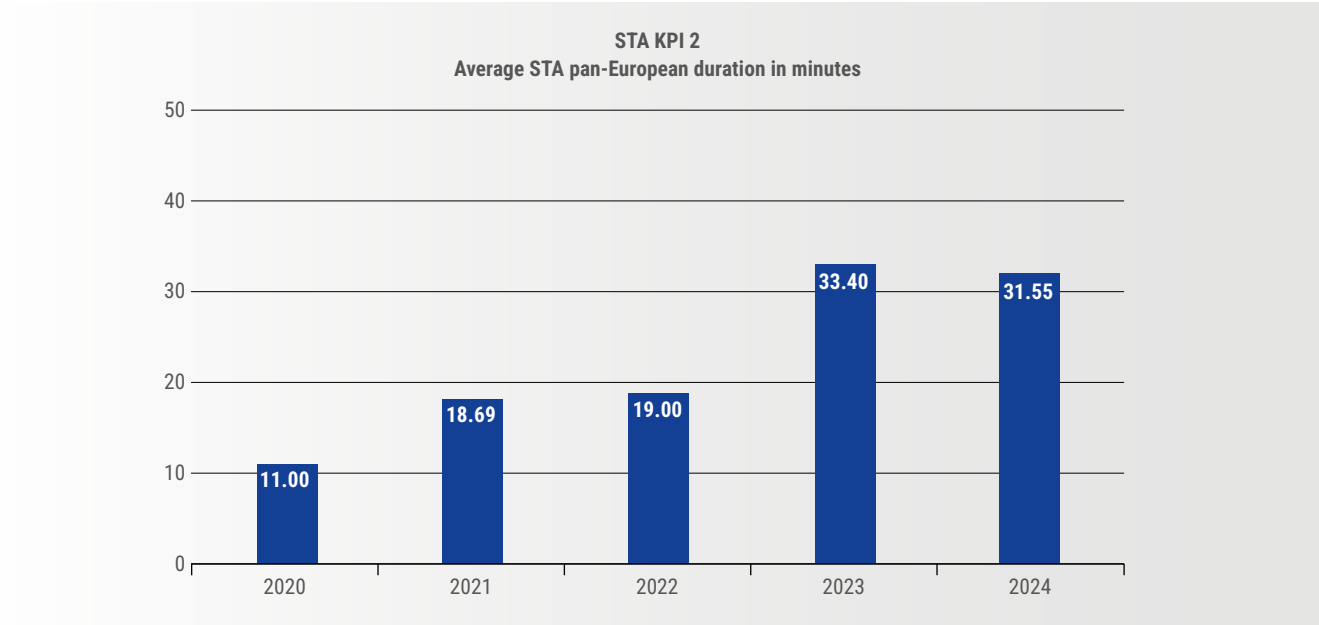


Figure 12: STA KPI 2 – Average STA pan-European process time

STA KPI 3: Description of regional adequacy assessments performed

In 2024, no regional STA processes were triggered.

No.	Date of assessment	Date of event	RCC leader	No. of concerned TSOs	Inadequacy duration	ENS [MWh]	Proposed mitigation action
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

No:	Order number of inputs.
Date of assessment:	Date when the pan-European ¹⁵ STA is assessed.
Date of event:	Date and timestamp of the case for which the regional STA process is triggered.
RCC leader:	RCC responsible for leading the regional STA process.
No. of TSOs concerned:	Number of TSOs participating in the regional STA process, the main affected TSO (for which ENS is detected) and its neighbours that can have an impact on the main affected TSO (determined based on the dynamic matrix).
Inadequacy duration:	Number of timestamps in the WA time-frame for which the main affected TSO is in an inadequacy situation (each timestamp corresponds to 1 hour).
ENS [MWh]:	Amount of Energy Not Supplied in the timestamp assessed during the regional STA process.
Proposed mitigation action:	List of RAs considered as a solution to the lack of adequacy (this can be one or multiple actions, depending on the case assessed).

Table 7: KPIs for regional STA triggers (sample). No values are available as no regional processes were initiated in 2024.

15 The pan-European STA process is also referred to as a cross-regional adequacy assessment.

6 Conclusions

This report contains the KPIs for the tasks provided by the RCCs to fulfil the obligations stated in Article 17 of the SO GL.

In general, no interoperability issues were raised, nor were any changes proposed to improve the effectiveness and efficiency of the system operation coordination. Furthermore, no interoperability issues were reported regarding the threshold values selected by the TSOs in accordance with Article 6.2 of CSAm.

The following scheme provides an overview of the expected reporting requirements for the coming years. After all tasks are implemented, the enduring reporting template will be applied for all tasks.

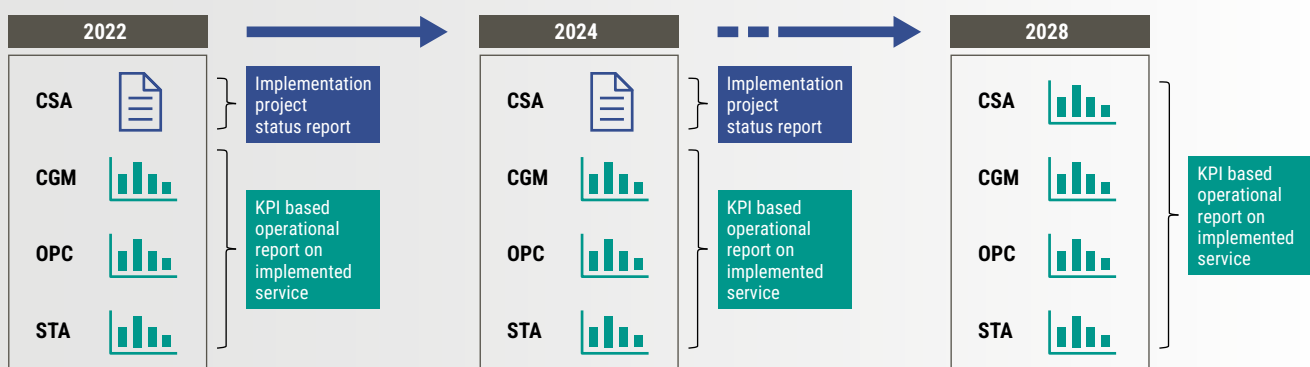


Figure 13: Overview of the trajectory towards the full reporting of RCC tasks according to SO GL

Note: The reports refer to the year in which the reporting data were collected, based on estimations according to the available information during the creation of the report.



Glossary

2D	Two-Days-ahead	OPDE	Operational Planning Data Environment as defined in Article 3 of the SO GL
ACER	Agency for the Cooperation of Energy Regulators	OPDM	Operational Planning Data Management
BDS	Boundary Dataset	OPI	Outage Planning Incompatibility as defined in Article 3 of the SO GL
CCC	Coordinated Capacity Calculation	PEVF	Pan-European Verification Platform
CCR	Capacity Calculation Region as defined in Article 2.3 of CACM	QoCDC	Quality of CGMES Datasets and Calculations
CCROSA	Coordinated Cross-Regional Operational Security Assessment as defined in Article 33.1(e) of CSAm	RA	Remedial Action as defined in Article 2.13 of CACM
CGM	Common Grid Model as defined in Article 3 of the SO GL and Article 2.2 of CACM	RAO	Remedial Action Optimiser
CGMa	Common Grid Model alignment	RCC	Regional Coordination Centre
CGMES	Common Grid Model Exchange Standard	RORA	RCC Outage Responsibility Area
CorNet	Cooperation programme between Coreso and TSCNET	ROSC	Regional Operational Security Coordination as defined in Article 76 of the SO GL
COSA	Coordinated Operational Security Analysis as defined in Article 72 of the SO GL	ROSCm	Regional Operational Security Coordination methodology for Regional Security Coordinator as defined in Article 3 of the SO GL
CROSA	Coordinated Regional Operational Security Assessment as defined in Article 33.1 (b) of CSAm	RSC	Regional Security Coordinator
CSA	Coordinated Security Analysis as defined in Article 75 of the SO GL	SA	Security Assessment
CSAm	Coordinated Security Analysis methodology	SAFA	Synchronous Area Framework Agreement
DA	Day-ahead	SCC	Security Coordination Centre
EMF	European Merging Function	SOC	ENTSO-E System Operations Committee
ENS	Energy Not Supplied	SO GL	Guideline on Electricity Transmission System Operation Commission Regulation (EU) 2017/1485 of 2 August 2017 establishing a guideline on electricity transmission system operation
ENTSO-E	European Network of Transmission System Operators for Electricity	SOR	System Operation Region as defined in Article 36 of Regulation (EU) 2019/943
ID	Intraday	SP	Service Provider
IDCF	Intraday Congestion Forecast	STA	Short Term Adequacy as defined in Article 81 of the SO GL
IGM	Individual Grid Model as defined in Article 2.1 of CACM	StG ReC	Steering Group Regional Coordination (SOC)
KPI	Key Performance Indicator	SWE	South-West Europe
MC-EnC	Ministerial Council of the Energy Community	TLI	Tie Line Inconsistencies
MIQCP	Mixed Integer Quadratically Constrained Program	TSC	TSO Security Cooperation
MWh	Megawatt hour	TSO	Transmission System Operator
NM&FT	Network Modelling and Forecasting Tool	UCTE-DEF	Union for the Co-ordination of Transmission of Electricity Data Exchange Format
NRA	National Regulatory Authority	WA	Week-ahead
NTC	Net Transfer Capacity	WB	West Balkan
OCR	Outage Coordination Region as defined in Article 3 of the SO GL	YA	Year-ahead
OPC	Outage Planning Coordination as defined in Article 80 of the SO GL		

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