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

Regional Coordination Assessment Annual Reporting (SOGL ART. 17)

September 2022

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ENTSO-E Mission Statement

Who we are

ENTSO-E, the European Network of Transmission System Operators for Electricity, is the **association for the cooperation of the European transmission system operators (TSOs)**. The 39 member TSOs, representing 35 countries, are responsible for the **secure and coordinated operation** of Europe's electricity system, the largest interconnected electrical grid in the world. In addition to its core, historical role in technical cooperation, ENTSO-E is also the common voice of TSOs.

ENTSO-E **brings together the unique expertise of TSOs for the benefit of European citizens** by keeping the lights on, enabling the energy transition, and promoting the completion and optimal functioning of the internal electricity market, including via the fulfilment of the mandates given to ENTSO-E based on EU legislation.

Our mission

ENTSO-E and its members, as the European TSO community, fulfil a common mission: Ensuring the **security of the interconnected power system in all time frames at pan-European level** and the **optimal functioning and development of the European interconnected electricity markets**, while enabling the integration of electricity generated from renewable energy sources and of emerging technologies.

Our vision

ENTSO-E plays a central role in enabling Europe to become the first **climate-neutral continent by 2050** by creating a system that is secure, sustainable and affordable, and that integrates the expected amount of renewable energy, thereby offering an essential contribution to the European Green Deal. This endeavour requires **sector integration** and close cooperation among all actors.

Europe is moving towards a sustainable, digitalised, integrated and electrified energy system with a combination of centralised and distributed resources.

ENTSO-E acts to ensure that this energy system **keeps consumers at its centre** and is operated and developed with **climate objectives** and **social welfare** in mind.

ENTSO-E is committed to use its unique expertise and system-wide view – supported by a responsibility to maintain the system's security – to deliver a comprehensive roadmap of how a climate-neutral Europe looks.

Our values

ENTSO-E acts in **solidarity** as a community of TSOs united by a shared **responsibility.**

As the professional association of independent and neutral regulated entities acting under a clear legal mandate, ENTSO-E serves the interests of society by **optimising social welfare** in its dimensions of safety, economy, environment, and performance.

ENTSO-E is committed to working with the highest technical rigour as well as developing sustainable and **innovative responses to prepare for the future** and overcoming the challenges of keeping the power system secure in a climate-neutral Europe. In all its activities, ENTSO-E acts with **transparency** and in a trustworthy dialogue with legislative and regulatory decision makers and stakeholders.

Our contributions

ENTSO-E supports the cooperation among its members at European and regional levels. Over the past decades, TSOs have undertaken initiatives to increase their cooperation in network planning, operation and market integration, thereby successfully contributing to meeting EU climate and energy targets.

To carry out its legally mandated tasks, ENTSO-E's key responsibilities include the following:

- Development and implementation of standards, network codes, platforms and tools to ensure secure system and market operation as well as integration of renewable energy;
- Assessment of the adequacy of the system in different timeframes;
- Coordination of the planning and development of infrastructures at the European level (Ten-Year Network Development Plans, TYNDPs);
- Coordination of research, development and innovation activities of TSOs;
- Development of platforms to enable the transparent sharing of data with market participants.

ENTSO-E supports its members in the **implementation and monitoring** of the agreed common rules.

ENTSO-E is the common voice of European TSOs and provides expert contributions and a constructive view to energy debates to support policymakers in making informed decisions.

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Executive Summary

To fulfil the obligations from Article 17 of Regulation (EU) 2017/1485 on establishing a guideline on electricity transmission system operation (hereinafter "SO GL"), ENTSO-E publishes this annual report on regional coordination assessment. It contains Key Performance Indicators (KPIs) for the services provided by the Regional Security Coordinators (RSCs[1]). As long as a service is not fully implemented, RSCs can use this report to show whether a legacy service is in place, what this consists of and if the RSC started working towards the service based on the regulatory framework.

For the complete reported year 2021, the Outage Planning Coordination (OPC) and Short-Term Adequacy (STA) processes were in operation. In the regional OPC process, the RSCs assess the Outage Planning Incompatibility (OPIs). Since the go live of the regional STA process in September 2021, RSCs have been involved in the resolution of adequacy issues detected in the pan-European process. In 2021, some RSCs used Union for the Co-ordination of Transmission of Electricity UCTE (UCTE) format-based Common Grid Models (CGMs) to perform the service. All RSCs work on the implementation of CGM based on Common Grid Model Exchange Standard (CGMES). The minimum viable solution of the CGM went live in December 2021. The Coordinated Security Assessment (CSA) service according to the requirements set out in SO GL and respective methodologies (CSAm and Regional Operational Security Coordination methodologies, ROSCm) is still in the implementation stage in all RSCs.

There are already preliminary versions of CSA and CGM processes implemented in the daily operational practice, based on the voluntarily organised regional security cooperation of the TSOs. The status of the implementation of the legally compliant services and the good practices applied so far are described in this report.

In total, the regional coordination assessment shows well established RSCs that progressed with the implementation of a new process (regional STA process) in 2021. No interoperability issues were identified in 2021; therefore, this report does not contain any proposed change to improve effectiveness and efficiency in the system operation coordination.

1 From 01 July 2022 RSCs were replaced by Regional Coordination Centres (RCC) in line with the Regulation (EU) 943/2019. In this report we used RSCs because in 2021 still RSCs were in operation.

1. Introduction

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

Annual report on regional coordination assessment (Art. 17 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. […]"

The input data for this report was provided by the RSCs by 01 March 2022. This report was created by ENTSO-E based on this input.

Some of the services, which the RSCs shall report on according to Article 17 of SO GL, are still under implementation according to the relevant methodologies. This report distinguishes between legally compliant services and legacy services:

- Legally compliant services mean the services fully implemented according to SO GL requirements; and
- Legacy services mean services that were implemented on a voluntary basis according to operational needs prior to the relevant methodologies of SO GL being finalised. This is because some RSCs have been operational even prior to the entry into force of SO GL.

OPC and STA have been implemented in operation but are still pending the readiness of CGMES, etc.

For the CGM in CGMES format, the minimum viable solution went live in December 2021. The CGM service based on CGMES format will be reported on in the 2022 report to be published in 2023.

Regarding the CSA, the legally mandated service is not yet in operation, but it is currently in the development phase. Meanwhile, RSCs have legacy services in place to different extents, supporting the Transmission System Operators (TSOs) in ensuring the grid security during the operational planning processes. In this document, we refer to these legacy services as Security Assessment (SA).

The report consolidates data received from all RSCs which are subject to the SO GL, namely the Baltic RSC, Coreso, Nordic RSC, SEleNe CC and TSCNET Services (TSCNET). Security Coordination Centre (SCC) has been included on a voluntary basis. The non-EU TSOs are not subject to the SO GL requirements, but voluntarily participate in regional agreements to ensure the cooperation according to the relevant methodologies.

It is also important to consider the geographical scope of the services. The CGM merging in CGMES format, for example, is a pan-European service, and the grid models created are to be used by other RSC services. The OPC and STA services have pan-European and regional components, whereas the CSA service will be a regional service performed per Capacity Calculation Region (CCR) with cross-regional aspects in the future. The different regions are subject to different interpretations of the regional OPC process which affect the interpretation of certain regional KPIs – we describe these differences in the OPC chapter.

2. Common Grid Model

With the MVS Go-Live of the CGM in December 2021, the following capabilities for the pan-European exchange of network model data between TSOs and RSCs are in operation:

- Using the Physical Communication Network (PCN), ENTSO-E's Communication and Connectivity Service Platform (ECCo SP), ENTSO-E's OPDE Platform;
- Individual Grid Model (IGM) provision and CGM merging in the CGMES; and
- OPDE CGM Application services (Quality Assurance Service [QAS], Common Grid Model Alignment [CGMA], pan-European Verification Function [PEVF] and Boundary Management Service [BMS]).

The Go-Live has been delivered under the CGM Programme led by TSOs and RSCs facilitating the pan-European exchange of network model data between TSOs and RSCs, as set out in the Common Grid Model Methodology (CGMM).

The CGM business process will serve as the main data input for performing further analysis through the processes in the STA, OPC, CSA and Coordinated Capacity Calculation (CCC) services.

In the RSCs there are currently regional merged models in place which serve as the foundation for the existing regional services. In Nordic RSC, a day-ahead regional merged model based on CGMES is used as input to the flow-based capacity calculation (in External parallel run during 2022) and for CSA v1 (further details on versions in CSA chapter). In the other RSCs, regional models based on the UCTE format are used as input to the legacy services.

In general, a majority of services are planning the implementation of CGMES-based services as well as the integration of OPDE data exchange between 2021 and 2026. Some services are planning the initial Go-Live based on CGMES while others are planning to migrate to CGMES from UCTE format. The integration of OPDE-based data exchange is usually associated with the same dates as CGMES format implementation.

KPI-based reporting for the CGM business process in CGMES format will be provided in the next report in 2023, covering the service operation in 2022.

3. Coordinated Security Analysis

CSA is performed to assess the operational security of the transmission system and to agree on proposed remedial actions, which are considered as coordinated Remedial Actions (RAs) if agreed upon by all affected TSOs, needed to maintain it for the day-ahead and intraday timeframes.

3.1 Legacy Security Assessment

Even before the legal obligation of SO GL, TSOs have organised themselves, on a voluntary basis, to develop common security analyses, often including the creation of UCTE-based grid models. In some areas, this coordination occurred on a bilateral basis (between 2 TSOs across a shared border) or through regional initiatives. However, these voluntary initiatives were not implemented based on a shared methodology; hence, they are not comparable with each other.

For instance, at TSC (TSO Security Cooperation – a voluntary cooperation of Central European TSOs) a basic security assessment process has been running for the last 10 years. The service was designed by TSC TSOs and TSCNET with the main objective to enhance coordination in the TSC region, including some neighbouring TSOs. The service relies on the common tool used by the TSC TSOs, providing them with the common overview of the process results.

Currently the security assessment is performed for the day-ahead and intraday timeframe.

Another example is Coreso, another voluntary cooperation of European TSOs, performing Day Ahead and Intraday Security Analysis, as a legacy service of the CSA process, since 2009. The service has been designed, developed and setup by several TSOs, considering the need for cross-border view on security studies. These coordinated studies rely on a dedicated tool and strong interaction between Coreso and TSOs' operators to ensure a common overview of the process results, as well as on associated remedial actions.

SCC also performs security analysis for the day-ahead and intraday timeframes, using a dedicated tool. Based on the security analysis results for the day-ahead timeframe, SCC creates regular statistical reports about the detected security constraints to the service user TSOs.

3.2 Coordinated Security Assessment – according to SO GL requirements

RSCs shall perform contingency analysis on the CGM to detect potential violations of operational security limits on cross-border relevant network elements, requiring coordination between TSOs and RSCs. For each detected violation, RSCs 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 so that they can evaluate the impact of the recommended RA on their grid before agreeing to activate it. If the RAs agreed within one CCR significantly impact the physical flows in one or more other CCRs, a cross-regional coordination process between these CCRs shall be initiated to ensure that the residual violations in the overlapping zones are addressed.

To allow RSCs to perform the CSA service, TSOs need to provide RSCs with several inputs – their IGMs that RSCs will merge into a CGM, list of their monitored elements, the contingencies that need to be simulated and the available RAs that can be used for solving identified violations.

The legal framework behind the CSA process has been defined at 2 levels: CSA methodology (CSAm, according to SO GL Article 75) and ROSC methodologies (according to SO GL Article 76, on regional 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, remedial action inclusion in IGMs and cost sharing. At the regional level, each CCR has developed an ROSCm – Article 76 of SO GL – further detailing the regional specificities while respecting the CSA methodology. The main points that are regionally determined are the principles for RA optimisation and coordination, and the conditions and frequency of intraday coordination. The expected go-live dates of the CSA processes at the CCRs are regularly reported to ACER and the National Regulatory Authorities (NRAs).

Until the implementation of ROSC methodologies, RSCs continue to provide the current legacy security analysis services. Since the CSA service was not operational in 2021 according to the SO GL requirements, no KPIs can be calculated for the year 2021.

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

3.2.1 Baltic CCR

A regional CSA process is under a development phase. For this reason, testing data results are being provided based on BRELL (a synchronous zone where Baltic TSOs operate) coordination model for the day ahead timeframe. A test security analysis (SA) process covers contingency analysis calculations and results provided to Baltic (Estonian, Latvian, Lithuanian) TSOs.

Test data and results for the temporary SA process in Baltic region has been successfully provided for 97.3 % of working days for the day ahead timeframe. No critical issues were identified for year 2021.

3.2.2 Core CCR, Italy North CCR

Coreso and TSCNET (together in a rotational model) have been appointed to perform the CSA processes for two CCRs – Core CCR and Italy North CCR. The timeline for implementing the CSA process in each CCR is defined at the regional level.

In the Core CCR, a stepwise implementation of the CSA service is foreseen. In April 2024, the first version of the target solution with reduced scope is expected while the second version is planned to be implemented in June 2025. In Italy North CCR, the final target version will be implemented in early 2026.

To exploit the synergies in the Core CCR and Italy North CCR, Coreso and TSCNET initiated the CorNet Programme to ensure efficient and effective tool development and prepare future operations.

3.2.3 Hansa CCR

For Hansa CCR, the specific CSA processes will consist of providing relevant input (remedial actions, cross-border network elements etc.) to the TSOs of Core and Nordic CCRs and participating in the coordination of remedial actions whenever necessary. This concept will be adopted for interim and target solutions, the only difference is that for interim solution Nordic and Core CCRs will use different grid models (Nordic and Continental Europe models, respectively) whereas for target solutions the same model will be used (Pan-European CGM).

Because of these dependencies, the go-live dates for Hansa CSA follow the go-live dates of the CSA processes in the two neighbouring CCRs, according to the approved process. For the interim solution the expected go-live is in Q2 2024 (3 months after the Core and Nordic interim solutions go-live), whereas for the target solution the expected go-live is in Q2 2026 (12 months after the Core and Nordic target solutions go-live).

3.2.4 Nordic CCR

Nordic RSC is implementing the CSA service in the following steps.

Version 1.0 – View and Verify:

The security analysis is performed on Day Ahead IGMs. The results are subsequently published to the Nordic TSOs and verified by them. The outcome of the analysis is discussed in the Daily Operational Planning Teleconference (DOPT). No RA optimisation will be performed in this version. CSA Version 1.0 went into production in Q2 2022.

Version 2.0 – Suggest and Accept:

The next version will build on top of Version 1.0 and add the suggestion of RAs based on the security analysis. These suggested RAs will be published on the Nordic CSA coordination platform for the Nordic TSOs to accept or reject. The go-live of version 2.0 is expected in 2023.

Version 3.0 – Intra Day View and Verify

The process for running the security analysis will be expanded to include Intra Day IGMs.

3.2.5 SEE CCR

The CSA will be performed in the SEE region by SeleNe CC in the day-ahead timeframe to ensure the security of the Greek, Bulgarian and Romanian power systems. The CSA is currently under the testing/validation phase. The go-live of this service is expected for Q3 2022.

The CSA process consists of two main parts: The first part includes the security analysis on day-ahead common grid models (CGMs in UCTE format) considering the N-1 criterion to identify potential thermal and voltage violations. The second part includes the coordination of remedial actions. For the time being, no optimisation procedure is used for the selection of the non-costly RAs, but an iterative process is used involving all relevant TSOs (propose remedial actions) and the SeleNe CC operator. The iterative process ends when all TSOs agree that the applied RAs ensure the security of their system.

Finally, it is worth noting that the implementation has begun (business requirements, vendor selection) of the first version of the ROSC based on the methodology for ROSC for the capacity calculation region SEE. According to the implementation plan, the ROSC will go-live in two different phases during Q2 of 2023 and Q2 of 2025.

3.2.6 GRIT CCR

The ROSC will be performed in a first stage for the day-ahead time frame to ensure the respect of the operational security limits of grid elements of both Italian and Greek power systems deemed as being of cross-border relevance within the Area of Common Interest. To do so, an N-1 security analysis is performed to detect current and voltage limit violations in combination with an RA selection procedure, including both non-costly (e. g. capacitors/reactors connection/disconnection) and a selected set of costly RAs (e. g. identification of powerplants for voltage stability constraints).

The ROSC methodology will be then complemented with the required timeframes in intraday.

3.2.7 SWE CCR

After a thorough review and comparison analysis between SWE and CORE/Italy North requirements for the CSA process, different scenarios were defined and proposed for the development of tools (fully independent SWE, hybrid SWE-CorNet and full CorNet), it was agreed by all parties (SWE TSOs and CorNet) to adopt the hybrid approach. This decision ensures the smooth development of the CSA process and the meeting of its go-live target in Q1 2024.

The SWE CSA process will rely on the CorNet IT developments as tools for Coreso to carry out most of the CSA subtasks. Externally integrable modules will be developed as applicable to satisfy the region's specificities. Both SWE CSA and CorNet team successfully worked together to consider the specificities of the SWE CSA process in the CorNet requirements, always in line with CorNet deadlines.

The main extra module is the SWE CSA Remedial Action Optimiser (RAO) that will start its developments in 11/2022 and will be followed independently by Coreso.

3.2.8 SCC

All non-EU TSOs in the synchronous area Continental Europe signed the SAFA in April 2019, thereby committing themselves to applying all the provisions of the *SO GL* regulation in due time. In the beginning of 2021, in accordance with Art. 76 of *SO GL*, SCC and TSOs that are SCC service users and signatories of the *SAFA* document at the same time (CGES, EMS, MEPSO, NOSBiH and OST) started activities towards the development of *SAFA West Balkan Regional Operational Security Coordination (SAFA WB ROSC)* methodology.

Non-EU SEE TSOs signatories of SAFA

Development of ROSC methodologies, design and implementation of the ROSC process and its daily operation is a legal obligation of all EU TSOs along with their respective RSCs executed on the level of CCRs.

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

On the other hand, non-EU TSOs signatories of the Synchronous Area Framework Agreement (SAFA) can participate in the listed activities above by developing the methodology and implementing and executing the ROSC process in their non-EU region.

EU TSOs of each CCR have in their methodologies assigned ROSC activities to their respective RSCs while for non-EU SEE TSOs who agreed to develop and operate ROSC process with SAFA agreement, SCC is the RSC.

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

- Design of *SAFA WB ROSC* methodology – finalised in September 2021;
- Creation of *SAFA WB ROSC* business process – Project Group consisted of experts from SAFA WB TSOs and SCC is established in October 2021, whose work is expected to be finalised in April 2022;

The implementation of *SAFA WB ROSC* methodology and business process – adequate Project Group will be defined to solve two biggest obstacles: to harmonise tools on TSO and RSC side with all requirements, as well as to make organisational changes in their companies (operation planning department shifts on TSO side have to be extended to the late afternoon and additional staff have to be employed).

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, sharing the element list and maintaining of the database for the relevant assets. A coordinated procedure ensures the quality and consistency of the data, e.g. via the validation of information about the planned status of the cross-border lines of the TSOs.

On the foundation of the pan-European OPC process, regional OPC processes, commonly known as regional Outage Planning Incompatibility (OPI) assessment processes, are also performed by RSCs[2] as per Art. 80.4. of SO GL. Its goal is to determine if the outage planning of the European TSOs is feasible in terms of grid security. In case it identifies potential congestions, it shall suggest Remedial Actions (RAs) and verify the grid status after their application. The OPI process is executed for two-time horizons: week and year ahead calculation.

In the SEE region, SEleNe CC started the extended test for the OPI assessment in October 2021, and the services are executed on a weekly and yearly basis. The go-live of the Regional OPC process is scheduled for Q4/2022 and from Q3/2022 SEleNe CC will provide the pan-European OPC service.

Baltic RSC and Nordic RSC provides an expert assessment based on the planned outages in the region to avoid outage incompatibilities.

The regional OPC processes are not completely comparable and have some significant differences among the RSCs, according to the requirements of the TSOs and the responsibility of the corresponding RSC. The main characteristics of these OPI processes are summarised in the table below.

The number of timestamps calculated in 2021 for SCC is greater in Yearly OPI than in Weekly OPI. In Yearly OPI, TSOs requested repetition of calculations for some weeks, due to changes of outage planning after the 1st run calculations. Calculations are repeated only for weeks which were affected by this change of outage planning (36 weeks).

Input data are collected and considered for the time frames week-ahead (W-1) and year-ahead (Y-1).

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

- **OPC KPI 1:** % failures and reasons for failures.
- **OPC KPI 2:** Average merge duration per process timeframe
- **OPI KPI 1:** Average duration of OPI calculation
- **OPI KPI 2:** % failures and reasons for failures
- **OPI KPI 3:** % of times when OPI assessment results in identified outage planning incompatibilities.

	Timeframe	Coreso	SCC	TSCNET[3]
Calculation method (Security analysis)		Manual	Automatic	Automatic
Remedial action selection method		Manual identification based on expert knowledge and operational rules	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.	OPI cases confirmed by the respective TSOs.	All OPI cases identified by the OPI calculation.
Number of time-stamps calculated in 2021	Weekly OPI	52 (1/week)	52 (1/week)	980 (21/week from CW10, 7/week until CW9)
	Yearly OPI	52 (1/week)	52 (1/week, for for 36 CWs a second calculation was requested)	52 (1/week)

Table 1: Regional characteristics of the OPI process

2 Coreso and TSCNET are in the process of establishing a task allocation related to the STA and OPC services, in order to increase efficiency.

3 TSCNET performs the OPI assessment process in two cycles per time horizon – Initial OPI assessment and final OPI assessment. Coreso and SCC perform one cycle per time frame and a second cycle upon request from TSOs

4.1 OPC KPIs

4.1.1 OPC KPI 1: % of process failures and reason for failure

Description: The ratio of failed processes compared to all processes performed on a pan-European level. These cases were classified by their cause, which are usually related to the data quality issues, the IT tool and infrastructure – anything else not fitting into this category is covered in the "Other" class.

In 2021 there have been 4 recorded times when merge failed (4x W-1) due to IT issues; however, this did not prevent the process from finishing successfully. Rescheduling was mostly used to solve issues and deliver results with a delay.

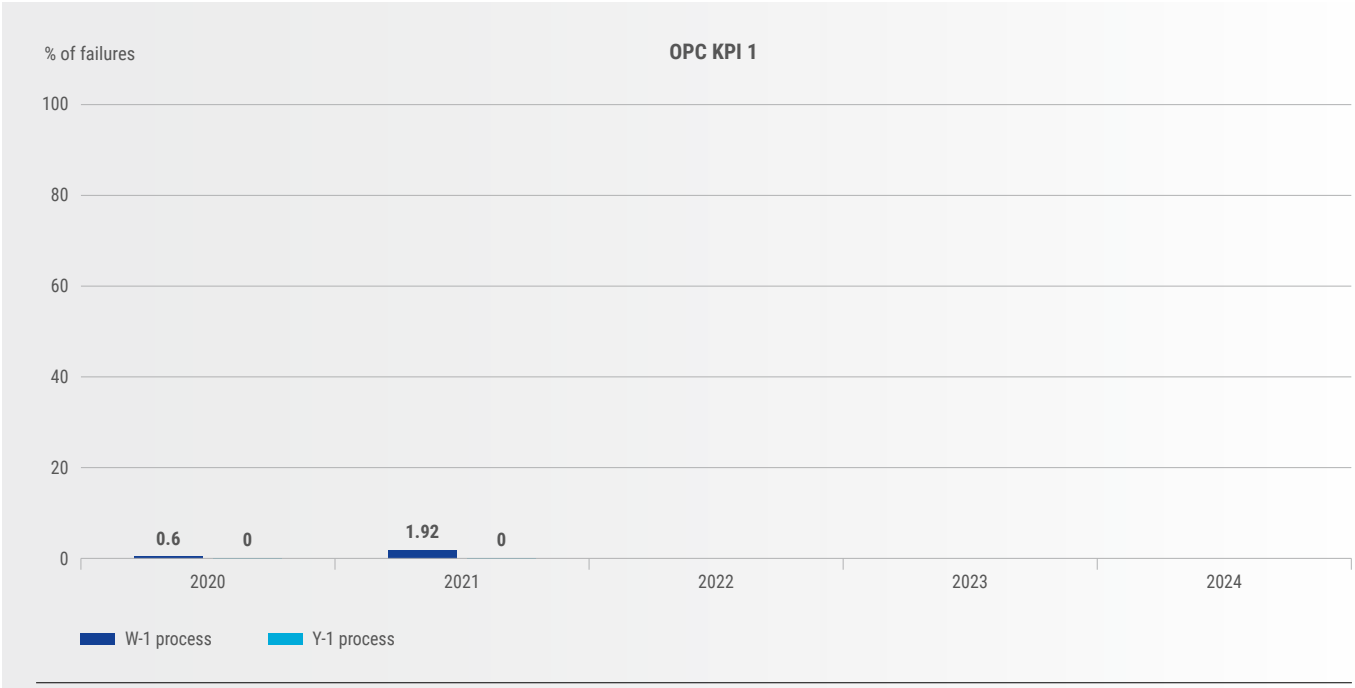


Figure 1: OPC KPI 1 – % of process failures per year

Reason for failures

Number of cases in 2021	Weekly process	Yearly process
Data Quality	0	0
IT – Tool	4	0
IT – Infrastructure	0	0
Other	0	0

Table 2: OPC KPI 1 – % of process failures per reason class

4.1.2 OPC KPI 2: Average merge duration per process timeframe

Description: the value shows the average duration of each individual merge performed on the pan-European level in seconds. The processes are differentiated by the timeframe covered: the weekly processes are performed every week covering the next week, and the yearly processes are performed during the yearly planning period for the whole next year.

The longer duration of the yearly merge compared to the weekly is due to the higher number of outages, higher number of elements and the complexity of the database to be considered. The 2021 results are higher due to the tool being used more actively and the greater number of data provided compared to 2020.

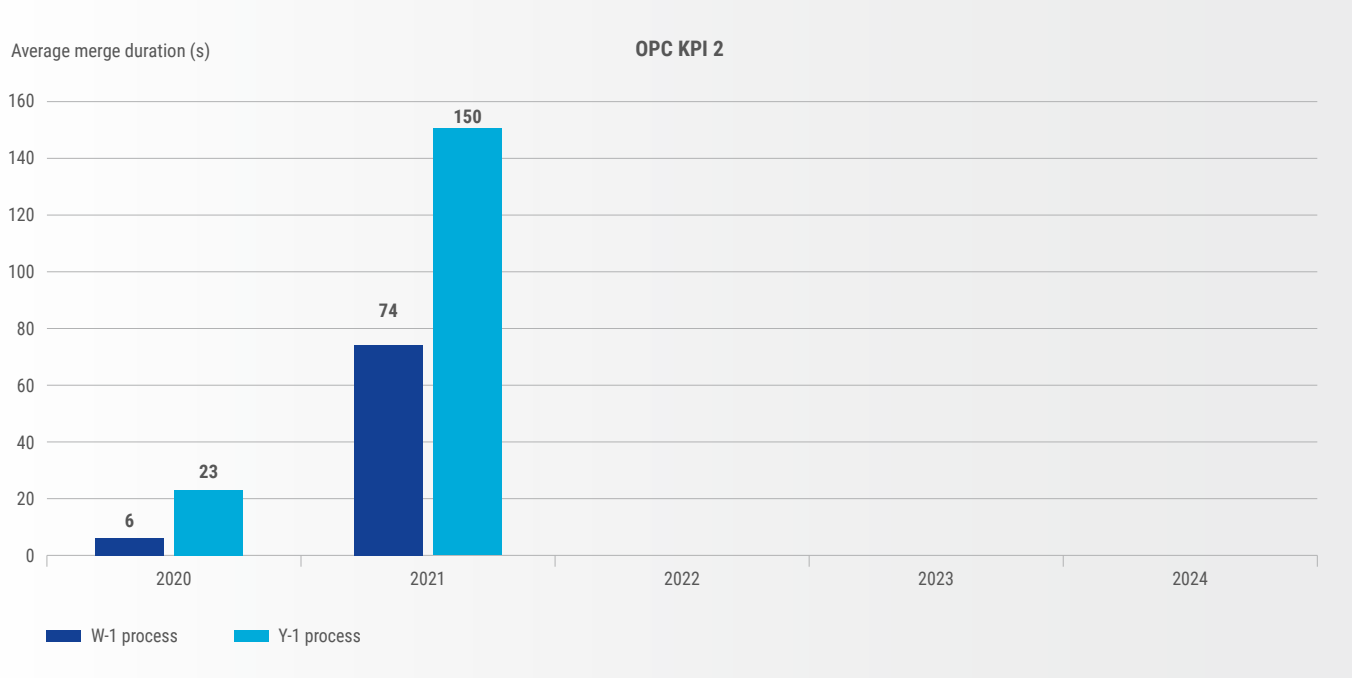


Figure 2: OPC KPI2 – average merge duration in seconds

4.2 OPI KPIs[4]

4.2.1 OPI KPI 1: Average duration of OPI calculation

Description: the value shows the average duration of each OPI calculation on regional level.

The OPI process is already performed by some of the RSCs, calculated for their shareholder TSOs, and the results are discussed with the TSOs and the RSCs on regular teleconferences. This process was provided based on the RORA (RSC Outage Responsibility Area) regions. It is foreseen that by 2023–2025, the process will be provided according to the Outage Coordination Region (OCR) definition.

Nevertheless, as shown in Table 1, there is some difference in the practical implementation (regionally agreed with the respective TSOs in line with the regional needs of the process), which is also reflected in the resulting OPI KPIs. The duration of the calculation is, for example, strongly influenced by the fact that some RSCs are performing the calculations manually for different amount of timestamps, whereas others use automated calculation and optimisation methods. The number of timestamps considered are not the same.

4 Coreso, TSCNET and SCC perform Regional OPI assessment using input reference models in UCTE format; Baltic RSC and Nordic RSC provides an expert assessment based on the planned outages in the region to avoid outage incompatibilities; SEleNe CC Regional OPI assessment is expected to go live in 2022.

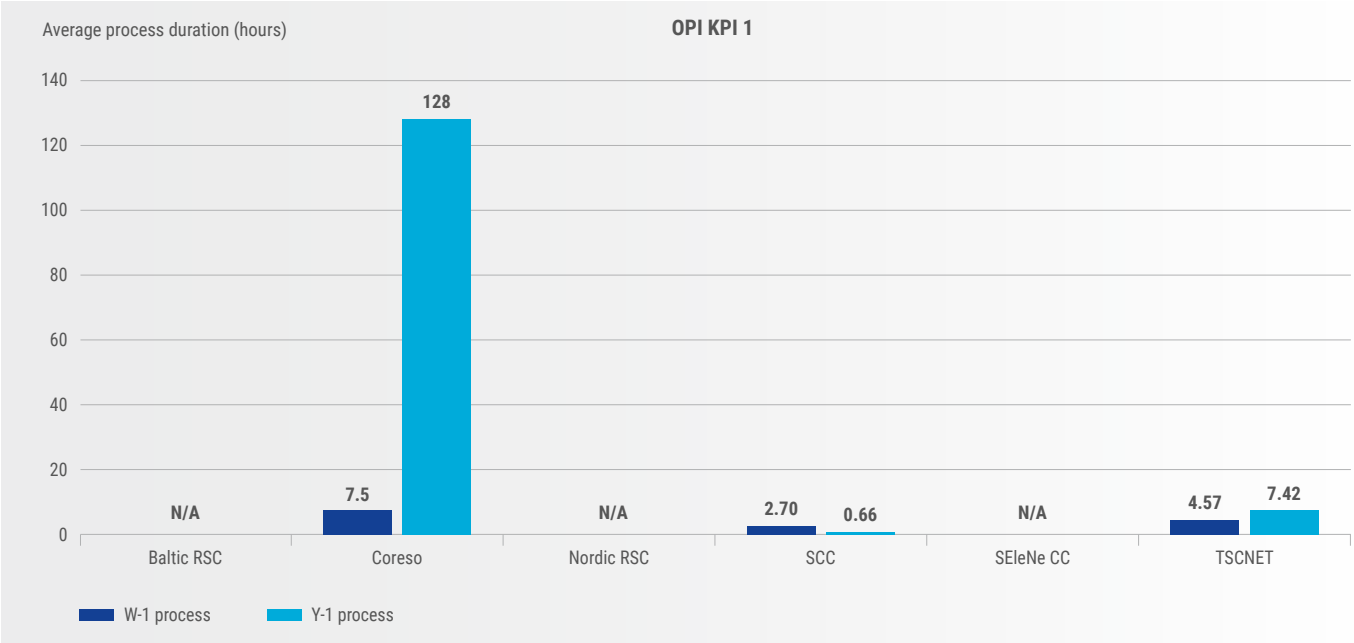


Figure 3: OPI KPI 1 – average process duration in hours

4.2.2 OPI KPI 2: % of process failures and reason for failure

Description: The ratio of failed processes compared to all processes performed on regional level. These cases were classified by their cause, which are usually related to the data quality issues or the IT tool or infrastructure – anything else not fitting into this category is covered in the "Other" class.

In 2021, 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 compared to the manually performed processes.

- For SCC, the W-1 OPI process failed once due to divergency of calculation on the CGM used.
- For TSCNET, the W-1 OPI process failed once due to input data quality issues.

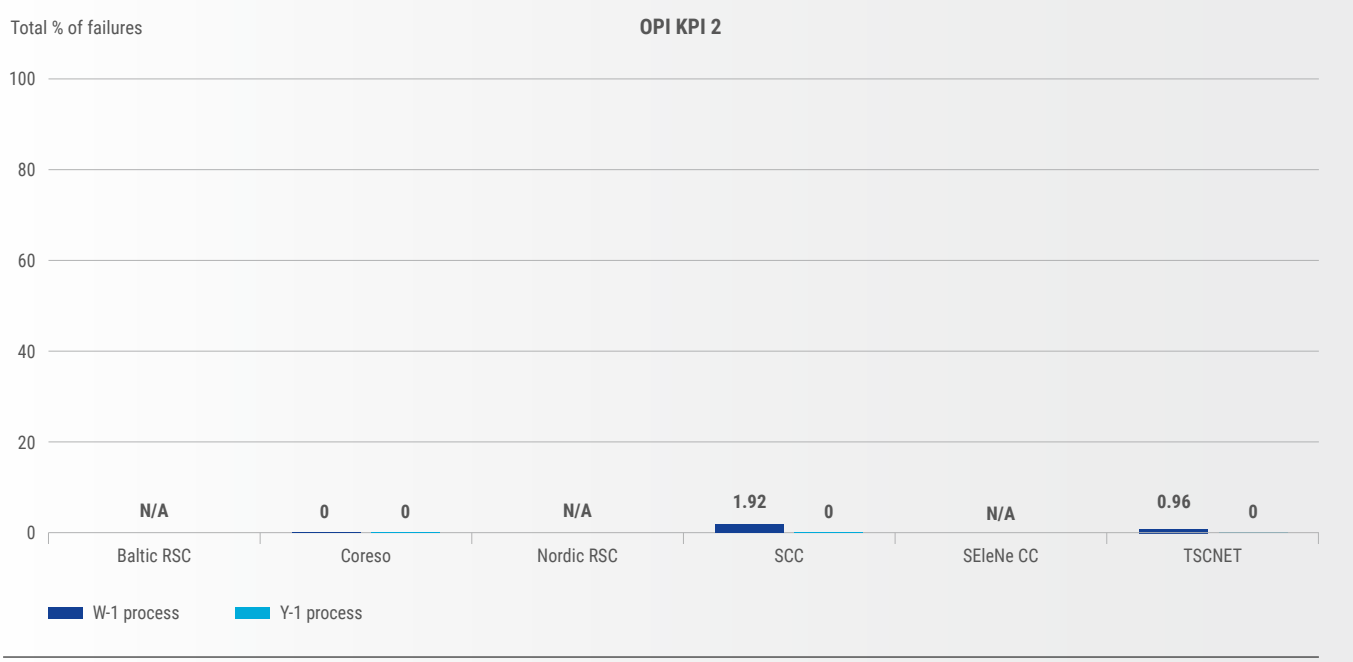


Figure 4: OPI KPI 2 – Percentage of total failures

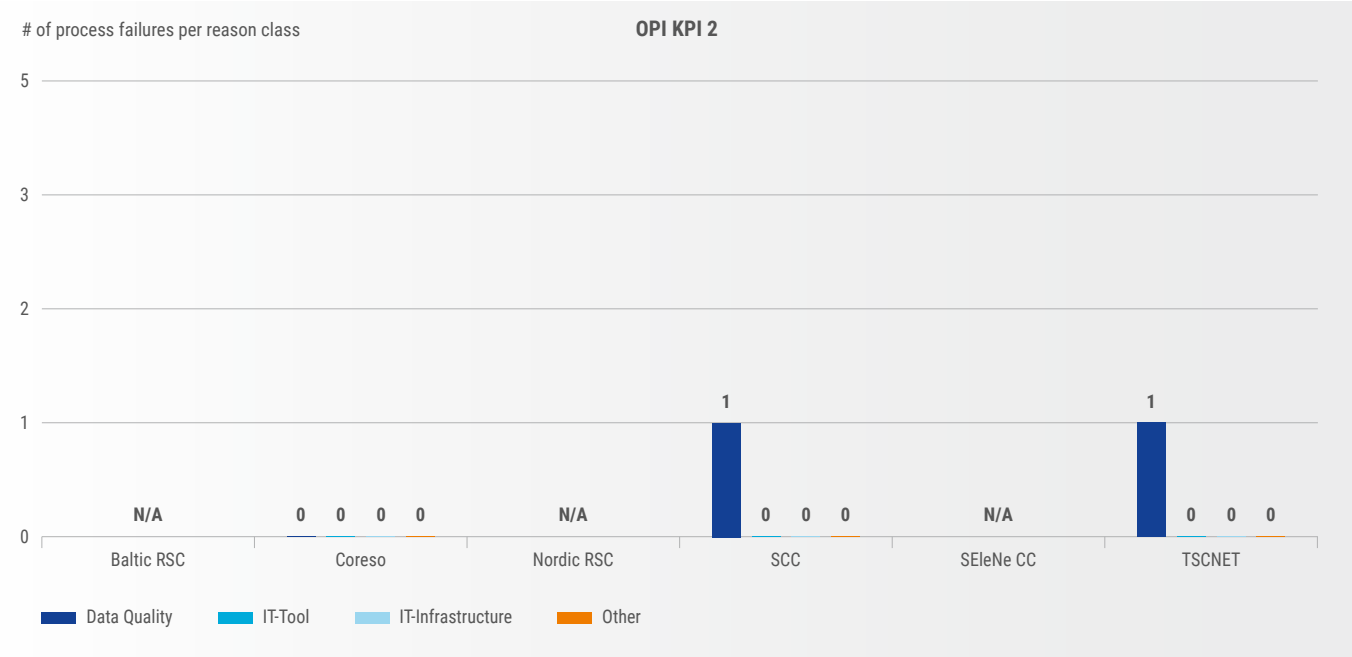


Figure 5: OPI KPI 2 – Number (#) of process failures per reason classification

Reason for failures

Number of cases in 2021	Baltic RSC	Coreso	Nordic RSC	SCC	SEleNe CC	TSCNET
Data Quality	N/A	0	N/A	1	N/A	1
IT – Tool	N/A	0	N/A	0	N/A	0
IT – Infrastructure	N/A	0	N/A	0	N/A	0
Other	N/A	0	N/A	0	N/A	0

Table 3: OPI KPI 2 – Number of process failures per reason classification

4.2.3 OPI KPI 3: % of time when OPI assessment results in identified incompatibilities

Description: The OPI assessment can result in either an OPI is identified or not. The OPI KPI 3 indicates how often OPIs were detected during the weekly / yearly planning.

The OPI process and the definition of OPI was different among the RSCs in 2021, therefore the KPIs are hardly comparable. The main reason for this is that Coreso and SCC reported those OPIs which were also confirmed by the TSOs, whereas the reported OPIs of TSCNET represent the identified OPIs of the RSCs' security assessment.

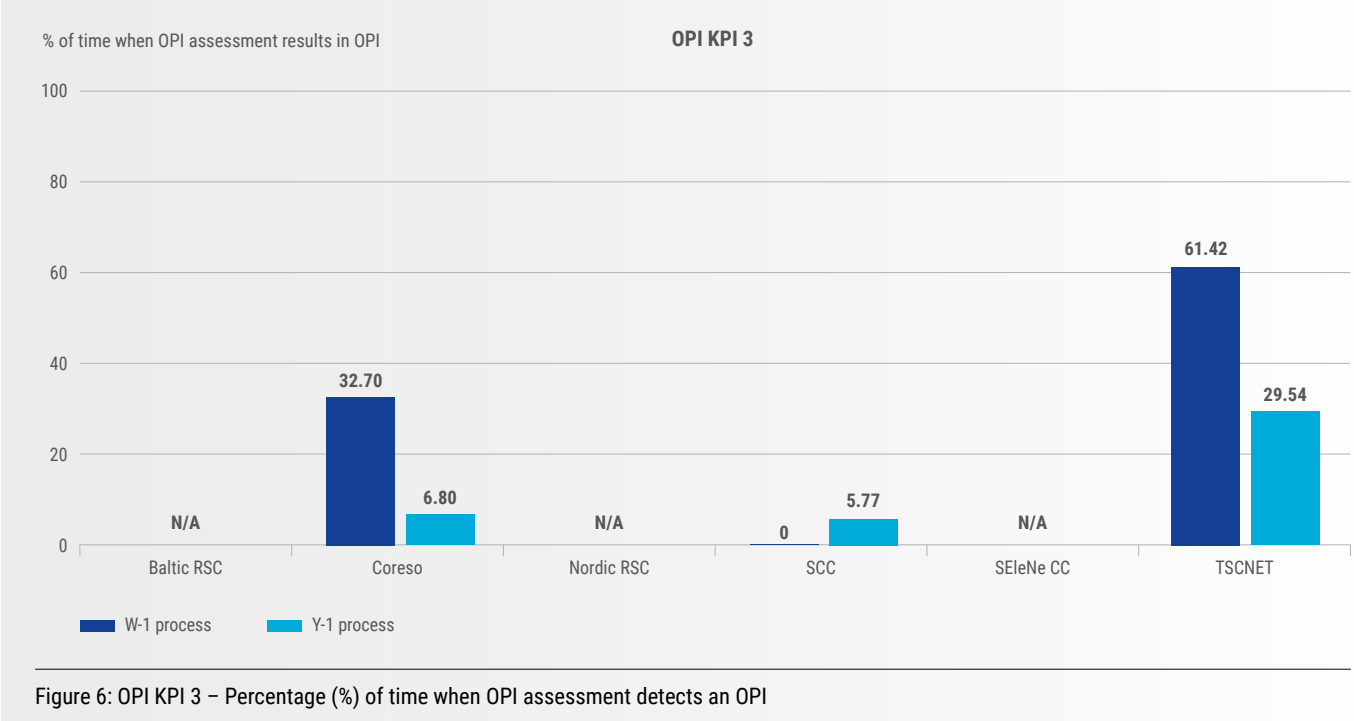


Figure 6: OPI KPI 3 – Percentage (%) of time when OPI assessment detects an OPI

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 regional level, considering possible cross-border exchanges and operational security limits. Based on this assessment, RSCs will provide recommendations to TSOs to achieve overall adequacy.

The STA service is performed on a pan-European level daily for the following seven days. During 2021, calculations were monitored (and operational tasks such as communication with TSOs and IT tool provider, data upload etc. were performed) by five RSCs (Coreso, TSCNET, SCC, Nordic RSC and Baltic RSC) taking responsibility on the rotational basis, whereas from September 2022 SEleNe CC will join the service provision5. For each week there is one main responsible RSC and one backup RSC, activated in case the main RSC faces an issue regarding any part of the STA process.

In the event of inadequacy on pan-European level, the regional STA process should be performed under the leadership of the RSC leader. Regional processes should cover the affected TSO and the neighbouring TSOs; 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. The timeframe of the regional process is determined by the timestamp that is foreseen as the most critical one based on pan-European results. Regional STA is triggered automatically for the timestamps that are in the scope of the next three days. However, any TSO can trigger a regional STA process whenever it identifies the need and independently of the timeframe.

RSCs and TSOs use the same STA tool owned by ENTSO-E for all pan-European STA-related activities: delivery of STA input data & quality check, monitoring of STA calculation process, creation and downloading of STA reports.

The STA KPIs are:

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

At SEleNe CC, for the time being the regional STA is executed (when necessary) for ESO (Bulgaria) and IPTO (Greece) on a regional level. During 2021, this service was under continuous testing. The go-live for the STA was on 01 January 2022.

For the Nordic RSC, no regional KPI is collected as they did not participate in the Regional STA Process during the whole of 2021. After internal agreement, Nordic RSC will join the Regional STA process in a 2-step approach:

1. By mid June 2022, Nordic TSOs and RSC will join the initial teleconference if requested by neighbouring TSOs, proposing possible RAs on their behalf to relieve the situation and support the other TSOs.

2. In the near future, Nordic TSOs and RSC will join the entire Regional STA process when triggered and if the adequacy issue is detected in the Nordic bidding zones. This means that at that time, Nordic RSC will take the responsibility of being the RSC Leader.

5 Coreso and TSCNET are in the process of establishing a task allocation related to the STA and OPC services, in order to increase efficiency.

5.1 STA KPIs

5.1.1 STA KPI 1: % of failures

Description: STA KPI 1 presents the percentage of failed processes compared to all processes performed on pan-European level. The pan-European STA process runs once every day; an additional run can be requested by any TSO(s). Thus, the total number of runs would be maximum 365×2 (or 366×2 in leap years).

It can be seen that the 2021 value for STA KPI 1 is approximately 8 times higher for the adequacy calculation process and about 2 times higher for the reporting process than for 2020. This increase is due to the more complex algorithm which entered into operation in June 2021 combined with limited hardware resources. This also caused a slight increase in the duration.

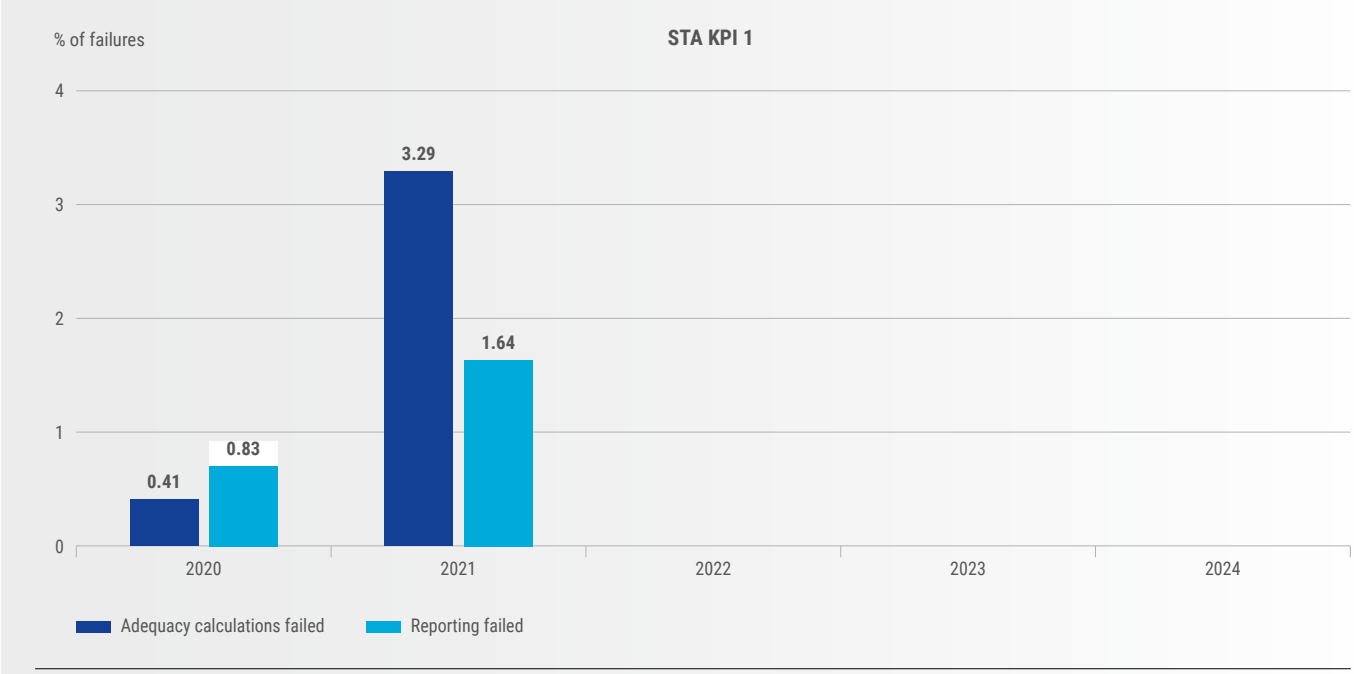
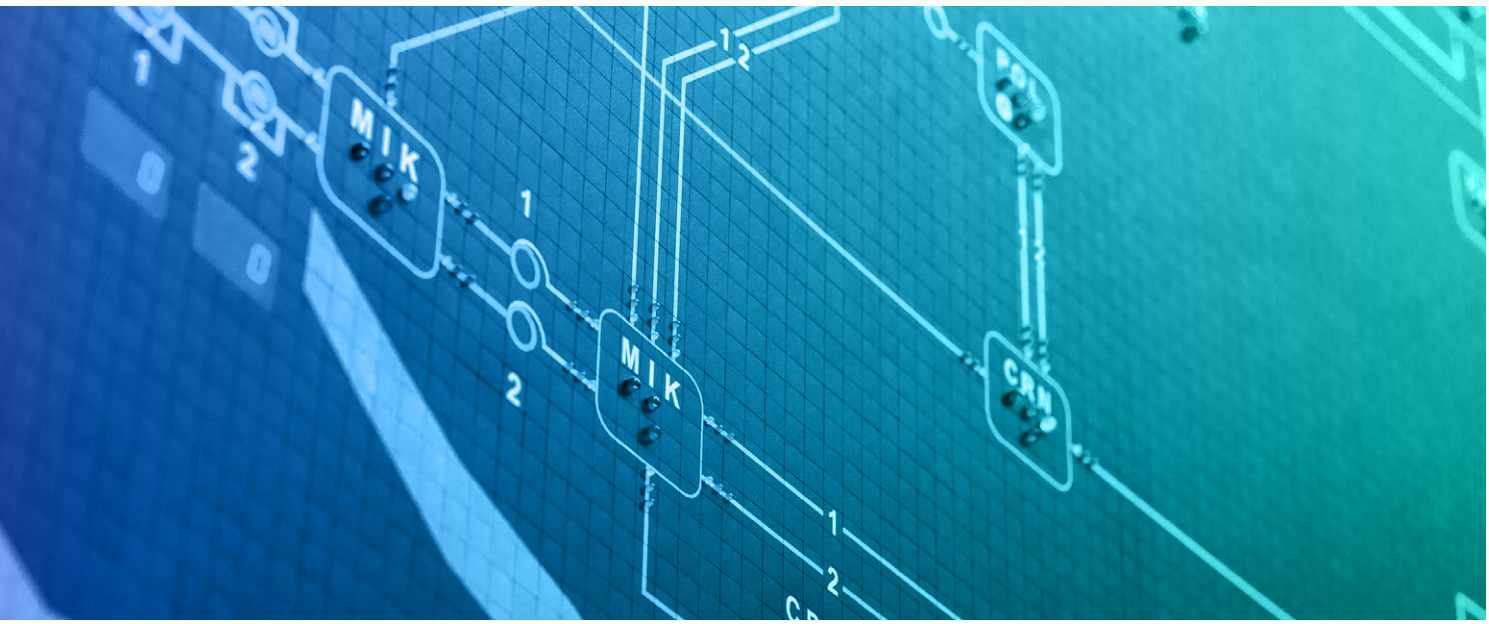


Figure 7: STA KPI 1 – Percentage of failures



5.1.2 STA KPI 2: Average STA pan-European process time

Description: STA KPI2 presents the average time of all pan-European STA computations performed during the year. Data for STA KPI 2 are obtained from the ENTSO-E STA tool.

In addition, STA calculation in 2021 was on average longer due to the increase from 500 scenarios in probabilistic calculation to 8,500 scenarios.

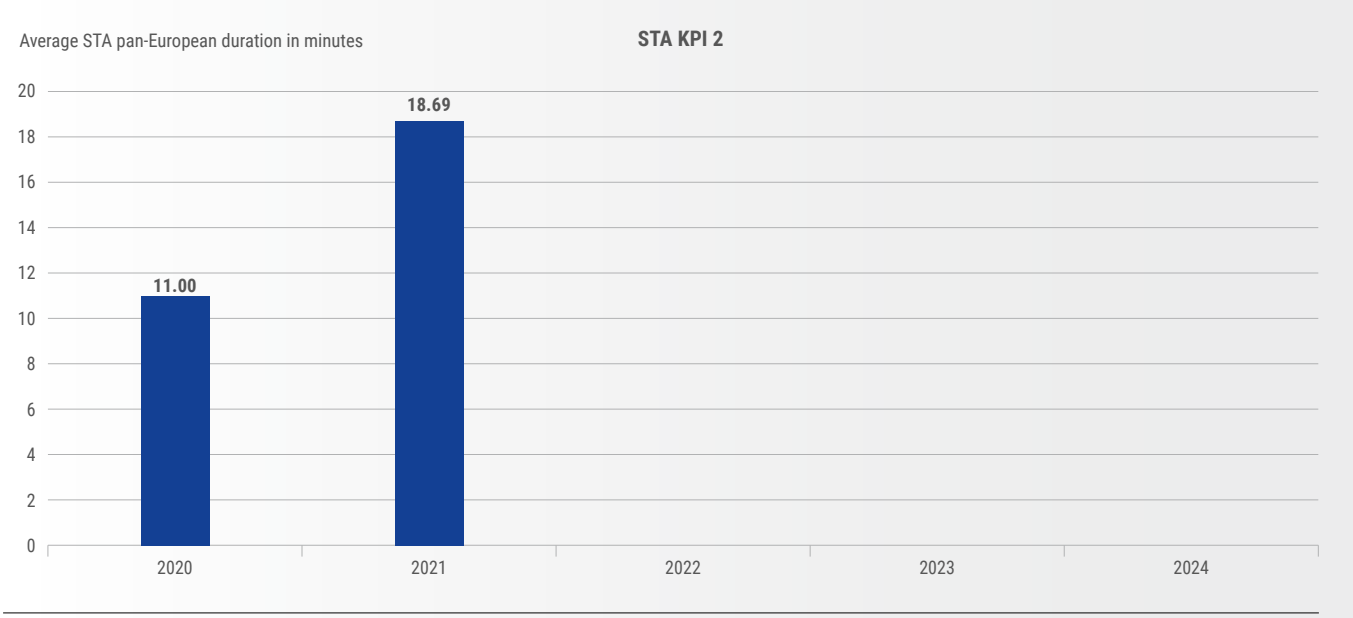


Figure 8: STA KPI2 – Average STA pan-European process time

5.1.3 STA KPI 3: Description of regional adequacy assessments performed

Description: The following table presents the details of each launched regional STA process in 2021.

No	Date of Assessment	Date of Event	RSC leader	No. of concerned TSOs	Inadequacy duration	ENS [MWh]	Used mitigation action
1	2021-11-25	2021-11-26	Coreso	2	3	−1.424	Increase net position
2	2021-12-05	2021-12-06	TSCNET	10	2	−1.700	Increase of generation
3	2021-12-06	2021-12-07	TSCNET	12	1	−700	Increase of generation and NTC
4	2021-12-08	2021-12-09	TSCNET	6	1	−1.200	Increase of generation and NTC
5	2021-12-09	2021-12-10	TSCNET	5	1	−1.100	Increase of generation and NTC
6	2021-12-10	2021-12-11	TSCNET	5	1	−1.135	Internal outage cancellation

Legend

No: order number of inputs

Date of Assessment: date when the pan-European STA is assessed

Date & Time of Event: date and timestamp of the case for which Regional STA process is triggered

RSC leader: RSC responsible for leading the Regional STA process

No. of concerned TSOs: No. of TSOs participating in the Regional STA process, main affected TSO (for which ENS is detected) and their neighbours that can have an impact on the main affected TSO (determined based on Dynamic matrix)

Inadequacy duration: number of timestamps in the week ahead timeframe for which Main affected TSO is in inadequacy situation (each timestamp corresponds to one hour)

ENS [MWh]: amount of Energy Not Supplied in the timestamp assessed during the Regional STA process

Used 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 3: OPI KPI 2 – Number of process failures per reason classification

Conclusions

To fulfil the obligations from Article 17 SO GL, this report contains KPIs for the services provided by the RSCs.

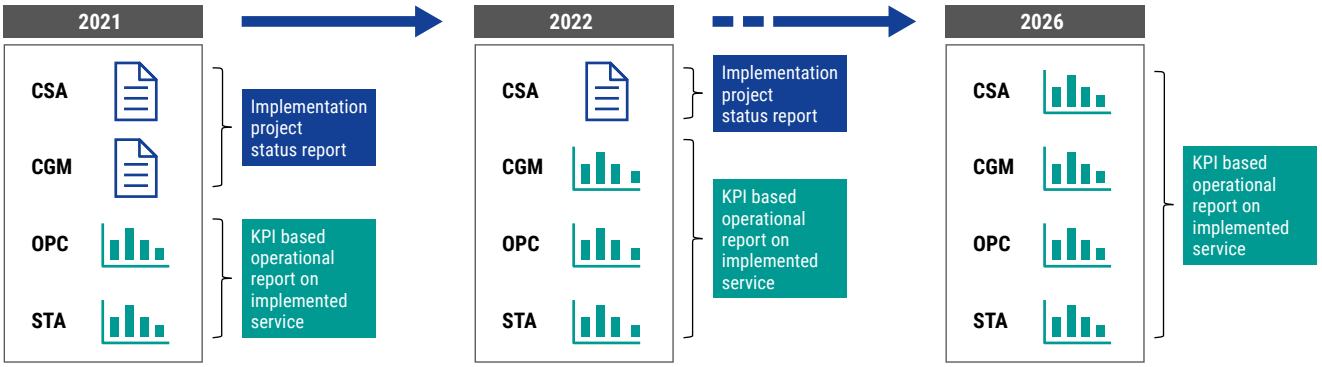


Figure 9: Overview of trajectory towards full reporting of RSC services according to SO GL. (In the figure the reports refer to the year the reporting data was collected from, based on estimations according to the available information during the creation of the report).

Glossary

Art.	Article
CACM	Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management
CCC	Coordinated Capacity Calculation
CCR	Capacity Calculation Region
CGM	Common Grid Model
CGMA	Common Grid Model Alignment
CSA	Coordinated Security Analysis
DOPT	Daily Operational Planning Teleconference
ENS	Energy Not Supplied
FCA	Commission Regulation (EU) 2016/1719 of 26 September 2016 establishing a guideline on forward capacity allocation
IGM	Individual Grid Model
KPI	Key Performance Indicator
MW	Megawatt
NRA	National Regulatory Authority
OCR	Outage Coordination Region
OPC	Outage Planning Coordination
OPI	Operation Planning Incompatibility
PEVF	Pan-European verification function
RA	Remedial Action
RO	Outage Responsibility Area
ROSC	Regional Operational Security Coordination
RSC	Regional Security Coordinator
SA	Security Analysis
SAFA	Synchronous Area Framework Agreement
SOC	ENTSO-E System Operations Committee
SO GL	Guideline on Electricity Transmission System Operation Commission Regulation (EU) 2017/1485 of 02 August 2017 establishing a guideline on electricity transmission system operation
SOR	System Operation Region
STA-	Short-Term-Adequacy
StG OF	Steering Group Operational Framework (ENTSO-E)
TSC	TSO Security Cooperation
TSO	Transmission System Operator
UCTE	Union for the Co-ordination of Transmission of Electricity

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