ENTSO-E
Market report 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 42 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 European 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 the 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 using 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, 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 cooperation among its members at the European and regional level. 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 time frames;
- 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 transparent data-sharing with market participants.

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

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Executive summary

Capacity allocation and congestion management are the cornerstones of the European single electricity market as they harmonise the way in which cross-border electricity markets operate from long-term to real-time. An interconnected, integrated and well-functioning European electricity market ensures use of the most efficient resources and is key to ensuring security of supply at the lowest cost for consumers. Significant progress has been made again during the reporting period from 2021 to 2022 across the market's various time frames, bringing a single European electricity market for the benefit of all Europeans closer to full realisation.

Currently, the European electricity markets are facing fundamental challenges. In particular, market fundamentals and geopolitical crises have led to drastically elevated fuel costs and wholesale electricity prices. High electricity prices also affect transmission system operators' (TSOs) activities such as balancing and the procurement of transmission losses, which need to be reflected properly by grid tariffs. At the same time, TSOs support undistorted wholesale price formation, which is key to the functioning of the internal electricity market and security of supply. The advanced level of the grid interconnection and market integration achieved in most parts of Europe has mitigated the negative effects of the scale of increase in electricity prices. The integration of long-term, day-ahead, intraday and balancing markets is already delivering tremendous savings to end consumers year on year. According to the Agency for the Cooperation of Energy Regulators (ACER), these savings account to EUR 34 billion per year for the day-ahead market alone[1].

In addition, the overall regulatory framework is again subject to continuous change processes. The ongoing revision of the capacity allocation and congestion management (CACM) regulation, called 'CACM 2.0', will have a major impact on the work of TSOs. Therefore, ENTSO-E engaged intensively in the public debate on its revision and published two *CACM 2.0 Amendment Advocacy Report*s on its website[2,3], which are summarised in Chapter 2.1. In particular, nominated electricity market operators (NEMOs) and TSOs see shortcomings in ACER's proposal for the market coupling operation (MCO). NEMOs and TSOs offer an alternative idea that builds upon the proven successes of the current organisation: a revised governance comparable to ACER's proposal and yearly update of the work plan, sufficient regulatory oversight via a joint non-compliance assessment by all national regulatory authorities (NRAs) and operational security by maintaining the rotational MCO system and dealing with local issues locally. Furthermore, ENTSO-E sees severe risks in expanding the 70% minimum cross-zonal capacity (CZC) available for trade up to the intraday time frame. In fact, TSOs will be given little to no time to perform remedial actions to keep the system in balance. TSOs call upon NRAs, ACER and the European Commission to investigate alternative solutions that better balance market needs and system security.

Like the 2021 report, this report provides an assessment of the minimum cross-zonal trading capacity targets of the Clean Energy for all Europeans Package (CEP), called the 'CEP70 provisions'. With a few exceptions, TSOs reached the required capacity targets again in 2021.

The events of 2022 have been a painful reminder of the need to complete Europe's internal energy market as fast as possible. ENTSO-E stays highly committed to further integrating Europe's energy markets, together with stakeholders such as regulatory authorities, policymakers and market parties. This ENTSO-E *Market Report* outlines key developments and the main highlights of the past year across the market's time frames.

Forward capacity allocation at a glance

- Forward capacity allocation (FCA) uses a single pan-European platform, established in October 2018, to

1 *ACER's Final Assessment of the EU Wholesale Electricity Market Design: April 2022* – https://extranet.acer.europa.eu/Official_documents/Acts_of_the_Agency/Publication/ACER's%20Final%20Assessment%20of%20the%20EU%20Wholesale%20Electricity%20Market%20Design.pdf.

2 TSO CACM 2.0 report available from https://eepublicdownloads.azureedge.net/clean-documents/Network%20codes%20documents/NC%20CACM/2022/February_NC-ENTSOE_CACM_Amendment_advocacy_report_TSOs_only_part_light_version.pdf.

3 Joint NEMO-TSO CACM 2.0 report available from https://eepublicdownloads.azureedge.net/clean-documents/Network%20codes%20documents/NC%20CACM/2022/NC-ENTSOE_CACM_Amendment_advocacy_report_Joint_NEMO-TSOs_part_february_final.pdf.

explicitly allocate auction-based cross-zonal transmission rights.

- The project includes 22 countries with 30 TSOs that cover 65 serviced borders and have more than 350 active market participants.
- In total, more than 3 500 cross-border auctions have been successfully completed since the go-live in October 2018.
- The introduction of long-term flow-based capacity allocation in the Nordic and Core capacity calculation regions (CCRs) in the coming years will mark a major milestone in the evolution of FCA.

Market coupling

On 14 January 2022, the new joint governance structure of pan-European single day-ahead coupling (SDAC) and single intraday coupling (SIDC) entered into force. Both time frames are now governed by a joint steering committee, called the Market Coupling Steering Committee (MCSC). This evolution will make the decision-making process more efficient and generate synergies. TSOs and NEMOs continue to develop ideas to further improve market coupling and streamline market coupling organisation.

Single day-ahead coupling at a glance

- Single day-ahead coupling (SDAC) uses one common price coupling algorithm to implicitly calculate electricity prices across Europe and to allocate auction-based cross-zonal capacity (CZC).
- The project includes 27 countries with 32 TSOs and 17 NEMOs that so far cover 61 bidding zones in two operational projects.
- The integration of the borders PL–DE, PL–CZ, PL–SK, CZ–DE, CZ–AT and HU–AT in June 2021, and BG–RO in October 2021, into the pan-European day-ahead power market marked a milestone of the integration of European electricity markets. One common SDAC is now in operation across all EU countries.
- On 8 June 2022, flow-based implicit allocation has been implemented for the Core CCR as the target solution required by regulation.
- In total, more than 3 000 market sessions have been successfully completed since the go-live in February 2014.

Single intraday coupling at a glance

- Single intraday coupling (SIDC) uses one common information technology (IT) system to continuously perform adjustments in market participants' positions until one hour before delivery time, considering available CZC across Europe[4].
- The project includes 27 countries[5] with 30 TSOs and 15 NEMOs which so far cover 47 integrated bidding zones.
- The third go-live wave on 21 September 2021 integrated the Northern Italian borders (IT–FR, IT–AT and IT–SI) and the Italian internal bidding zone borders into the already coupled intraday region.
- In total, as at the end of April 2022, more than 157 million trades have been executed since the go-live in June 2018.

Balancing markets at a glance

One of the major ongoing undertakings of the TSOs over the past decade has been the integration of the European energy markets, especially on the development and harmonisation of sets of technical, operational and market rules to govern the functioning of electricity balancing markets. TSOs have cooperated on such harmonisation efforts not only by proposing sets of rules but also by proactively implementing several projects such as the **balancing platform projects**, and drafting and implementing the **CZC calculation**, **CZC allocation** and **imbalance settlement harmonisation methodologies**.

Selected key achievements with respect to the implementation of the Electricity Balancing (EB) Regulation roadmap regarding balancing platforms, regional implementations and go-live processes are:

- The imbalance netting process (IN) platform (called the International Grid Control Cooperation – IGCC) became the European imbalance netting platform on 24 June 2021.
- To optimise processes and costs, adaptations have been carried out in the first and second quarter of 2022 for the frequency restoration reserves with automatic activation (aFRR) platform (Platform for the International Coordination of Automated Frequency Restoration and Stable System Operation – PICASSO) and IN platforms (IGCC) for sharing the same IT tool.
- The settlement of KΔf, ACE and ramping period (FSkar) process – the new scheme for financial settlement of TSOs' unintended deviations, TSO-TSO ramps and frequency bias contribution of each TSO – went live on 1 June 2021.
- In the Nordic Synchronous Area, financial settlement of TSOs' unintended deviations had already been established before the introduction of the EB Regulation but is now formalised according to the EB Regulation provisions.

4 Explicit (capacity only) is provided where requested by NRAs, i.e. at the French-German and Croatian-Slovenian borders.

5 Twenty-two of these are operational with at least one border: Austria, Belgium, Bulgaria, Croatia, Czechia, Denmark, Estonia, Finland, France, Germany, Hungary, Latvia, Lithuania, Luxembourg, Norway, the Netherlands, Poland, Portugal, Romania, Slovenia, Spain and Sweden.

Regulatory achievements accomplished in 2021 are as follows:

- The implementation framework for the exchange of balancing energy from replacement reserves (RRIF) (Article 19 of the EB Regulation), submission of replacement reserves (RR), NRAs first amendment, and public consultation of second amendments were launched.
- The pricing methodology (Article 30 of EB Regulation) for establishing price limits for a transient period of 4 years at balancing processes was amended.
- All TSOs' public consultation on the proposed amendment of the frequency restoration reserves with manual activation (mFRR) international framework[6], aFRR international framework[7] and IN international framework[8] (Articles 20.1, 21.1 and 22.1 of EB Regulation) was launched in the final quarter of 2021.

6 Available from https://extranet.acer.europa.eu/en/Electricity/MARKET-CODES/ELECTRICITY-BALANCING/Pages/05-mFRR-IF.aspx.
7 Available from https://extranet.acer.europa.eu/en/Electricity/MARKET-CODES/ELECTRICITY-BALANCING/Pages/06-aFRR-IF.aspx.
8 Available from https://extranet.acer.europa.eu/en/Electricity/MARKET-CODES/ELECTRICITY-BALANCING/Pages/01-IN-IF.aspx.

1. Introduction

Every year, ENTSO-E monitors the progress of electricity markets[9]. This monitoring covers the different time periods for which electricity is traded, ranging from long-term to day-ahead markets and intraday to balancing markets.

The 2022 version of ENTSO-E's annual *Market Report* covers the period from June 2021 to May 2022. The report is formally submitted to the Agency for the Cooperation of Energy Regulators (ACER) and published on ENTSO-E's website after the reporting period.

Electricity markets from long-term to real-time

Electricity is a non-storable good which needs to be produced at the time in which it is to be consumed (in real time). Trading of electricity takes place before and after this point in time. **Figure 1** gives an overview of the current trading time frames of wholesale and balancing markets. Transmission system operators (TSOs) are establishing the basis for the efficient performance of European wholesale electricity markets across these time frames by offering the optimal level of transmission capacity.

Harmonised cross-border markets across all time frames lead to a more efficient European market overall, which will ultimately lead to benefits for all European customers.

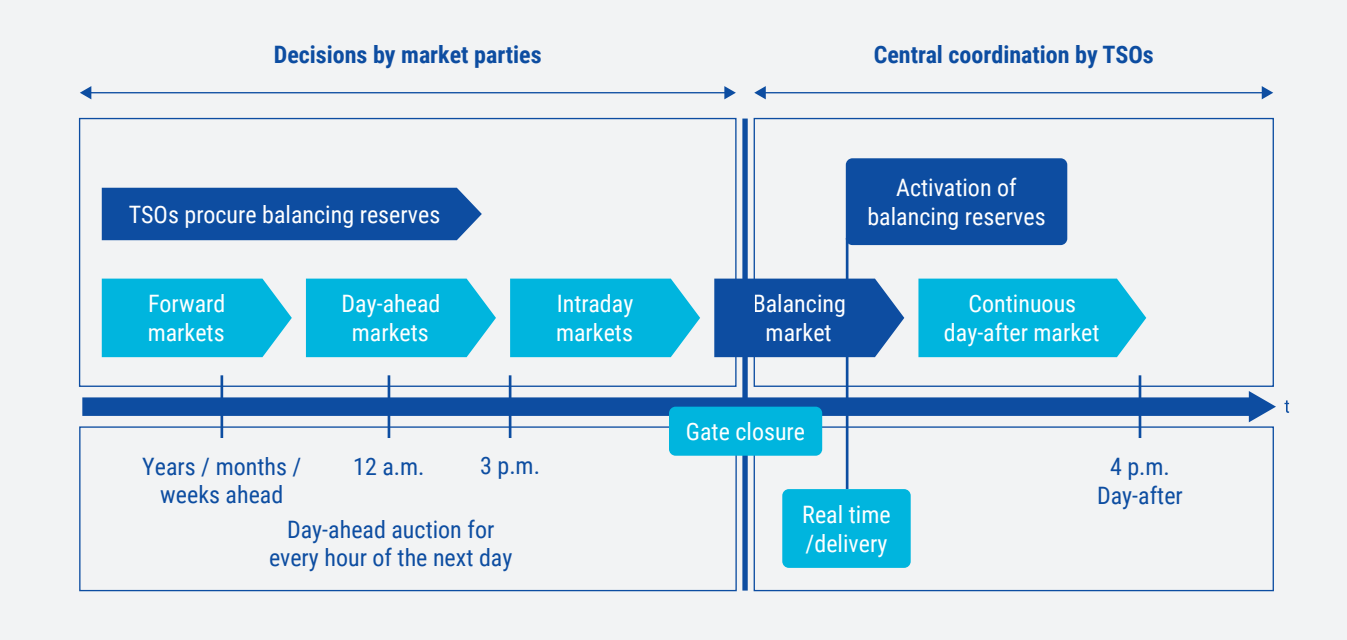


Figure 1 – Overview of different time frames of the wholesale and balancing markets

Long-term capacity calculation

Up to one year in advance of the actual delivery date, TSOs determine the appropriate level of **long-term transmission capacity** at the borders they are managing. Based on this assessment, long-term transmission rights (LTTRs) are allocated via explicit auctions by the single allocation entity joint allocation office (JAO)[10]. These LTTRs provide the right for cross-border electricity trading during the product period, for example a specific year or month. Calculating the appropriate level of long-term transmission capacity is a complex and challenging task given the high degree of uncertainty around

9 For legal references, please see the annex.

10 See www.jao.eu.

long lead times. TSOs must make assumptions and ensure that the allocated LTTRs can be guaranteed at all times of the product period. Risks such as potential outages of transmission lines and varying generation and load patterns must be considered in this context. Given these uncertainties, the long-term capacity calculation process greatly differs from capacity calculation processes that are closer to real-time, as more relevant information is available. The forward capacity allocation (FCA) regulation, which entered into force on 17 October 2016, sets out harmonised rules for the calculation and allocation of LTTRs, along with how transmission rights holders are compensated if their right is curtailed. The overarching goal is to promote the development of liquid and competitive forward markets in a coordinated way across Europe and to provide market participants with the ability to hedge their risk associated with cross-border electricity trading.

Short-term day-ahead and intraday capacity calculation

TSOs are able to perform more reliable forecasts of a grid's situation closer to the electricity's actual delivery date. The available electricity transmission capacity between bidding zones is determined by translating physical transmission constraints into commercial transaction constraints. These commercial transaction constraints are then considered in the market clearing algorithm, which determines market prices and cross-zonal exchanges between bidding zones. This action is performed one day prior to the delivery date, i.e. the **day-ahead capacity calculation and allocation**, and also continuously throughout the delivery date, i.e. **the intraday capacity calculation and allocation**. Congestions occurring after the market coupling process require redispatching measures, which are coordinated between all affected TSOs during real-time grid operation.

The rules set by the capacity allocation and congestion management (CACM) regulation provide the basis for implementing a single energy market across Europe in day-ahead and intraday time frames. They also establish the methods for allocating capacity in day-ahead and intraday time frames and outline how capacity will be calculated across the different zones.

Real-time balancing

Power generation and demand are subject to forecasting errors and technical disturbances. To balance deviations and maintain the network frequency within permissible limits, TSOs operate load frequency control processes. The energy activated in this process is called **balancing energy**. The procurement and settlement of balancing energy is organised in balancing markets. The Commission Regulation (EU) 2017/2195 of 23 November 2017 (Electricity Balancing [EB] Regulation)[11] establishes detailed rules for the implementation of these balancing energy markets in Europe which aim to foster effective competition, non-discrimination, transparency and balancing market integration. This will ultimately enhance the efficiency of the European balancing system as well as the security of supply.

Imbalance settlement aims to ensure efficient maintenance of the system balance by incentivising market participants to maintain, keep and restore their individual, and thereby ultimately the overall, system balance. In this sense, imbalance settlement constitutes a cornerstone to a fully and efficiently functioning internal energy market. To ensure fairness, objectivity and transparency within the mechanism, the EB Regulation sets out rules for the financial imbalance settlement that have to be implemented through terms and conditions for balance responsible parties (BRPs).

The EB Regulation lays down the guidelines for creating a balancing market in which countries can share their resources to ensure that generation equals demand at all times. The final goal of the EB Regulation is to integrate balancing markets and promote the possibilities for exchanges of balancing services while contributing to operational security.

The regulation lays down principles for the exchange of balancing energy and the associated settlement among TSOs and between TSOs and connected balancing service providers (BSPs), regarding the following set of products: frequency restoration reserves (FRR – both with automatic [aFRR] and manual activation [mFRR]), replacement reserves (RR), and a common methodology for the exchange and sharing of reserves and for the procurement of frequency containment reserves (FCR), although to a lesser extent.

Report structure

This report is mainly structured according to the time frames described earlier:

- **Chapter 2** provides insights on topics related to the European electricity market.
- **Chapter 3** introduces the progress of the electricity market across all time frames described previously.
- **Chapter 4** provides a detailed overview of the common European processes of long-term electricity trading and transmission capacities according to the FCA regulation.
- **Chapter 5** outlines the current situation in achieving a single European day-ahead and intraday coupling process according to the CACM regulation.
- **Chapter 6** provides an update on the harmonisation and integration of European balancing markets governed by the implementation of the EB Regulation.
- **The annex** includes additional information such as an explanation on how TSOs comply with the 70% minimum capacity target requirement per country.

11 *Commission Regulation (EU) 2017/2195 of 23 November 2017, establishing a guideline on electricity balancing* – https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017R2195&from=EN.

2. Improving the integration of the European electricity market

2.1. Updating regulations for short-term markets – TSOs' view on the CACM 2.0 process

On 22 January 2020, the European Commission issued a request to ACER to provide a recommendation for reasoned amendments of the CACM regulation. Based on this request, ACER published a recommendation for the revision of the CACM regulation in late 2021, called 'CACM 2.0'. It is expected that CACM 2.0 will enter into force after a public consultation and the comitology process in 2023.

The revision of the CACM regulation affects a broad range of topics such as capacity calculation and market coupling processes, bidding zone review, and monitoring obligations, and will have a major impact on the work of ENTSO-E and European TSOs. Therefore, ENTSO-E engaged intensively in the public debate on the revision of CACM 2.0 and published two CACM 2.0 Amendment Advocacy Reports on its website on 1 March 2022. One of the two reports addressed TSO-only topics[12], while the other report had been drafted in cooperation with the All NEMO [nominated electricity market operators] Committee[13].

The following main topics were addressed in relation to TSOs, while further details can be found in the dedicated advocacy report:

- The enforcement of the **70% minimum cross-zonal capacity (CZC) available for trade-up to the intraday** requires offering 'virtual capacity' to market participants with little to no time to perform remedial actions. Since TSOs are responsible for maintaining operational security, the minimum capacity requirement will in reality be offset to maintain operational security. TSOs call upon national regulatory authorities (NRAs), ACER and the European Commission to investigate alternative solutions which better balance market needs and system security.
- **The capacity calculation region (CCR) redefinition** introduced with amendments stems from ACER's anticipation that a future CCR determination assessment will induce a change in CCR set-up. It is fundamental that TSOs and their NRAs are able to assess and choose the most efficient CCR configuration on the basis of economic and governance-related criteria. Moreover, the concept of bidding zone borders in multiple CCRs must take into account the impact on the implementation of other guidelines, in particular the FCA regulation and System Operation Guideline.
- The distinction between **third-country flows** and EU flows in the implementation of the 70% target would lead to even more virtual capacity being offered. Hence TSOs strongly call for a reasonable approach to keep the status quo for the consideration of third countries in the EU processes, at least where local arrangements are already in place and/or initiatives exist to develop them.
- Applying **flow reliability margin instead of total reliability margin in CCRs applying the coordinated net transfer capacity (cNTC) approach** will be burdensome, might not bring additional benefits and would be unnecessary for those CCRs switching to flow-based. Therefore, TSOs support option 2, whereby cNTC CCRs assess this through a cost-benefit analysis.
- TSOs understand, in the context of the **bidding zones review**, the necessity for the new requirement in Article 33.3(d) for bidding zones to be able to meet the energy transition targets. However, the evaluation of cost efficiencies, in particular of investments, is the **responsibility of the NRAs**. Furthermore, the newly required flow decomposition analysis in Article 34.2(c) imposes a very rigid and potentially infeasible condition for the *Bidding Zone Technical Report*.

12 TSO CACM 2.0 report available from https://eepublicdownloads.azureedge.net/clean-documents/Network%20codes%20documents/NC%20CACM/2022/February_NC-ENTSOE_CACM_Amendment_advocacy_report_TSOs_only_part_light_version.pdf.

13 Joint NEMO-TSO CACM 2.0 report available from https://eepublicdownloads.azureedge.net/clean-documents/Network%20codes%20documents/NC%20CACM/2022/NC-ENTSOE_CACM_Amendment_advocacy_report_Joint_NEMO-TSOs_part_february_final.pdf.

Furthermore, NEMOs and ENTSO-E made a critical review of the proposal for the governance of the **market coupling operation (MCO)**, and make an alternative proposal that builds upon the proven successes of the current organisation and addresses its alleged shortcomings. ACER's proposal for the MCO organisation aims to answer **four shortcomings** it identified:

1. **slow implementation**
2. **difficult regulatory oversight and conflict of interest**
3. **risky operational security**
4. **possible absence of MCO services in a region.**

ACER proposes a solution in which all those tasks are dealt with by a **single legal entity**. A critical review of ACER's proposal shows that the **proposed measures do not address the identified issues**:

- Implementation delays due to escalations are a governance issue that can be dealt with **without the necessity to create new entities**.
- Implementation delays due to **lack of resources in the current decentralised organisation will not be solved by the creation of new entities**.
- **Improvements to the regulatory oversight are partial** in terms of costs and absent in terms of accountability.
- **Operational security is at risk** with entities created *ex nihilo* and whose expertise will take time to reach the required level.
- The **continuity of MCO services cannot be cost-effectively ensured** through the introduction of a regulated pan-European last-resort NEMO.

More generally, **ACER's proposal could raise costs on several fronts: transition, inefficiencies in operation and higher operational risks.** All TSOs and NEMOs'[14] proposal, on the contrary, builds upon the proven successes of the current organisation and addresses its alleged shortcomings:

- governance: **revised governance** comparable to ACER's proposal and yearly update of the work plan;
- regulatory oversight: **joint non-compliance assessment** by all NRAs;
- operational security: maintaining the **rotational MCO system** and dealing with local issues locally.

ACER's proposal for the revision of the MCO should be in line with legal principles such as **subsidiarity, proportionality, freedom to conduct a business and boundaries of implementing acts**.

2.2. Further evolution of long-term transmission rights

Since the occurrence of the decoupling event in the day-ahead time frame on 7 June 2019, TSOs seek to improve the remuneration of LTTRs in the event of decoupling in cooperation with policymakers and regulatory authorities. Since then, two additional partial decouplings have taken place (on 4 February 2020 and 13 January 2021), with a significant financial impact on TSOs and tariff payers. All in all, the additional costs for society came to approximately EUR 24 million.

TSOs understand that there is a need for a fairer approach to create a level playing field for all affected parties, and that the financial risk could be mitigated by an amendment of the FCA regulation.

In this line of reasoning, on 11 February 2021, ENTSO-E submitted a letter to the European Commission formally requesting amendment of the FCA regulation. In particular, ENTSO-E asked to address the 'Principles for long-term transmission rights remuneration' as governed by Article 35 of the FCA regulation. The TSOs explained the non-correlation between the remuneration of LTTRs holders and market fundamentals, highlighting that 'the cross-border capacity price determined under the explicit auction fallback and consequently the congestion rent collected by the TSOs diverges from the day-ahead market price differences.'

Based on follow-up discussions among the TSOs, the European Commission, ACER and NRAs, a workshop organised by TSOs took place on 23 April 2021. During the workshop, the parties discussed the remuneration issue and alternative fallback solutions that could improve the reference price for remuneration of LTTRs in the event of decoupling (i.e. intraday auctions).

In addition to the discussions, NRAs requested ENTSO-E to produce a written econometrics-based argumentation on whether there is a specific design flaw in the shadow auction mechanism. Therefore, TSOs requested a group of researchers from Ulm University to conduct an econometric

14 Nasdaq does not support the joint position.

study[15] to assess the question of whether the remuneration of LTTRs based on market spreads reduces incentives to allocate capacity in the shadow auctions and, thus, reduces its efficiency. The results[16] highlight two aspects that need to be changed: the fallback procedures and the price reference for remuneration of LTTRs in the event of decoupling.

In parallel, the European Commission informed the TSOs that the process for amending the FCA regulation will be launched in the near future. Therefore, TSOs have started some preparatory work for the upcoming debate on forward markets and long-term hedging opportunities including improvement of remuneration of LTTRs.

2.3. TSOs' view on the increase of electricity wholesale prices in the EU

Over the course of 2021 and early 2022, a sharp increase in wholesale electricity prices could be observed. The causes for this are based on market fundamentals and geopolitical factors. These factors are outside the TSOs' sphere of influence and TSOs are not actively engaging in electricity wholesale markets. Nevertheless, the high electricity prices also affect TSOs' activities such as balancing and procurement of transmission losses, which need to be reflected properly by grid tariffs.

Figure 2 – Evolution of monthly average day-ahead electricity wholesale prices from June 2021 to May 2022

15 Available from https://eepublicdownloads.entsoe.eu/clean-documents/Network%20codes%20documents/NC%20FCA/publications/SSRN-id3998735__4_.pdf.

16 Ibid.

ACER: market fundamentals and geopolitical factors driving wholesale electricity prices

In October 2021, the European Commission published *Tackling rising energy prices: A toolbox for action and support*[17] and asked ACER to conduct an assessment of the benefits and drawbacks of the current wholesale electricity market design. According to an in-depth analysis by ACER published in April 2022[18], the current energy crisis is a gas price shock, which has impacted the electricity wholesale markets. The initial strong increase in the second half of 2021 was mainly caused by soaring gas prices driven by global demand and supply dynamics for liquefied natural gas as a result of the global economic recovery from the COVID-19 pandemic. Furthermore, ACER identified several secondary factors: Europe's lower-than-average gas storage stocks, limited additional pipeline gas imports to the EU, rising Emissions Trading System (ETS) allowance prices, and particular weather patterns impacting Europe (in terms of both generation and demand). In 2022, Russia's invasion of Ukraine led to a further strong increase of wholesale gas and therefore electricity prices.

The integrated European electricity markets helped to mitigate the current crisis

Against this background, ACER assessed the implications for the design of the EU electricity market by taking a long-term perspective. As a starting point, ACER stated that the current market design is not the root cause of the current energy crisis. On the contrary, the current market design and its free interconnected markets led to significant welfare benefits for European consumers and ensured security of supply. **All in all, the monetary benefits of integrated electricity markets for Europe are estimated to be approximately EUR 34 billion per year**. ACER concludes that 'ill-designed emergency measures or distorting price signals by interfering in market price formation may roll back EU market integration and overall competition, thereby endangering the benefits achieved up until now and possibly increasing the overall cost of the energy transition up ahead'[19]. Massive investments in low-carbon generation and the integration of system-serving flexibility especially depend on adequate wholesale price signals.

Looking forward, ACER identified 13 measures for the consideration of policymakers, which are shown in **Figure 3**.

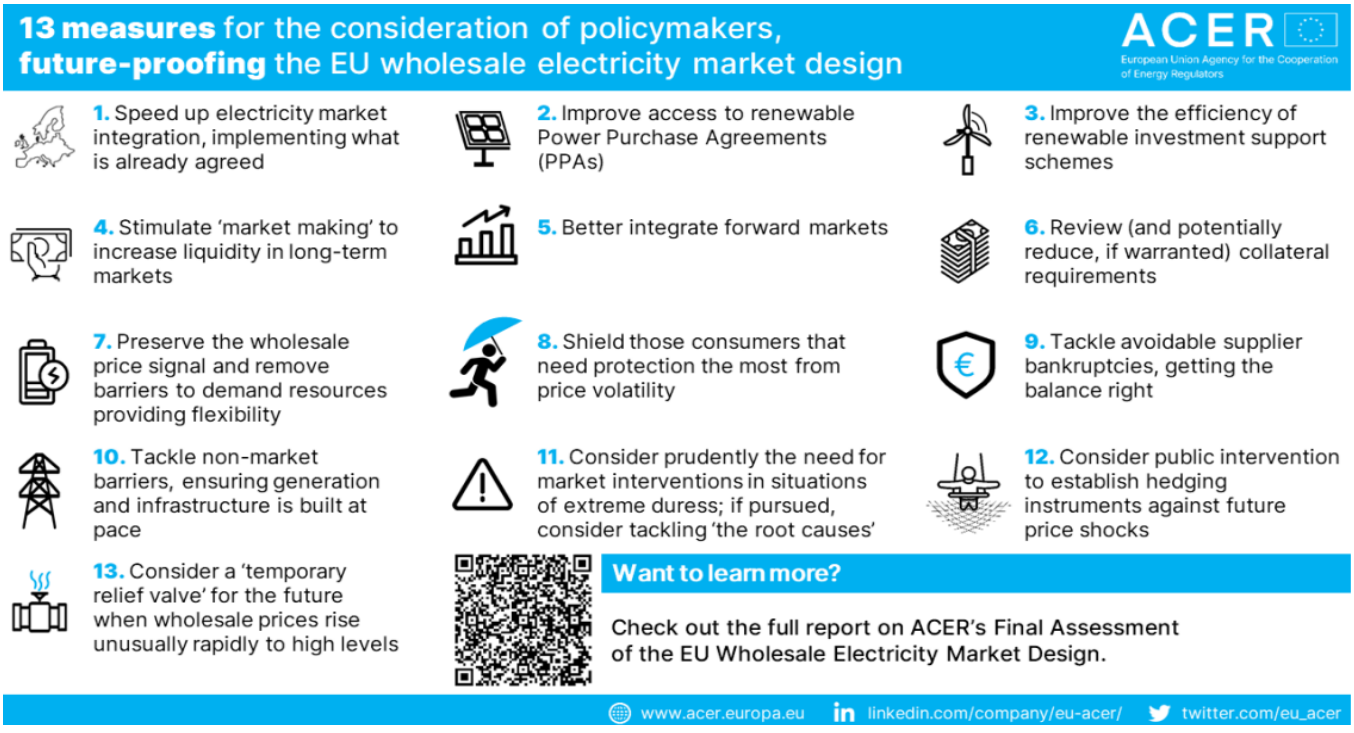


Figure 3 – Measures identified by ACER for the consideration of policymakers (source: ACER)

17 Tackling rising energy prices: A toolbox for action and support – https://ec.europa.eu/commission/presscorner/detail/en/FS_21_5213.

18 ACER's Final Assessment of the EU Wholesale Electricity Market Design: April 2022 – https://extranet.acer.europa.eu/Official_documents/Acts_of_the_Agency/Publication/ACER's%20Final%20Assessment%20of%20the%20EU%20Wholesale%20Electricity%20Market%20Design.pdf.

19 Ibid.

In conclusion: a well-functioning market delivers tremendous savings to the end consumer

ENTSO-E wishes to highlight that well-functioning electricity markets are essential for TSOs. Furthermore, the electricity grid infrastructure is one of the key enablers of the energy transition and of system integration. An interconnected, integrated and well-functioning European electricity market ensures use of the most efficient resources and is key to ensuring security of supply at the lowest cost to consumers. The advanced level of the grid interconnection and market integration achieved in most parts of Europe has mitigated the negative effects of the scale of increase in electricity prices. The integration of long-term, day-ahead, intraday and balancing markets is already delivering tremendous savings to end consumers year on year.

In conclusion, TSOs support undistorted wholesale price formation, which is key to the functioning of the internal electricity market and security of supply. It is essential the European Commission, Member States and NRAs support the further reinforcement of the electricity transmission grid as the backbone of a future climate-neutral energy system, with particular attention to strengthening interconnection levels with peripherical regions. TSOs are highly committed to further integrating European electricity markets and pursuing the goal of building one single European market for electricity at the lowest cost to consumers. We are happy to present our latest activities in this report.

2.4. Implementation of the CEP70 provisions

The CEP entered into force on 4 July 2019. As one of the main provisions of Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity (EU Electricity Regulation), from 1 January 2020, at least 70% of the transmission capacity of internal and cross-zonal critical network elements (CNEs) must be made available for cross-zonal electricity trading of borders that use a flow-based approach, with 70% of the transmission capacity respecting operational security limits after deductions of contingencies set for trading of borders that use a cNTC approach (Article 16(8)). The inclusion of 'derogations'[20] and 'action plans'[21] in the EU Electricity Regulation provides temporary exemptions, which can be applied to achieve the 70% (CEP70) target via a transitionary phase. During the legislative process, ENTSO-E raised concerns as to whether a general minimum cross-zonal trading margin would be an appropriate instrument to enhance European market integration. While ENTSO-E fully supports the general optimisation of the use of trading capacities, the economic and technical impact of the CEP70 target needs further analysis and discussion. Such an assessment should particularly focus on system security, economic efficiency and decarbonisation targets. Nevertheless, TSOs and ENTSO-E continue to invest significant efforts and apply the appropriate tools to implement the existing CEP70 provisions and achieve compliance with the legal provisions, while also accommodating fallback options to ensure system security at all times.

According to the EU Electricity Regulation, the NRAs are responsible for assessing TSOs' compliance with the CEP70 provisions. This report provides an overview of the national assessments for external stakeholders. The main findings can be found in this chapter. Additionally, the annex provides detailed country-by-country assessments including explanations of the respective monitoring methodologies.

CEP70: the situation in 2021

Table 1 presents the status of CEP70 provisions from 2021. As a central performance indicator for TSOs, the share of market time units (MTUs) where the minimum capacity is reached (considering action plans or derogations) is shown. The underlying methodological assumptions for these figures can be found in Table 2. Acknowledging that NRAs are responsible for assessing TSOs' compliance with the CEP70 provisions, a reference to the NRA report is provided when applicable. Where an NRA has not made an official decision or an NRA's decision has not been published at the time of publication of this report, it is referred to as "N/A" (not applicable).

Table 1 and Table 2 provide an overview; further information and detailed graphs of the analysis performed by TSOs can be found in section 1.2 of the annex of this report. Due to the large amount of supporting information provided by TSOs, this is also provided in the annex.

20 Option to deviate from the minimum cross-zonal capacity target for a predefined period of time. In 2021, this was applied by Austria, Belgium, Bulgaria, Croatia, Czechia, France (only for SWE border), Greece, Hungary, Italy, Netherlands, Poland, Portugal, Slovakia, Spain and Sweden.

21 Option to achieve the 70% minimum cross-zonal trading capacity via a linear trajectory by 31 December 2025 in the event of internal structural congestions. In 2021, this was applied by Austria, the Netherlands, Germany and Poland.

Country	TSO	Border / region	% of MTUs in which minimum target was reached (considering action plans and/or derogations)[22]	Compliance decision by relevant NRA	Exemption clause applied
AT	APG	CWE (AT<>DE)	99.99%[23]	Pending	Derogation and action plan
		cNTC (AT<>CZ/HU/SI)	99.92%	Pending	
		Italy North (AT<>IT)	100%	Pending	
BE	Elia	CWE	62.2%	During 62.2% of MTUs and on 99.2% of all CNECs the minimum target is reached. Link to report	Derogation
		ALEGrO	92.5%	During 92.5% of MTUs full capacity has been provided. Remaining 7.5% of MTUs mostly represent outages. Link to report	-
BG	ESO	SEE BG-<>GR	100%	Compliant but NRA appreciation	Derogation[24]
		SEE BG-<>RO			
CZ	ČEPS	CZ->(AT + DE + PL + SK)	91.5%	N/A	Derogation[25]
		(AT + DE + PL + SK)->CZ	97.0%		

22 The underlying assumptions can be found in Table 2. Please note that the assessment of compliance is complex and therefore considers much more than the calculation of percentages of MTUs in which targets where reached. TSOs can be compliant with the CEP70 provisions, even if they did not reach the minimum target in all hours.

23 In line with the method of the Austrian NRA, each relevant critical network element and contingency (CNEC) of a border/coordination area is assigned (under consideration of the granted derogations) with a compliance value, depending on its margin available for cross-zonal trade (MACZT). The percentage listed in the table is the compliance level of a coordination area, based on the performance of all relevant CNECs of the area. This is applicable for all three Austrian Power Grid AG (APG) coordination areas in the table.

24 Without a minimum capacity.

25 Derogation: reach 60% threshold in at least 90% of MTUs that are not considered a special operational state, for which no minimum capacity applies.

Country	TSO	Border / region	% of MTUs in which minimum target was reached (considering action plans and/or derogations)[22]	Compliance decision by relevant NRA	Exemption clause applied
DE	Amprion	CWE	100%	Compliant Link to report	Action plan
		ALEGrO (CWE)	100%		
	Transnet-BW	CWE	100%		
	50Hertz	DK2<>DE	100%		
	50Hertz/ TenneT	DE<>PL/CZ	100%		
	TenneT	DE->SE4	99%		
		SE4->DE	100%		
		DE<>DK1	100%		
		DE<>NO2	100%		
		CWE	100%		
DK	Energinet	DK1->DE	80.9%	N/A	-
		DK1<-DE	80.6%		
		DK1<>NL	99%		
		DK1->NO2	98%		
		DK1<-NO2	100%		
		DK1->SE3	95%		
		DK1<-SE3	88%		
		DK1->DK2	99%		
		DK2->DK1	100%		
		DK2<>DE	100%		
		DK2->SE4	98.5%		
		DK2<-SE4	98.2%		
EE	Elering	EE<>FI	N/A	N/A	-
		LV<>EE			

Country	TSO	Border / region	% of MTUs in which minimum target was reached (considering action plans and/or derogations)[22]	Compliance decision by relevant NRA	Exemption clause applied
EL	IPTO	GR<>BG	100%	Compliant – pending decision by NRA	Derogation (for GR<>BG border)
		GR<>IT	100%	Compliant	-
ES	REE	FR<>ES	100%	N/A	Derogation
		PT<>ES	100%	N/A	Derogation
FI	Fingrid	FI<>SE1	100%	100%	-
		FI<>SE3	100%	100%	
		FI<>EE	100%	100%	
FR	RTE	CWE	85.7%	NRA appreciation	-
		SWE (ES-<>FR)	100%		Derogation[26]
		IN	98.2%		-
HR	HOPS	HR<>SI	100%	Compliant but NRA appreciation	Derogation
		HR<>HU			
HU	MAVIR	AT–HU	75.5%	N/A	Derogation[27]
		HR–HU	72%		
		RO<>HU	100%		
		SK–HU	100%		
		HU–AT	100%		
		HU–HR	100%		
		HU–SK	100%		
IE	Eirgrid	No information provided			

26 Minimum threshold from derogation: for more than 80% of MTU, the French element was above 70% MACZT. The MTU with no French limiting element are deemed compliant. The MTU with price convergence are deemed compliant.

27 Derogation in 2021 with respect to all EU bidding zone borders (HU–HR, HU–AT, HU–RO, HU–SK, future HU–SI), until the introduction of a coordinated flow-based capacity calculation methodology (CCM) in accordance with the CACM regulation. No minimum capacity level in 2021.

Country	TSO	Border / region	% of MTUs in which minimum target was reached (considering action plans and/or derogations)[22]	Compliance decision by relevant NRA	Exemption clause applied
IT	Terna	IN	89%	Pending	Derogation
		GR<>IT	100%	Pending	-
LT	Litgrid	LT<>SE4	100%	N/A	-
		LT<>PL	100%		
		LT<>LV	N/A		
LV	AST	LV<>LT	N/A	N/A	-
		LV<>EE	N/A		
NL	TenneT BV	CWE	45.4%	Pending Link to report	Action plan and derogation
		NL--<>DK1	100%		-
		NL--<>NO2	100%		-
NO	Statnett	No information provided			
PL	PSE	CZ–DE–SK->PL	100%	Pending	Action plan and derogation
		PL->CZ–DE–SK– PL	100%	Pending	
		PL<>LT	100%	Pending	Action plan
		PL<>SE4	100%	Pending	Action plan
PT	REN	PT<>ES	100%	Pending	Derogation[28]
RO	Transe-lectrica	Import	65%	Pending	Action plan
		Export	85%	Pending	

28 According to the PT derogation, REN will offer, as a result of the capacity calculation process, at least the minimum levels of capacity in accordance with Article 16(8)(a) of the EU Electricity Regulation during 70% of the hours in which the one-year derogation applies, considering the criteria agreed with the NRA.

Country	TSO	Border / region	% of MTUs in which minimum target was reached (considering action plans and/or derogations)[22]	Compliance decision by relevant NRA	Exemption clause applied
SE	Svenska kraftnät	SE4<>DK2	100%	N/A	Derogation[29]
		SE1>FI	94%		-
		FI>SE1	92%		-
		SE3<>FI	N/A		-
		SE3<>DK1	100%		Derogation[29]
		SE1<>SE2	N/A		-
		SE2<>SE3	N/A		-
		SE3<>SE4	N/A		-
		SE4<>PL	100%		Derogation[29]
		SE4<>LT	100%		Derogation[29]
		SE4<>DE	100%		Derogation[29]
SI	ELES	IN	100%	N/A	-
		SI<>AT	100%		
		SI<>HR	100%		
SK	SEPS	SK>(CZ + PL + HU)	82%	N/A	Derogation
		(CZ + PL + HU)>SK	95%	N/A	Derogation

CWE = Central Western Europe, ALEGrO = Aachen – Liège Electricity Grid Overlay, ESO = ESO Bulgaria, SEE = South East Europe, HOPS = Croatian Transmission System Operator, RTE = Réseau de Transport d'Électricité, SWE = South West Europe, IPTO = Independent Power Transmission Operator SA, MAVIR = Magyar Villamosenergia-ipari Átviteli Rendszerirányító Zártkörűen Működő Részvénytársaság, AST = AS Augstsprieguma tikls, PSE = Polskie Sieci Elektroenergetyczne, SEPS = Slovenská elektrizačná prenosová sústava, a.s., ELES = Elektro-Slovenija, REE = Red Eléctrica de España.

Table 1 – TSOs' performance regarding the CEP70 provisions from 2021

29 No minimum capacity level in 2021.

Country	TSO	Border / region	Grid elements considered	Third countries considered	Hours considered	Time frames considered
AT	APG	CWE (AT<>DE)	All AT CNECs of the final flow-based domain except virtual ones	Yes	All hours in the time frame 28.07.21 – 31.12.21 (time frame not covered by the general derogation), except 26 hours with spanning or DFP	Day-ahead
		cNTC (AT<>CZ/HU/SI)	All limiting AT CNECs	Yes	All hours in the time frame 01.07.21 – 31.12.21 (time frame not covered by the general derogation), except 34 hours with tool failure where only one direction was calculated	Day-ahead
		Italy North (AT<>IT)	All limiting AT CNECs	Yes	All hours in the time frame 29.10.21-31.12.21 (time frame not covered by the general derogation), except 123 hours with tool failure	Day-ahead
BE	Elia	CWE	All CNECs considered, where the least-performing CNEC per MTU defines the % of MACZT target reached	Yes	All except 53 hours that resulted into DFPs, plus 48 hours where no target could be calculated due to local tooling issue (fallback applied: 20% RAM for CWE)	Day-ahead
		ALEGrO	Only ALEGrO	N/A	All hours	Day-ahead
BG	ESO	SEE BG<>GR	All limiting CNECs, with respect to concluded agreements with neighbouring countries (Serbia, North Macedonia and Turkey) – see annex	Yes, the results take into consideration the long-term available capacities on the given borders and on operational experience with neighbouring non-EU countries (TR, NMK, RS) – see annex	All hours, please refer to the explanations in the annex	Long-term and day-ahead
		SEE BG<>RO				

Country	TSO	Border / region	Grid elements considered	Third countries considered	Hours considered	Time frames considered
CZ	ČEPS	CZ->(AT + DE + PL + SK)	Only cross-border CNEs and CNECs	No	6 080 MTUs were taken into account according to the derogation	Day-ahead
		(AT + DE + PL + SK)->CZ				
DE	Amprion	CWE	All CNEs (most critical contingency is determining the trading margin of the CNE per MTU)	Yes	All hours except 62 MTUs in which spanning or DFPs have been applied	Day-ahead
		ALEGrO (CWE)	Only ALEGrO	No	All hours	
	50Hertz	DK2<>DE	NTC (relative to Fmax)	No	All hours	
	50Hertz/ TenneT	DE<>PL/CZ	All limiting CNECs are provided	Yes	All hours	
	Transnet-BW	CWE	all CNEs (most critical contingency is determining the trading margin of the CNE per MTU)	Yes	All hours except 62 MTUs in which spanning or DFPs have been applied	
	TenneT TSO GmbH	DE<>SE4	NTC (relative to Fmax)	Yes	All 8 654 hours of operation	
		DE<>DK1	All limiting CNEC	Yes	All 8 736 hours without failure of capacity calculation	
		DE<>NO2	All limiting CNEC	Yes	All 8 736 hours without failure of capacity calculation	
		CWE	All CNEs (most critical contingency is determining the trading margin of the CNE per MTU)	Yes	All 8 698 hours without failure of capacity calculation	

Country	TSO	Border / region	Grid elements considered	Third countries considered	Hours considered	Time frames considered
DK	Energinet	DK1<>DE	All limiting CNECs	Yes	All hours	Day-ahead
		DK1<>NL		Yes		
		DK1<>NO2		No		
		DK1<>SE3		No		
		DK1<>DK2		No		
		DK2<>DE		No		
		DK2<>SE4		No		
EE	Elering	EE<>FI	([30])	N/A	N/A	Day-ahead
		LV<>EE				
EL	IPTO	BG<>GR	All limited CNECs provided	no	All hours with the tie line BG–GR in operation	Day-ahead
		IT<>GR	-	yes	All hours with the tie line IT–GR in operation	
ES	REE	FR<>ES	All limiting CNECs	No	All hours when the limiting CNEC is identified	Day-ahead
		PT<>ES				
FI	Fingrid	FI <> SE1	All CNECs	N/A	All hours	Day-ahead
		FI<>SE3				
		FI<>EE				
FR	RTE	CWE	All CNECs for relative trading margin graph (annex). For compliance only limiting CNECs (CEP70 situation – Table 1)	Yes	All hours for relative trading margin graph (Annex). For compliance only hours without price convergence (CEP70 situation – Table 1)	Day-ahead
		SWE (ES-<>FR)		Yes (but no non-EU country in SWE CGM)		
		IN		Yes		

30 No. According to the approved CACM CCM of the Baltic CCR, the capacity calculation process doesn't foresee a daily capacity calculation process with CGM and therefore CNEs cannot be efficiently identified and data related to CNEs cannot be provided.

Country	TSO	Border / region	Grid elements considered	Third countries considered	Hours considered	Time frames considered
HR	HOPS	HR<>SI	All limiting CNECs	Yes	All hours	Day-ahead
		HR<>HU				
HU	MAVIR	AT<>HU	The CNECs considered relevant during the capacity calculation were chosen	Yes	Yes	Day-ahead
		HR<>HU				
		RO<>HU				
		SK<>HU				
IE	Eirgrid	No information provided				
IT	Terna	IN	All CNEs	Yes	All hours	All except long-term
		GR<>IT	N/A	N/A		
LT	Litgrid	LT<>SE4	No CNECs	No	All hours	Day-ahead
		LT<>PL	No CNECs	No	All hours	
		LT<>LV	([31])	N/A	N/A	
LV	AST	LV<>LT	([31])	N/A	N/A	Day-ahead
		LV<>EE				
NL	TenneT TSO B.V.	CWE	All CNECs considered. Least-performing CNEC sets the MACZT compliance	Yes	All hours except 62 MTUs in which spanning or DFPs have been applied	Day-ahead
		NL--<>DK1	Only DC link considered	Yes	All hours	Day-ahead
		NL--<>NO2				
NO	Statnett	No information provided				
PL	PSE	CZ–DE–SK -> PL	All limiting CNECs	Yes	All hours	Day-ahead
		PL -> CZ–DE–SK–PL	All limiting CNECs	Yes	All hours	Day-ahead
		PL<>LT	Monitoring NTC provided on the DC link	N/A	All hours	Day-ahead
		PL<>SE4				

31 According to the approved CACM CCM of the Baltic CCR, the capacity calculation process does not foresee a daily capacity calculation process with a CGM, and therefore CNEs cannot be efficiently identified and data related to CNEs cannot be provided.

Country	TSO	Border / region	Grid elements considered	Third countries considered	Hours considered	Time frames considered
PT	REN	PT<>ES	All limiting CNECs	No	All hours when the limiting element is identified	Day-ahead
RO	Transe-lectrica	Import	All limiting CNECs	Yes	All hours for 2021 in which positive MACZT values are considered for relative trading margin	Day-ahead
		Export				
SE	Svenska kraftnät	SE4<>DK2	All limiting CNECs	Yes	All hours	Day-ahead
		SE1<>FI				
		SE3<>FI				
		SE3<>DK1				
		SE1<>SE2				
		SE2<>SE3				
		SE3<>SE4				
		SE4<>PL				
		SE4<>LT				
		SE4<>DE				
SI	ELES	IN	All relevant CNECs	Yes	All hours	Day-ahead
		SI<>AT		No		
		SI<>HR		No		
SK	SEPS	SK<>(CZ + PL + HU)	All limiting CNECs	Yes	All hours	Day-ahead

CCM = capacity calculation methodology, CGM = Common Grid Model, DFP = default flow-based parameter, Fmax = maximum allowable power flow, NTC = net transfer capacity, RAM = remaining available margin.

Table 2 – Underlying assumptions

Virtual capacities will not always lead to more economic efficiency

Virtual cross-zonal trading capacities do not create economic welfare gains under all circumstances and can in many cases – due to the corresponding increase in costs for remedial actions – even reduce economic efficiency.

Sufficient cross-zonal transmission capacities are a crucial prerequisite for adhering to the policy objective of avoiding undue discrimination between internal and cross-zonal exchanges, and for achieving price convergence[32]. Furthermore, higher price convergence is a desirable result of an enhanced market integration. Yet, 'simply' providing market participants with additional trading capacity via virtual capacity does not necessarily increase welfare. Additional capacity only provides added value in times where the market 'asks' for more trading possibilities. Or in other words: if prices are equal in all bidding zones, the provision of additional CZC will not create welfare – because the offered trading capacity already fully satisfies market demand (and is therefore not limited by congestions). Meanwhile, in the opposite case, if prices differ among bidding zones, additional capacity will create more trading possibilities and can lead to a welfare increase. However, the benefit of the increased offered capacity should always be assessed against the corresponding increase of the overall costs for remedial actions required to ensure system security.

In recent years, electricity markets have become fully interconnected and their performance has greatly improved. TSOs, in cooperation with all stakeholders, are continuously working to ensure the optimal use of transmission infrastructure and market functioning while maintaining the highest system security. Transmission investments and improved coordination are resulting in continuously increasing availability of CZCs and price convergence in Europe.

Yet, the CEP70 provisions and its assessment by European authorities do not recognise that more CZC during hours with price convergence will not benefit consumers. TSOs are therefore of the opinion that the European electricity market performs better than many stakeholders believe and advise policymakers to reassess the economic efficiency of the CEP70 provisions.

Deep-dive of CACM 2.0: expansion of 70% to intraday time frame

The ACER recommendation on the revision of the CACM regulation –CACM 2.0[33]– foresees the application of the CEP70 provisions to the intraday time frame.

TSOs understand the increasing importance of the cross-zonal intraday market for the integration of fluctuating renewable generation into the European system. Therefore, sufficient cross-zonal intraday capacities are a key prerequisite for the efficient integration of European electricity markets. In contrast, the current market design fosters low capacities in the intraday time frame since the priority is given to the day-ahead market. Nevertheless, assumptions concerning the day-ahead market cannot be simply transferred to the intraday market.

If the available physical capacity is lower than the required minimum capacity for cross-zonal trading, TSOs have to offer 'virtual capacity' to comply with the CEP70 provisions. With virtual capacity in day-ahead, the market may clear where costly remedial actions are needed. The congestions will be alleviated thanks to a coordinated security analysis (regional operational security coordination), but no additional margin will be created since a cost-minimisation objective is applied. This procedure is applied in the day-ahead time frame on a regular basis, where sufficient lead times for system security analyses and the coordination of remedial actions exist.

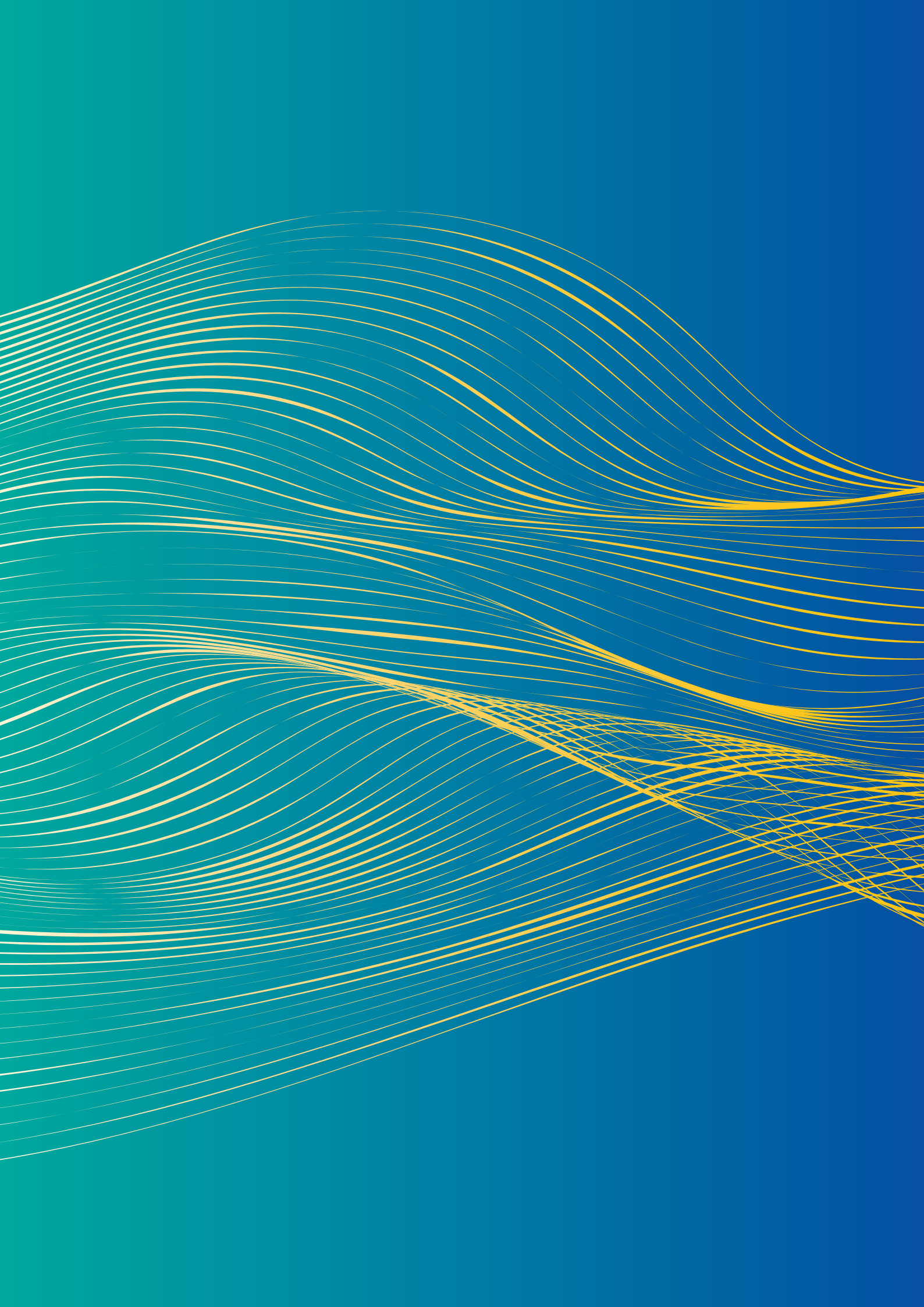
In contrast, the intraday time frame has completely different characteristics and the application of virtual capacity would lead to severe problems. Firstly, the availability of remedial actions is much lower due to the lead times of power plants close to real-time. Secondly, TSOs would be forced to validate cross-zonal intraday capacities up to one hour before real-time. This would leave TSOs no chance to coordinate and activate the application of remedial actions to ensure system security.

Therefore, the idea of applying the CEP70 provisions by virtual capacities to the intraday time frame is a threat to operational security. The identified issue of too low intraday capacities should be better addressed by an adjustment of the overall market design than by relying on a reconfiguration of bidding zones as a silver bullet solution. A reconfiguration of bidding zones may reduce the role of virtual capacity, yet there is no proof that a zonal model can guarantee 70% in intraday without the use of virtual capacity. Moreover, it needs to be emphasised that a reconfiguration of bidding zones cannot be enforced, and the final say remains with Member States.

A more flexible approach and less risky process are needed. TSOs are ready to collaborate with NRAs, ACER, the European Commission and stakeholders to investigate sustainable solutions which better balance market and system needs. Solutions such as an advanced zonal model (allowing the gap to be closed between markets and physics by integrating remedial actions into the allocation) or sharing the 70% target between the day-ahead and intraday time frame could be explored further.

32 Price convergence describes the same price level in multiple or all bidding zones.

33 For details, see section 2.1.



3. Implementation progress of the FCA and CACM regulations and the EB Regulation

3.1. FCA regulation

The FCA regulation, which entered into force on 17 October 2016, sets out rules for the type of LTTRs that can be allocated via explicit auction, and the way in which holders of transmission rights are compensated if their right is curtailed. **Table 3** outlines the implementation progress of this regulation.

	Proposal	FCA regulation article(s)	First submission	NRAs request for amendments	TSO submission after request for amendment	NRAs approval or ACER decision	Second TSO proposal	ACER decision
All-TSOs	CGM	17[34] 18[35]	May 2017 June 2017	February 2018	May 2018	October 2017 June 2018		
All-TSOs	Harmonised Allocation Rules (HAR)[36]	51	April 2017			August 2017[37] October 2017[38] October 2017[39]	July 2019	October 2019[40] October 2019[41]
All-TSOs	Single allocation platform (SAP)	49 59	April 2017			September 2017		
All-TSOs	Congestion income distribution (CID)	57	May 2018	November 2018	March 2019	May 2019		

34 Generation and load data provision methodology for long-term time frames.
35 CGM methodology for long-term time frames.
36 As part of the biennial review of the HAR, all TSOs submitted a third TSO proposal in June 2021, and ACER made a decision (No. 15/2021) in November 2021, approving a new HAR methodology.
37 On 17 August 2017, all NRAs requested ACER to adopt a decision.
38 On 2 October 2017, ACER adopted a decision (No. 03/2017).
39 HAR 2017 approved methodology.
40 On 29 October 2019, ACER adopted a decision (No. 14/2019).
41 HAR 2019 approved methodology.

Proposal	FCA regulation article(s)	First submission	NRAs request for amendments	TSO submission after request for amendment	NRAs approval or ACER decision	Second TSO proposal	ACER decision
Cost of ensuring firmness and remuneration of LTTRs (FRC)	61	April 2020			October 2020[42] October 2020[43]		October 2021[44] October 2021[45]

Table 3 – Overview of all-TSOs FCA regulation deliverables (as at May 2022)

Long-term flow-based allocation assessment

ACER has requested ENTSO-E to submit a proposal for amendment of the following FCA methodologies to enable the long-term flow-based allocation (LTFBA): HAR (Article 51 of the FCA regulation), the SAP requirements (Article 49 of the FCA regulation), the CID methodology (Article 57 of the FCA regulation) and the methodology for ensuring firmness and remuneration of long-term transmission rights (Article 61 of the FCA regulation). TSOs built a high-level market design overview in the last quarter of 2021 to initiate the first discussions with ACER. Based on that, ACER led a workshop with stakeholders[46] on 27 January 2022. This work is performed in parallel to the implementation of the long-term CCMs for the Nordic and Core CCR.

Market participants will be involved in the process in the form of public consultations and workshops during the second quarter of 2022.

Harmonised Allocation Rules methodology (Articles 51 and 52, FCA regulation)

On 29 November, ACER published a decision[47] to approve the amendment of the HAR proposed by all TSOs on the 24 June 2021, following the 2-yearly review of the methodology.

The amendments included minor adjustments in response to the need to update some operational aspects (i.e. new communication channels, acceptance of qualified electronic signature, clarification on VAT requirements, addition of electronically signed bank guarantees, etc.). Moreover, the methodology was adapted to take into account some procedural needs resulting from the experience of allocating LTTRs (i.e. deletion of submission of bids with the same bid price, application of sanctions, etc.).

In the TSOs' initial proposal, a cap was introduced to limit the effect on remuneration of LTTRs in the event of decoupling. ACER has recognised the issue raised by the TSOs but was not able to accept this amendment as it was assessed as non-compliant with the current version of the FCA regulation such that in the event of a fallback allocation for implicit allocation, the TSOs' proposal would not be based on market spread and thus would not ensure that LTTR holders are remunerated in accordance with Article 35 of the FCA regulation. ACER and the TSOs intend to follow up on this matter in the future and engage actively in discussions on the functioning of fallback mechanisms and on the principles of remunerating LTTRs. This applies to a future amendment of the FCA regulation in particular.

Following ACER's request, TSOs will amend the HAR over the course of the 2023 2-yearly review to enable LTFBA.

42 On 23 October 2020, ACER adopted a decision (No. 25/2020).
43 FCA FRC 2020 approved methodology.
44 On 4 October 2021, ACER adopted a decision (No. 12/2021).
45 FCA FRC 2021 approved methodology.
46 Available from www.youtube.com/watch?v=GieKnymWHRQ.
47 *Decision No. 15/2021 of 29 November 2021 on the TSOs' proposal for amendment of the harmonised allocation rules for long-term transmission rights* – https://eepublicdownloads.entsoe.eu/clean-documents/nc-tasks/HAR%20ACERs%20decision%20final%20approval%202021.pdf.

3.2. CACM regulation

The rules set by the CACM regulation provide the basis for implementing a single energy market across Europe in day-ahead and intraday time frames. The following tables show the implementation progress of this regulation:

Type	Proposal	CACM regulation article	First submission	NRAs approval(s) or ACER decision	First TSOs request for amend-ment	NRAs approval(s) or ACER decision	Second TSOs request for amend-ment	Second NRAs approval(s) or ACER decision	Third TSOs request for amend-ment	ACER decision
All-TSOs (I)	CCRs	15(1)	October 2015	November 2016[48]	June 2017[49]	September 2017	March 2018[50]	April 2019[51]	November 2020[52]	May 2021

Table 4 – Regulatory process of the proposal for the determination of CCRs

Type	Proposal	CACM regulation article	First submission	NRAs request for amendment	First submission after the request for amendment	NRAs approval(s) or ACER decision	Second TSOs request for amendment	ACER decision
All-TSOs (II)	CGM	16 17	May 2016	December 2016	March 2017	May 2017		
	Intraday cross-zonal gate clos-ing time (GCT)	59	December 2016	June 2017	August 2017	April 2018[53]		

48 Referral to ACER from all NRAs.

49 All TSOs drafted an amendment to Annex I of the CCRs established by ACER Decision No. 06/2016 (the draft CCR Amendment Proposal) to include the bidding zone border between Belgium and Great Britain (BE–GB) and to assign this new bidding zone border to the Channel CCR by 17 January 2018. The CCR amendment proposal was adopted upon the decision of the last regulatory authority concerned (14 February 2018).

50 All TSOs drafted an amendment to include the new bidding zone border DK1–NL and its corresponding TSOs to the Hansa CCR, add the TSOs National Grid IFA2 Limited and ElecLink Limited to the FR–GB bidding zone border in the Channel CCR, and add the TSO Amprion to the BE–DE/LU bidding zone border in the Core CCR.

51 Referral to ACER from all NRAs.

52 The General Court annulled the ACER Board of Appeal's Decision A-001-2017 (in the cases T-332/17 and T-333/17). Despite the annulment of the ACER BoA Decision, ACER Decision 06/2016 was not annulled. On 22 May 2020, a decision was issued inviting the competent party or parties to review the concerned proposal. On 5 June 2020, ACER requested all TSOs to prepare an updated CCRs proposal.

53 Referral to ACER from all NRAs.

Type	Proposal	CACM regulation article	First submission	NRAs request for amendment	First submission after the request for amendment	NRAs approval(s) or ACER decision	Second TSOs request for amendment	ACER decision
All-TSOs (II)	Scheduled exchange	43 56	February 2018[54] February 2018	September 2018[33,34]	December 2018[55] December 2018[56]	February 2019[57] February 2019[58]		
	Intraday CZC pricing	55(3)	August 2017	Referred to ACER		January 2019		
	CID	73	June 2016	January 2017	April 2017	December 2017[59]	July 2021	December 2021 December 2021

Table 5 – Overview of all-TSOs CACM regulation deliverables (as at May 2022)

Type	Proposal	CACM regulation article	First submission	NRAs request for amendment	First submission after the request for amendment	NRAs approval(s) or ACER decision	Second TSOs request for amendment	ACER decision
TSOs and all-NEMOs	Day-ahead and intraday algorithm	37	February 2017[60]	July 2017	November 2017	July 2018[61]	August 2019	January 2020
	Max./min. price	41 54	February 2017	Referred to ACER		November 2017 November 2017 November 2017 November 2017		

Table 6 – Overview of all-TSOs and all-NEMOs CACM regulation deliverables (as at May 2022)

54 Only the TSOs submitted day-ahead and intraday proposals, intending to calculate scheduled exchanges.
55 Day-ahead proposal.
56 Intraday proposal.
57 Day-ahead costs coefficients – 2021 update.
58 Intraday costs coefficients – 2021 update.
59 Referral to ACER from all NRAs.
60 Day-ahead and intraday requirements as annexes.
61 Referral to ACER from all NRAs.

Type	Proposal	CACM regulation article	First submission	NRAs request for amendment	First submission after the request for amendment	NRAs approval(s) or ACER decision	Second request for amendment	ACER decision
All-NEMO	Plan of the MCO	7(3)	April 2016	September 2016	December 2016	June 2017		
	Back-up methodology	36	February 2017	July 2017	November 2017	January 2018		
	Products accommodated	40 53(4)	February 2017	July 2017 July 2017	November 2017 November 2017	January 2018 January 2018	June 2020[62] August 2019	December 2020[63] December 2020[64] January 2020[65] January 2020[66]

Table 7 – Overview of all-NEMOs CACM regulation deliverables (as at May 2022)

3.2.1. Main development in all TSOs' deliverables

Determination of the capacity calculation regions (Article 15 of the CACM regulation)

As of August 2021, Norway was formally bound by the CACM regulation. Therefore, a new proposal for amendment of the determination of CCRs methodology has been prepared to allocate the Norwegian bidding zone borders to the relevant CCRs, namely CCR Nordic and CCR Hansa.

The final submission is awaiting Statnett's certification as a TSO, which is expected by mid-2022.

Congestion income distribution (Article 73 of the CACM regulation)

On 17 December 2021, ACER published a decision approving the amendment of the CID methodology for European electricity markets. The amendment proposal was submitted by all TSOs to ACER in July 2021. The amendment ensures compatibility with a flow-based approach for allocating long-term CZC; implementation is foreseen for the Nordic and Core CCR. Furthermore, it applies the congestion income-sharing to the intraday time frame and takes into account the occurrence of negative congestion income under specific circumstances.

According to the decision, TSOs have to develop a new amendment within 18 months including mature solutions to address the transfer of congestion income among different CCRs in case of non-intuitive flows[67]. Therefore, a new amendment process has been launched. The final submission date is expected in mid-2023.

Harmonisation of the redispatching and countertrading cost-sharing methodologies (Article74(7) of the CACM regulation)

ENTSO-E has initiated the task to harmonise as far as possible the regional redispatching and countertrading cost-sharing methodologies in accordance with Article 74(7) of the CACM regulation. The harmonisation task was triggered after the NRAs of the Italy North CCR approved a transitory methodology in late 2021. Therefore, ENTSO-E will now be able to consider all regional methodologies to further harmonise them.

For this purpose, a template methodology is being developed to serve as a basis for the CCRs to develop their necessary regional amendments. The timeline for submission of the methodology is 6 months after the latest approval (i.e. Italy North proposal).

62 All NEMOs' request for amendment.
63 On 22 December 2020, ACER adopted a decision (No. 37/2020).
64 SDAC products.
65 On 30 January 2020, ACER adopted a decision (No. 05/2020).
66 SIDC products.
67 Non-intuitive flows are physical cross-zonal electricity flows in the opposite direction of a cross-zonal price difference.

3.2.2. Main developments in the NEMOs deliverables

CACM annual report

On 14 October 2021, the All NEMO Committee organised, in cooperation with ENTSO-E, a webinar to present the key findings from the CACM Annual Report 2020 which was delivered on 1 July 2020. The webinar featured a policy discussion about future changes in the energy market. Participants included the Head of the Electricity Department of ACER, the Chair of the ACER Board of Regulators, the Deputy Director of the Florence School of Regulation and the Vice-chair of the ENTSO-E Market Committee. The closing remarks were delivered by the Director for Green Transition and Energy System Integration, from the European Commission.

Aggregated order curves

Following the go-live of multi-NEMO arrangements (MNAs), NRAs and market participants requested NEMOs to jointly publish aggregated orders after the day-ahead results.

Since 14 October 2021, market participants have had access to **all NEMO aggregated bid curves**[68] for the SDAC auction, including in multi-NEMO areas. This new feature provides enhanced transparency on day-ahead prices across Europe while ensuring the confidentiality of individual market participants' data. The aggregated and anonymised market data will be made available on NEMOs' respective websites.

Intraday products (Article 53, CACM regulation)

All NEMOs have run a public consultation (5 January to 12 February 2022) on the SIDC product methodology in line with the CACM regulation. After review, there are no proposed amendments to the products and all NEMOs are therefore proposing not to amend the content of the current list of SIDC products.

3.2.3. Main development on the joint work of the TSOs and NEMOs

Day-to-day management of the single day-ahead coupling and single intraday coupling (Article 10, CACM regulation)

In accordance with the commitment made in the previous year, NEMOs and TSOs have been actively working on implementing the Market Coupling Steering Committee (MCSC). The first MCSC meeting took place on the 2 and 3 February 2022. During this meeting, the MCSC decided to implement qualified majority voting for all MCSC decisions (except operational decisions for which unanimity remains).

MCSC installed a NEMO and TSO working group that is looking into further governance improvements. As a first deliverable, terms of reference for a market coupling stakeholder consultative group were prepared and approved during April's MCSC. The first stakeholder consultative group meeting will be organised for the second quarter of 2022.

68 See https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12553-Regles-de-lUE-en-matiere-denergies-renouvelables-reexamen/F2752810_fr.

3.3. EB Regulation

The EB Regulation establishes a set of technical, operational and market rules to govern the functioning of electricity balancing markets. It sets out rules for the procurement of balancing capacity, the allocation of cross-zonal transmission capacity for cross-border trades, the activation of balancing energy, and the financial settlement of BRPs.

This chapter describes the main achievements regarding the EB Regulation roadmap, with emphasis on the following topics:

(a) cross-border balancing capacity procurement development and harmonisation methodologies;

(b) balancing energy platforms (regulatory and technical aspects);

(c) imbalance settlement harmonisation process.

3.3.1. Procurement of balancing capacity and allocation of cross-zonal transmission capacity for cross-border trades

Procurement of balancing capacity ensures that resources to provide balancing energy in real time will be available when needed. The EB Regulation allows TSOs to procure balancing capacity at a regional level. Specific rules are being defined in dedicated methodologies according to Articles 38(3), 40, 41 and 42 of the EB Regulation. A majority of European TSOs have submitted methodologies according to EB Regulation Article 41. After implementation, TSOs can mutually exchange balancing capacity or share reserves.

Several methodologies have been accepted by ACER, which have already increased the level of harmonisation across the CCRs. This can serve as a basis for the harmonisation of all CZC calculation methodologies according to EB Regulation Article 38(3). Further information on the methodologies can be found in the ENTSO-E *Balancing Report 2022*.

At the time of writing, the CCRs that have submitted a methodology based on Article 41 of EB Regulation are implementing the process of market-based allocation. This includes amendments of other correlated processes such as day-ahead capacity calculation and CID.

Besides the market-based allocation, all TSOs submitted the co-optimised allocation process according to EB Regulation Article 40 in December 2019. ACER approved the methodology in June 2020 and specified the implementation actions to be taken. Due to the complexity of the implementation of a co-optimised allocation capacity, ACER allowed TSOs, in collaboration with NEMOs, to conduct an implementation impact assessment[69], which was published at the end of 2021. In accordance with Article 13(2) of the *Methodology for a co-optimised allocation process of cross-zonal capacity for the exchange of balancing capacity or sharing of reserves* (Annex I)[70], the implementation impact assessment addresses the eight topics depicted in Figure 4. For this purpose, the implementation impact assessment follows four major strands of analysis (economic analysis, implementation option of co-optimisation, technical feasibility analysis and governance). Based on its findings, the report shares some recommendations to be considered by TSOs when providing the set of requirements to NEMOs for the implementation of co-optimisation in June 2022. Further information on the assessment can be found in the implementation impact assessment.

69 Implementation impact assessment for the methodology for a co-optimised allocation process of CZC for the exchange of balancing capacity or sharing of reserves – https://eepublicdownloads.entsoe.eu/clean-documents/nc-tasks/211217_All%20TSOs_Co-optimisation%20IIA%20Report.pdf.

70 Available from https://www.eles.si/Portals/0/Novice/avkcije/sistemske%20storitve/EBGL%20uredbe/ACER%20Decision%20on%20CO%20CZCA.

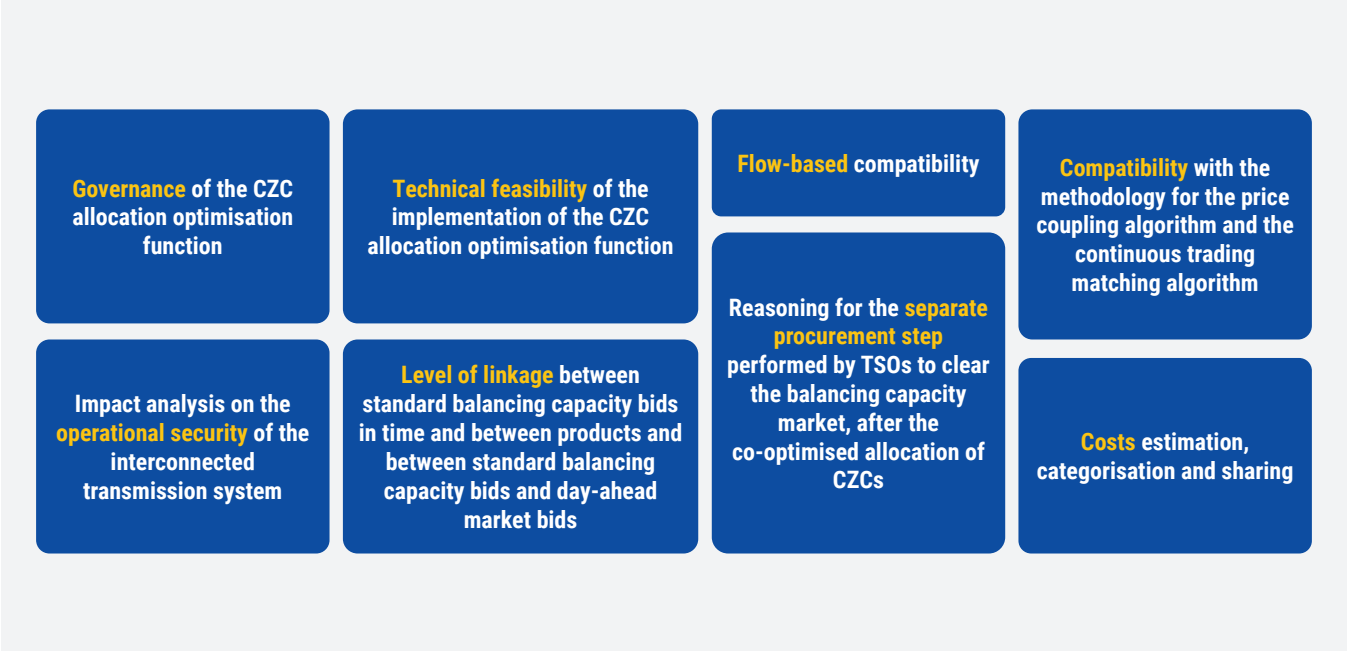


Figure 4 – Topics covered by the impact assessment of CZC

Besides explicit allocation of CZC for the exchange of balancing capacity for frequency restoration reserves with automatic activation (aFRR), frequency restoration reserves with manual activation (mFRR) and replacement reserves (RR), the exchange of FCR can rely on reliability margins in accordance with the CACM regulation.

3.3.2. Procurement and activation of balancing energy

The activation of balancing energy at regional or pan-European balancing platforms is key to the integration of balancing energy markets in Europe. It improves the efficiency of these markets from both security and economic point of views, with respect to former local activation balancing markets.

On one hand, efficiency is reached, by netting positive and negative balancing needs of multiple TSOs at different time horizons, if this netting brings economic advantage with respect to balancing bids activation (RR, mFRR, aFRR), while respecting the CZC available. Such netting of needs actions will be carried out **implicitly** at RR, mFRR and aFRR activation platforms, and **explicitly** at the imbalance netting process (IN) platform. On the other hand, the competition level is increased due to a higher number of BSPs and their different nature (conventional generation, demand, renewable energy sources, storage). Since the least expensive technologies are competing, the global social welfare of the respective balancing energy markets is maximised.

Moreover, regional and pan-European balancing activation platforms also increase the security of the respective systems. In particular, the already referred implicit netting of TSOs' needs carried out by different platforms at different time scopes leads to greater availability of RR, mFRR and aFRR reserves in the different time horizons. Nevertheless, TSOs need adequate back-up solutions to mitigate the risk of failure of centralised platforms.

The balancing activation markets are supported by corresponding implementation frameworks (implementation framework for the exchange of balancing energy from replacement reserves – RRIF[71], mFRR international framework[72], aFRR international framework[73] and IN international framework[74]), which are already approved but might be subject to further amendment. Settlement of the different processes is based on already approved TSO-BSP pricing[75] and TSO-TSO settlement methodologies.

71 *Implementation framework for the exchange of balancing energy from Replacement Reserves* – https://extranet.acer.europa.eu/en/Electricity/MARKET-CODES/ELECTRICITY-BALANCING/Pages/02-RR-IF.aspx.

72 *Implementation framework for a European platform for the exchange of balancing energy from frequency restoration reserves with manual activation* – https://extranet.acer.europa.eu/en/Electricity/MARKET-CODES/ELECTRICITY-BALANCING/Pages/05-mFRR-IF.aspx.

73 *Implementation framework for the European platform for the exchange of balancing energy from frequency restoration reserves with automatic activation* – https://extranet.acer.europa.eu/en/Electricity/MARKET-CODES/ELECTRICITY-BALANCING/Pages/06-aFRR-IF.aspx.

74 *Implementation framework for the European platform for the imbalance netting process* – https://extranet.acer.europa.eu/en/Electricity/MARKET-CODES/ELECTRICITY-BALANCING/Pages/01-IN-IF.aspx.

75 Amended by ACER to consider transient price limits to RR and FRR energy products on 25 February 2022.

3.3.3. Main achievements accomplished at balancing energy platforms

This section summarises the main EB Regulation implementation highlights regarding platforms, regional implementations and go-live processes accomplished throughout 2021 and the first semester of 2022 (addressed in more detail in following specific sections).

The IN platform, focused on aFRR netting of needs (International Grid Control Cooperation – IGCC) officially became the European IN platform on 24 June 2021[76]. In addition, adaptations were carried out in the first and second quarter of 2022 for the aFRR platform (Platform for the International Coordination of Automated Frequency Restoration and Stable System Operation – PICASSO) and the imbalance netting platform (IGCC) so that they could share the same IT tool. Additionally, according to Article 51 of the EB Regulation, the settlement of KΔf, ACE and ramping period (FSkar) process went live on 1 June 2021, starting with financial settlement of unintended exchanges between TSOs within the Continental Europe Synchronous Area (CESA) (in addition to the settlement of intended exchanges due to TSO-TSO schedules ramping and the contribution of each TSO to the frequency containment process). In the Nordic Synchronous Area, such a settlement had already been established before the introduction of the EB Regulation but is now formalised according to the EB Regulation provisions.

3.3.4. Main regulatory developments related to balancing energy platforms

The main regulatory highlights accomplished throughout 2021 (and foreseen in the first quarter of 2022) are as follows:

- **RRIF (Article 19 of the EB Regulation):**

First amendment (approved by replacement reserves national regulatory authorities on 18 October 2021)

This amended version was sent to RR NRAs in March 2021, after previous public consultation. The main aspects, covered in this first RRIF amendment, address aspects such as:

(a) governance (enable all TSOs to be regarded as operators of the platform);

(b) settlement of interconnection controllability actions carried out at the Trans-European Replacement Reserves Exchange (TERRE) platform, which should be compliant with the latest versions of the pricing proposal and the TSO-TSO settlement proposal validated by ACER, as of their entry into force in July 2022;

(c) an upward and downward energy bids counter-activations monitoring scheme in order to mitigate them.

Second amendment:

RR TSOs launched a public consultation from 4 February to 4 March 2022 on this second amendment, which was sent to RR NRAs on 31 March 2022. The main aspects covered in this RRIF amendment are:

(a) the harmonisation of provisions related to upward/downward energy bids counter-activations in the RRIF with those described in the mFRR international framework, including an explicit indication that monitoring of counter-activations is foreseen (in the event that inefficiencies are identified, RR TSOs or RR NRAs can request a minimisation of such counter-activations in the RR platform activation optimisation function);

(b) modifications derived from the pricing methodology approved by ACER on 24 January 2020 regarding desired flow range (also called interconnection controllability): a single clearing (and one single price) with balance plus desired flow range will be applied instead of two consecutive runs with and without desired flow range (and two different prices, with and without desired flow range).

- **Amendment of pricing methodology (Article 30 of the EB Regulation)** for establishing price limits for a transient period of 4 years at balancing processes:

The aim of this all-TSOs amendment is to mitigate potential market power scenarios during transient periods of establishing future aFRR and mFRR European platforms. These issues could arise, for instance, at the beginning of operation of these platforms, when only a few TSOs will be connected. The transitional upper price limit shall be EUR 15 000/MWh and the transitional lower price limit shall be EUR -15 000/MWh for the first 48 months after the European balancing platforms have become operational. On 25 February 2022, ACER approved the proposal on the amendment to the methodology for pricing balancing energy (RR and FRR) and CZC used for the exchange of balancing energy or operating the imbalance netting process in accordance with Article 30(1) of the EB Regulation. Further information on the pricing methodology amendment can be found in section 2.4 of the *Balancing Report 2022*.

- **All-TSO public consultation of amendment proposal of the mFRR, aFRR and IN implementation frameworks (Articles 20.1, 21.1 and 22.1 of the EB Regulation), launched in the final quarter of 2021:**

These amendments concern definition of the rules for governance and operation of the platforms. This includes the capacity management function, and the proposed designation

76 One year after the IN implementation framework entered into force on 24 June 2020.

of the entity that will perform this function, in accordance with ACER Decisions No. 02/2020, No. 03/2020 and No. 13/2020 related to the mFRR/aFRR and IN platforms. The mFRR international framework amendment also includes technical amendments to clarify some formulations for the go-live of the mFRR platform (complex bids, mFRR demand).

Once the written vote was approved by the Market Committee, the proposal was submitted to ACER on 31 March 2022. The ACER decision is expected 6 months after submission.

3.3.5. Imbalance settlement and other settlement deliverables

The EB Regulation and recast EU Electricity Regulation[77] establish a 15-minute ISP for which BRPs' imbalances must be calculated. It also sets the minimum time interval for NEMOs by which they shall provide market participants with the opportunity to trade in energy, for both day-ahead and intraday markets.

The 15-minute ISP is either already implemented within 3 years of the EB Regulation's entry into force (January 2021), subject to derogation (until 1 January 2025 at the latest), or subject to an exemption for the whole of a synchronous area, in which case the ISP shall be 30 minutes (1 January 2025 at the latest). Further information on the implementation status can be found in Chapter 4 of the *Balancing Report 2022*.

In July 2020, ACER decided[78] on the imbalance settlement harmonisation methodology, to be implemented nationally by January 2022 at the latest. This methodology, which is subject to approval by its NRA, limits the number of additional price components each TSO may apply in its imbalance price calculation and limits the number of conditions for application of dual imbalance pricing. Further information on the implementation status can be found in Chapter 4 of the *Balancing Report 2022*.

This methodology, which is to be adopted by each connecting TSO in order to calculate single final positions in each imbalance area for each ISP, depending on the dispatching model, is further described in Chapter 4 of the *Balancing Report 2022*.

77 *Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity* – https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019R0943&from=EN.

78 *Decision No. 18/2020 of the European Union Agency for the Cooperation of Energy Regulators of 15 July 2020 on the harmonisation of the main features of imbalance settlement* – https://extranet.acer.europa.eu/en/Electricity/MARKET-CODES/ELECTRICITY-BALANCING/10%20ISH/Action%205%20-%20ISH%20ACER%20decision.pdf.

3.3.6. Overview of European and regional implementation of the EB Regulation

This section summarises the status of the balancing energy procurement and activation deliverables (**Table 8**), the status of the balancing capacity procurement and CZC allocation deliverables (Table 9), and the status of the imbalance settlement and other settlements deliverables (Table 10).

After approval by the relevant NRAs in May 2020 (see Table 10), the regional implementation of TSO-TSO settlement of intended exchanges of energy due to ramps and FCR within CESA and of unintended exchanges of energy within CESA became operational in June 2021.

	Proposal	EB Regulation article	First TSOs submission	NRAs approval/ first request for amendment/ referral to ACER	First TSOs submission after the request for amendment	NRAs approval/ second request for amendment/ referral to ACER	Second TSOs submission after the request for amendment	ACER/ NRAs decision
All-TSO	Implementation framework for the European RR platform	19	18 June 2018	14 December 2018 (approval)				
All-TSO	First amendment of the implementation framework for the European RR platform	19	4 March 2021	18 October 2021[79]				
All-TSO	Second amendment of the implementation framework for the European RR platform	19	31 March 2022					
All-TSO	Implementation framework for the European mFRR platform	20	18 December 2018	24 July 2019 (referred to ACER)				24 January 2020
All-TSO	First amendment of the implementation framework for the European mFRR platform	20	31 March 2022					

79 Approval from RR NRAs was received via email. No official letter/document has been issued at the time of publication of this report.

	Proposal	EB Regulation article	First TSOs submission	NRAs approval/ first request for amendment/ referral to ACER	First TSOs submission after the request for amendment	NRAs approval/ second request for amendment/ referral to ACER	Second TSOs submission after the request for amendment	ACER/ NRAs decision
All-TSO	Second amendment of the implementation framework for the European mFRR platform	20	31 March 2022					
All-TSO	Implementation framework for the European aFRR platform	21	11 February 2019	24 July 2019 (referred to ACER)				24 January 2020
All-TSO	First amendment of the implementation framework for the European aFRR platform	21	31 March 2022					
All-TSO	Implementation framework for the European IN platform	22	18 June 2018	9 November 2018 (requests for amendment [RfAs] by individual NRAs)	23 January 2019	19 July 2019 (second RfA)[80] 16 January 2020 (referred to ACER)	10 September 2019	24 June 2020 Corrigendum: 8 December 2020
All-TSO	First amendment of the implementation framework for the European IN platform	22	31 March 2022					
All-TSO	Classification of the activation purposes of balancing energy bids	29	11 February 2019	23 July 2019 (RfAs by individual NRAs)	11 November 2019	19 July 2019 (second RfA)[80] 16 January 2020 (referred to ACER)		15 July 2020
All-TSO	Pricing method for all products	30	11 February 2019	24 July 2019 (referred to ACER)				24 January 2020

80 Second RfAs are not available (same as first RfAs) as those requests made by each NRA to their respective TSO.

	Proposal	EB Regulation article	First TSOs submission	NRAs approval/ first request for amendment/ referral to ACER	First TSOs submission after the request for amendment	NRAs approval/ second request for amendment/ referral to ACER	Second TSOs submission after the request for amendment	ACER/ NRAs decision
All-TSO	Amendment - pricing method for all products	30	28 August 2021					25 February 2022

Table 8 – Status of the balancing energy procurement and activation deliverables

	Proposal	EB Regulation article	First TSOs submission	NRAs approval/ first request for amendment/ referral to ACER	First TSOs submission after the request for amendment	NRAs approval/ second request for amendment/ referral to ACER	Second TSOs submission after the request for amendment	ACER/ NRAs decision
All-TSO	List of standard balancing capacity products for FRR and RR	25	18 December 2019					17 June 2020
All-TSO	Methodology for the allocation of CZC based on the co-optimisation allocation process	40	18 December 2019					17 June 2020

	Proposal	EB Regulation article	First TSOs submission	NRAs approval/ first request for amendment/ referral to ACER	First TSOs submission after the request for amendment	NRAs approval/ second request for amendment/ referral to ACER	Second TSOs submission after the request for amendment	ACER/ NRAs decision
Regional	Methodology for the allocation of the CZC market-based allocation process	41	Baltic: 18 December 2019	18 June 2020	28 August 2020	30 October 2020 (Second RfA)	30 December 2020 (NRAs forwarded for decision to ACER on 19 February 2021)	ACER approved on 13 August 2021
Regional			Core: 18 December 2019	12 August 2020	4 December 2020	NRAs forwarded for decision to ACER on 22 February 2021		ACER approved on 13 August 2021
Regional			GR–IT: 18 December 2019	1 July 2020	24 September 2020	1 December 2020 (Second RfA)	1 April 2021	NRAs approved on 22 June 2021
Regional			Hansa: 18 December 2019	24 July 2020	13 October 2020	Withdrawn by respective TSOs on 12 May 2021		
Regional			IT North: 18 December 2019	29 June 2020	4 September 2020	15 December 2020 (second RfA)	26 March 2021	NRAs approved on 1 June 2021
Regional			Nordic: 7 April 2019	17 October 2019	17 December 2019	28 February 2020 (referred to ACER)		5 August 2020
Regional			Core: 18 December 2019	12 August 2020	4 December 2020	Withdrawn by respective TSOs on 24 May 2021		
Regional			GR–IT: 18 December 2019	1 July 2020	24 September 2020	1 December 2020 (2nd RfA)	9 April 2021	NRAs approved on 22 June 2021

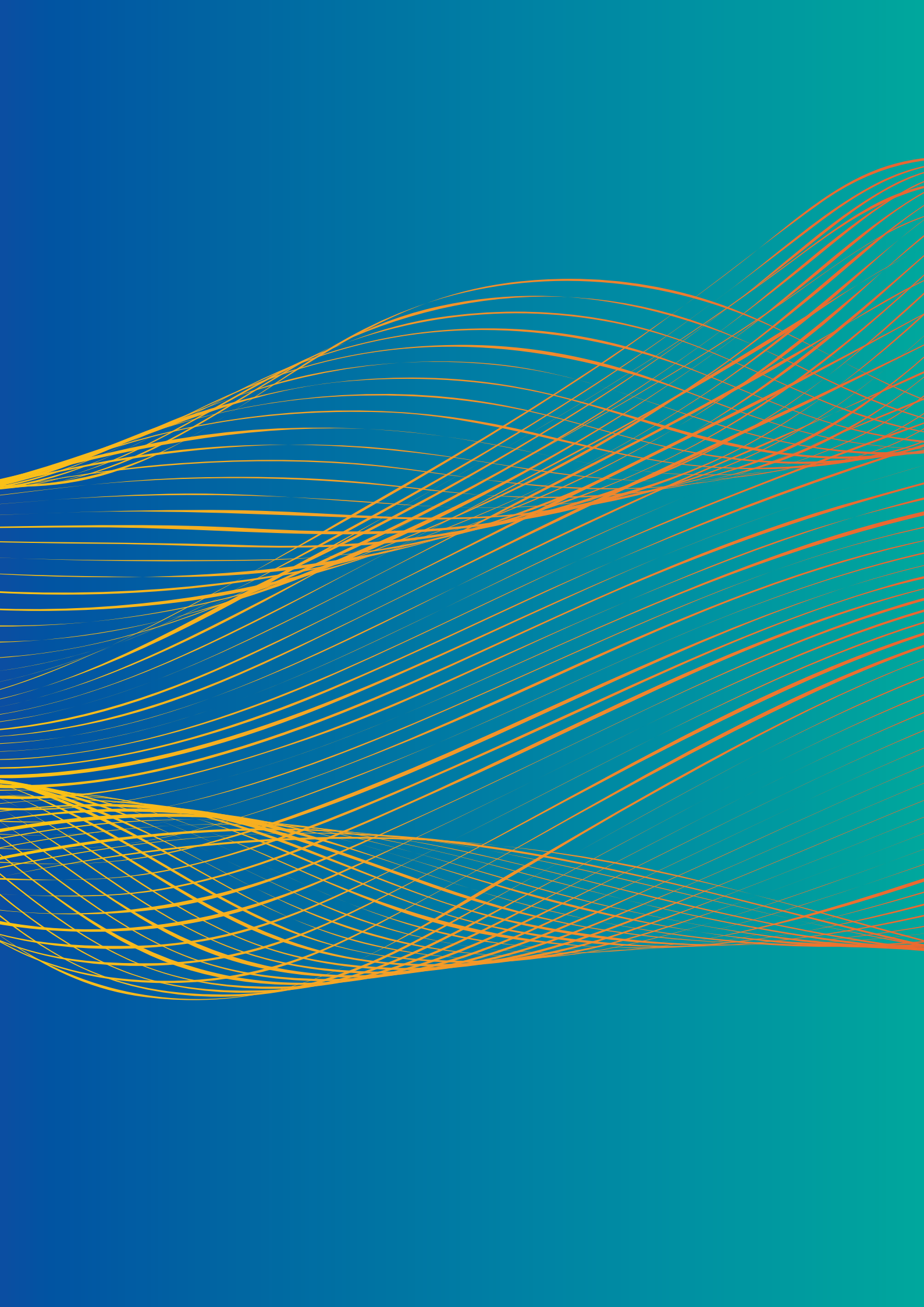
	Proposal	EB Regulation article	First TSOs submission	NRAs approval/ first request for amendment/ referral to ACER	First TSOs submission after the request for amendment	NRAs approval/ second request for amendment/ referral to ACER	Second TSOs submission after the request for amendment	ACER/ NRAs decision
Regional	Methodology for the allocation of the CZC market-based allocation process	41	Hansa	Did not submit.				
Regional			IT North: 18 December 2019	29 June 2020	18 December 2019	15 December 2020 (Second RfA)	26 March 2021	Withdrawn by corresponding TSOs on 27 May 2021
Regional			Nordic	Did not submit.				

Table 9 – Status of the balancing capacity procurement and CZC allocation deliverables

	Proposal	EB Regulation article	First TSOs submission	NRAs approval/ first request for amendment/ referral to ACER	First TSOs submission after the request for amendment	NRAs approval/ second request for amendment/ referral to ACER	Second TSOs submission after the request for amendment	ACER/ NRAs decision
All-TSO	TSO-TSO settlement of intended exchanges of energy as a result of the RR process, frequency restoration process and IN	50(1)	18 December 2018	23 July 2019	11 November 2019	16 January 2020 (referred to ACER)		16 July 2020
All-TSO	TSO-TSO settlement of intended exchanges of energy due to ramping restrictions and FCR between synchronous areas	50(4)	18 June 2019	4 December 2019	27 March 2020	22 May 2020 (NRAs approval)		

	Proposal	EB Regulation article	First TSOs submission	NRAs approval/ first request for amendment/ referral to ACER	First TSOs submission after the request for amendment	NRAs approval/ second request for amendment/ referral to ACER	Second TSOs submission after the request for amendment	ACER/ NRAs decision
All-TSO	TSO-TSO settlement of unintended exchanges between synchronous areas	51(2)	18 June 2020			4 December 2019 (NRAs approval)		
Regional	TSO-TSO settlement of intended exchanges of energy due to ramps and FCR within CESA and of unintended exchanges of energy within CESA	50(3)	18 June 2019	4 December 2019	15 March 2020	27 May 2020 (NRAs approval)		
Regional		51(1)	18 June 2019	4 December 2019	15 March 2020	27 May 2020 (NRAs' approval)		
Regional	TSO-TSO settlement of unintended exchanges within synchronous area Nordics TSOs of synchronous area and TSO-TSO settlement of intended exchanges of energy due to ramps and FCR within the Nordic synchronous area	50(3)(a)	18 June 2019	18 December 2019	18 Feburary 2020	31 March 2020 (NRAs approval)		
Regional		51(1)(b)						
All-TSO	Imbalance settlement harmonisation	52	11 February 2019	11 July 2019		16 January 2020 (referred to ACER)		15 July 2020

Table 10 – Status of the imbalance settlement and other settlements deliverables



4. Forward capacity allocation

All TSOs have appointed a JAO in accordance with Article 49 of the FCA regulation[81], to act as the SAP for FCA as of 1 November 2018. JAO is a joint service company currently owned by 25 TSOs[82] which hosts SAP services for TSOs.

SAP enables long-term auctions of transmission capacity and currently serves 30 TSOs from 22 EU countries. The IT system is scalable border by border, allowing for annual, non-calendar annual, half-yearly, quarterly, monthly, weekly, weekend, daily and intraday auctions.

4.1. Governance

In accordance with Article 1 of the approved SAP methodology, all TSOs and regulatory authorities[83] bound to the FCA regulation agreed to appoint JAO as the SAP operator. Consequently, the SAP Cooperation Agreement (SAP CA), according to Article 2(3)(g) of the SAP methodology, was developed and signed by all TSOs that issue LTTRs.

The SAP operator is governed by the SAP Council, consisting of TSOs and JAO representatives, which is the sole competent body for deciding on operational topics and the budget related to fulfilment of SAP tasks, in accordance with the FCA regulation[84].

81 *All TSOs' proposal of 7 April 2017 for the establishment of a Single Allocation Platform (SAP) in accordance with Article 49 and for the cost sharing methodology in accordance with Article 59 of Commission Regulation (EU) 2016/1719 establishing a Guideline on Forward Capacity Allocation* – https://eepublicdownloads.entsoe.eu/clean-documents/nc-tasks/170414_Attch2_SAP_Proposal_FINAL.pdf.

82 This includes TSOs / companies operating undersea cable interconnectors as well. These are 50Hertz, Amprion, APG, ČEPS, Creos, EirGrid, ELES, Elia, Akcionarsko društvo Elektromreža Srbije (EMS), Energinet, ESO, HOPS, IPTO, MAVIR, Moyle, PSE, RTE, SEPS, Statnett, Swissgrid, TenneT DE, TenneT NL, Terna, Transelectrica and TransnetBW.

83 Some regulatory authorities (the regulatory authorities of Finland, Lithuania and Sweden) have exempted their TSOs, pursuant to Article 30(1) of the FCA regulation, from issuing LTTRs and therefore, according to Article 30(7) of the FCA regulation, these TSOs are not part of the SAP CA yet.

84 Further details on the governance structure of JAO can be found in *Market Report 2020*.

Figure 5 – Countries whose TSOs are obliged to be part of the SAP Council and are part of the SAP CA (as at May 2022)[85]

4.2. Operations

JAO performs all tasks in compliance with the SAP CA, the SAP methodology and the HAR[86].

As of 2022, the SAP operator organises forward capacity rights auctions at 65 bidding zone directional borders and provides services by use of a common IT system for more than 350 registered market participants[87]. Only yearly, quarterly and monthly products are being allocated at EU borders in 2022. A gradual shift from physical transmission rights (PTR) to financial transmission rights (FTR) options at EU borders is being observed. This tendency is supported by the fact that PTR holders on average nominate only around 13% of allocated rights. A broad transition to FTR is planned in the context of the launch of flow-based day-ahead coupling in the Core CCR when a vast majority of remaining bidding zone borders in the region switch to FTR.

List of bidding zone borders and/or their subsets of interconnectors			Type of LTTRs
AT	<>	CZ	FTR options
AT	<>	HU	FTR options
AT	<>	IT	PTR

85 Creos does not issue LTTRs or commercialise any interconnector. Brexit did not have any impact on EirGrid participation as a full member of the SAP CA and SAP Council.

86 For further details on SAP tasks, see *Market Report 2020*.

87 A detailed description of the common IT System e-cat can be found in *Market Report 2019*.

List of bidding zone borders and/or their subsets of interconnectors			Type of LTTRs
AT	<>	SI	*FTR options
			(PTR for yearly horizon)
BE	<>	FR	FTR options
BE	<>	NL	FTR options
HR	<>	HU	*FTR options
			(PTRs for yearly horizon)
HR	<>	SI	PTR
CZ	<>	DE (50Hertz)	*FTR options
			(PTR for yearly horizon)
CZ	<>	DE (TenneT)	*FTR options
			(PTR for yearly horizon)
CZ	<>	PL	*FTR options
			(PTR for yearly horizon)
DK1	<>	DK2	FTR options
DK1	<>	DE (TenneT)	FTR options
DK2	<>	DE (50Hertz)	FTR options
FR	<>	DE	FTR options
FR	<>	IT	PTR
FR	<>	ES	PTR
DE	<>	NL	FTR options
GR	<>	IT	PTR
HU	<>	SK	*FTR options
			(PTR for yearly horizon)
SI	<>	IT	PTR
PL	<>	SK	*FTR options
			(PTR for yearly horizon)

List of bidding zone borders and/or their subsets of interconnectors			Type of LTTRs
PL	<>	DE (50Hertz)	*FTR options
			(PTR for yearly horizon)
AT	<>	DE	FTR options
BG	<>	RO	PTR
BG	<>	GR	PTR
CZ	<>	SK	*FTR options
			(PTR for yearly horizon)
HU	<>	RO	*FTR options
			(PTR for yearly horizon)
ES	<>	PT	FTR options
EE	<>	LV	FTR options
DK1	<>	NL	FTR options
BE	<>	DE	FTR options
SI	<>	HU	FTR options

**This border is switching to FTR for the monthly horizon starting from the first feasible market period after the CORE MC go-live in 2022 while for the yearly horizon, FTR deadlines are first foreseen for the yearly auction of market period 2023.*

Table 11 – Overview of borders served and products offered at SAP (as at May 2022)

The SAP operator organised more than 797 auctions with LTTRs in 2021 on the aforementioned borders, and similar amounts are anticipated for 2022.

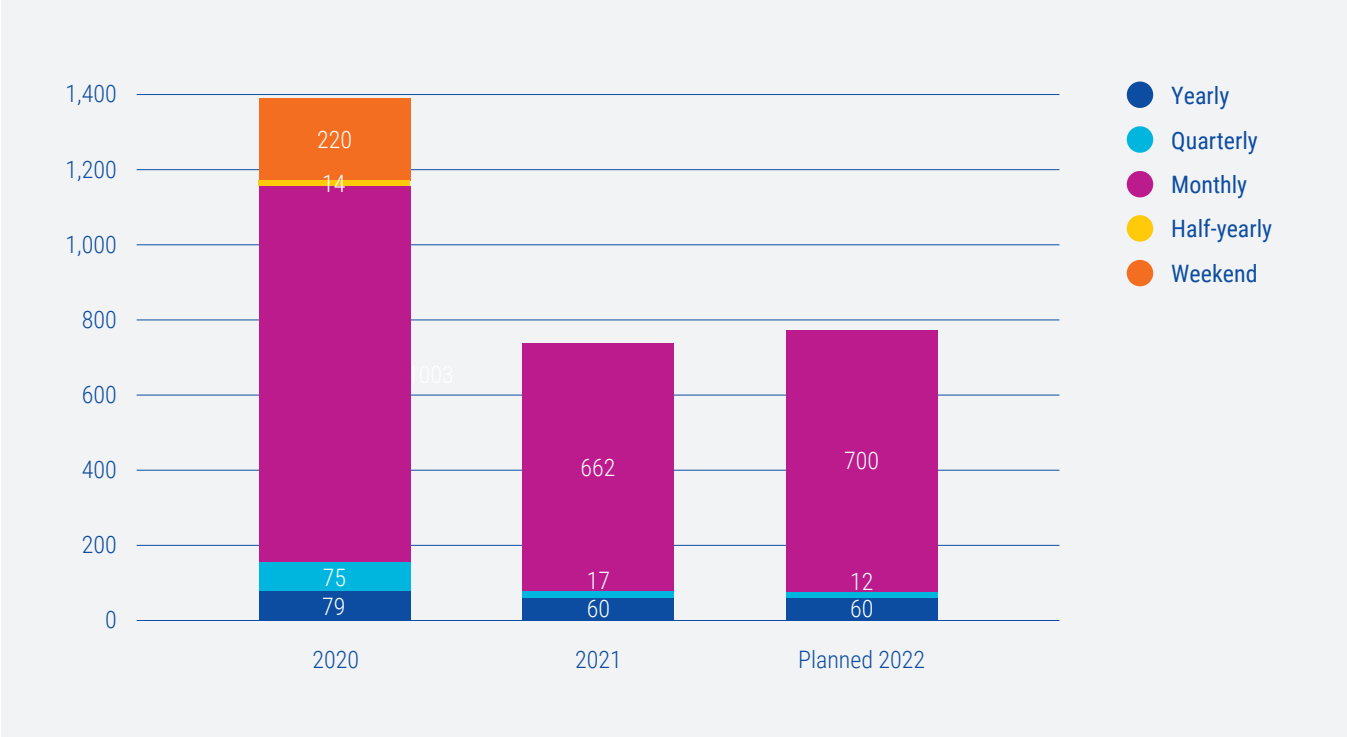


Figure 6 – Number of LTTR auctions

Figure 7 – Number of participants in every auction versus the number of participants that won the capacity during 2021 and 2022

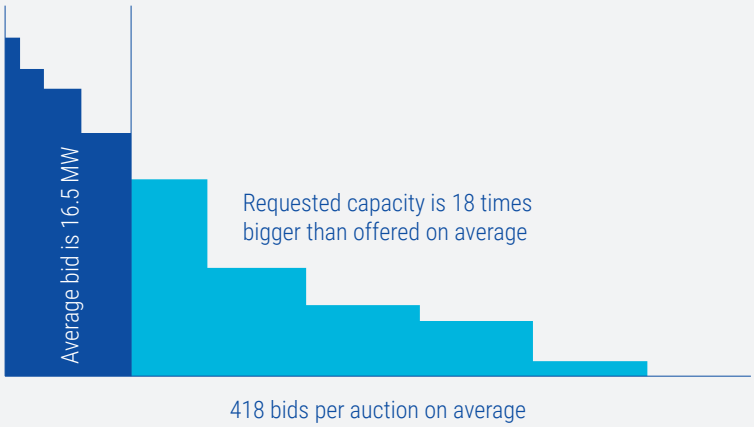


Figure 8 – Average long-term capacity rights auction structure

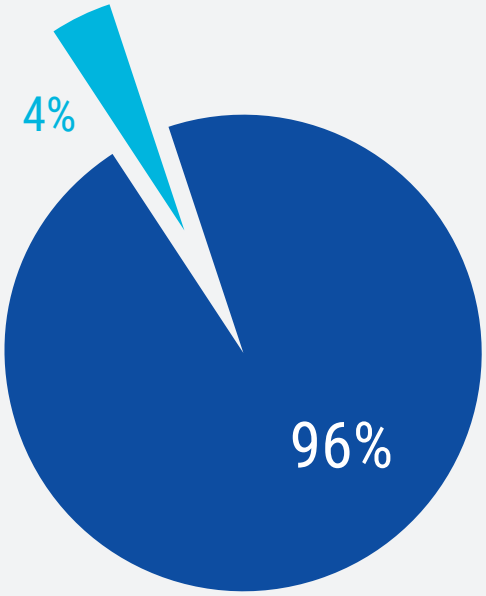


Figure 9 – Rate of return of long-term capacity rights for reallocation at subsequent long-term auction

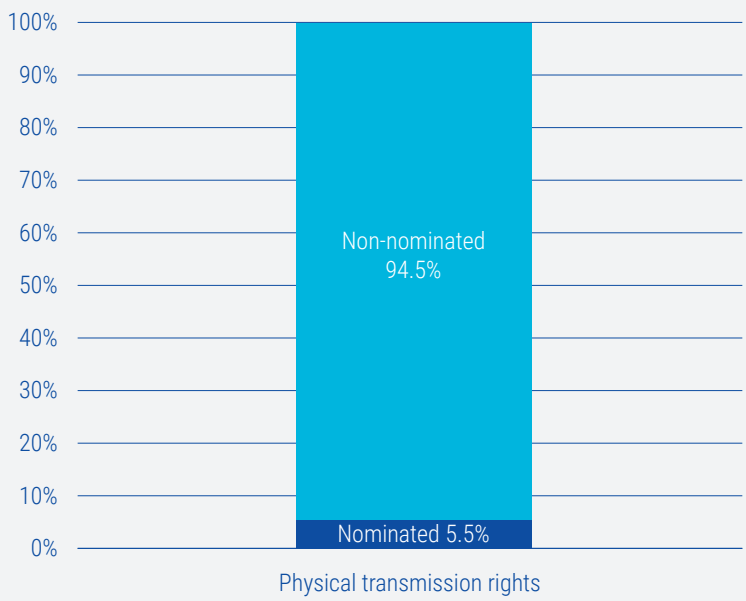


Figure 10 – Usage (nomination) rate of LTTRs

Quality of operations

The SAP Council regularly monitors the quality of operations performed by the SAP operator. More than 3 500 auctions have taken place since SAP operations began. Only about six incidents were visible to market parties: three caused by SAP and three caused by TSOs. All incidents were solved in due time and capacity was always allocated in line with HAR.

To monitor the SAP operator's operation quality, the TSOs of the SAP Council calculate 23 detailed key performance indicators (KPIs) which are merged into three meta-KPIs[88] (see Table 12).

Categories	Details
Fulfilling reporting obligations	Whether data to be reported were provided to Electricity Market Fundamental Information Platform (EMFIP) and ACER platform in line with transparency and the EU Regulation on wholesale energy market integrity and transparency (REMIT) regulations and whether the data were correct
Operational effectiveness	SAP system availability Invoicing correctness Operational incidents occurrence
Customer satisfaction	Users' satisfaction with JAO SAP's effectiveness in solving users' problems and requests Website usability

Figure 11 – SAP KPIs

88 A more detailed description is available in *Market Report 2020*.

Month	Fulfilment of reporting obligations	Operational effectiveness	Customer satisfaction	TOTAL	Quarterly score
VII.20	8.50	10.00	8.97	9.16	8.77
VIII.20	8.50	10.00	5.97	8.16	
IX.20	9.50	10.00	7.47	8.99	
X.20	9.50	9.50	5.97	8.32	8.77
XI.20	9.50	10.00	8.97	9.49	
XII.20	9.50	10.00	5.97	8.49	
I.21	9.50	7.50	9.20	8.73	9.07
II.21	9.50	10.00	7.20	8.90	
III.21	9.50	10.00	9.20	9.57	
IV.21	9.50	10.00	7.70	9.07	9.07
V.21	9.50	10.00	7.70	9.07	
VI.21	9.50	10.00	7.70	9.07	
VII.21	9.50	8.00	8.70	8.73	9.12
VIII.21	9.50	10.00	8.70	9.40	
IX.21	9.50	9.00	9.20	9.23	
X.21	9.50	10.00	6.20	8.57	9.07
XI.21	9.50	10.00	7.70	9.07	
XII.21	9.50	10.00	9.20	9.57	
I.22	9.50	10.00	6.00	8.50	8.94
II.22	9.50	10.00	9.00	9.50	
III.22	9.50	10.00	7.00	8.83	

Table 12 – Overview operation meta-KPIs of SAP (as at March 2022)

The COVID-19 pandemic and the lockdown measures imposed by the Luxembourgish government triggered the activation of a pandemic contingency plan on 13 March 2020. The SAP operator ensured continuity of all critical business processes while employees were working from home by reviewing key processes and implementing, where necessary, adequate information and communication tools in order to perform and document them. There were no operational issues recorded as a consequence of the COVID-19 pandemic.

Customer interaction and satisfaction

JAO has created a platform to gather the feedback and requests from users of the JAO eCAT system, related to IT interfaces and other services performed. The users' expertise and views are essential for the continuous improvement of the services provided by JAO. Therefore, JAO has established the User's Group, which serves as a platform for relevant stakeholders. The User's Group comprises representatives from key European stakeholder organisations interested in participating while ensuring broad geographical coverage by the group.

According to the SAP operator annual survey that took place in early 2022, market participants rated the SAP operator's performance as very good. Scores are stable as the general satisfaction value from the last survey was 4.0 points out of 5.0. The SAP Council continuously works with JAO to identify key elements for improvement which are then incorporated in the SAP operator work plan.

Figure 12 – SAP customer interaction and satisfaction

4.3. Expenditures

This section provides a summary of TSOs' common costs of establishing, amending and operating the SAP. **Figure 13** shows planned and actual costs since 2018[89]. Larger investment costs are anticipated due to changes needed for flow-based day-ahead and long-term allocation.

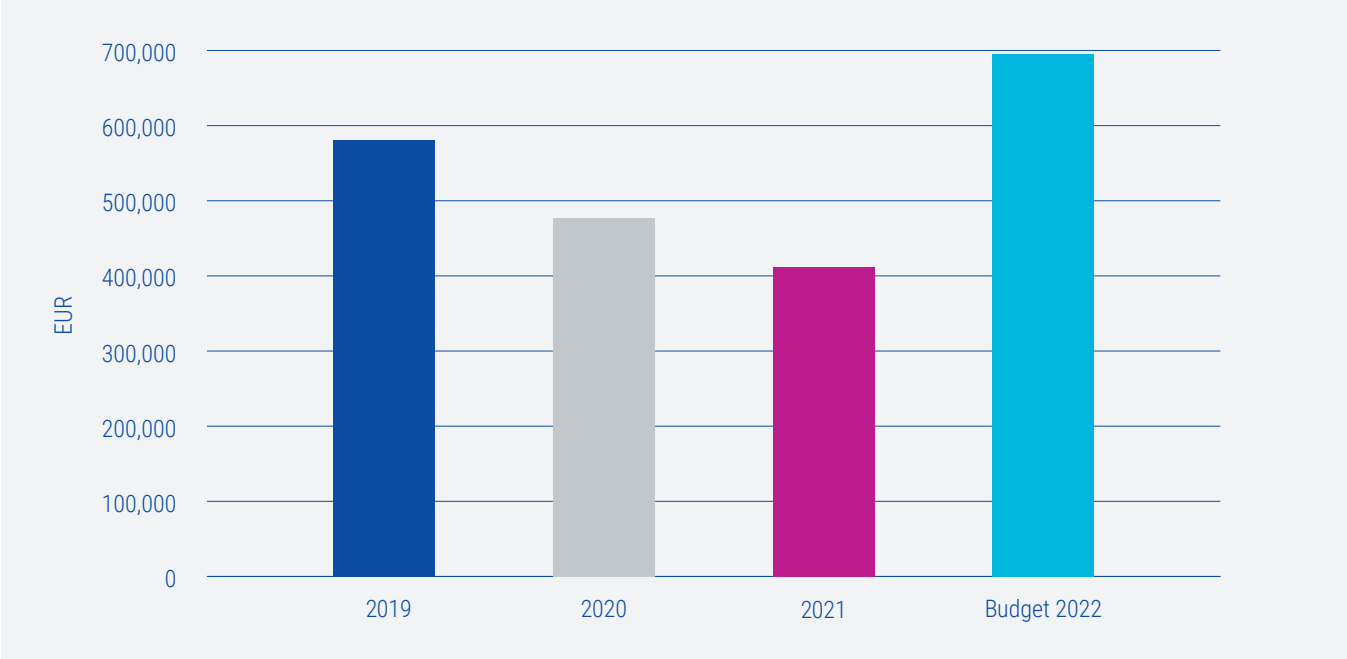


Figure 13 – Overview of the SAP for establishing and amending costs

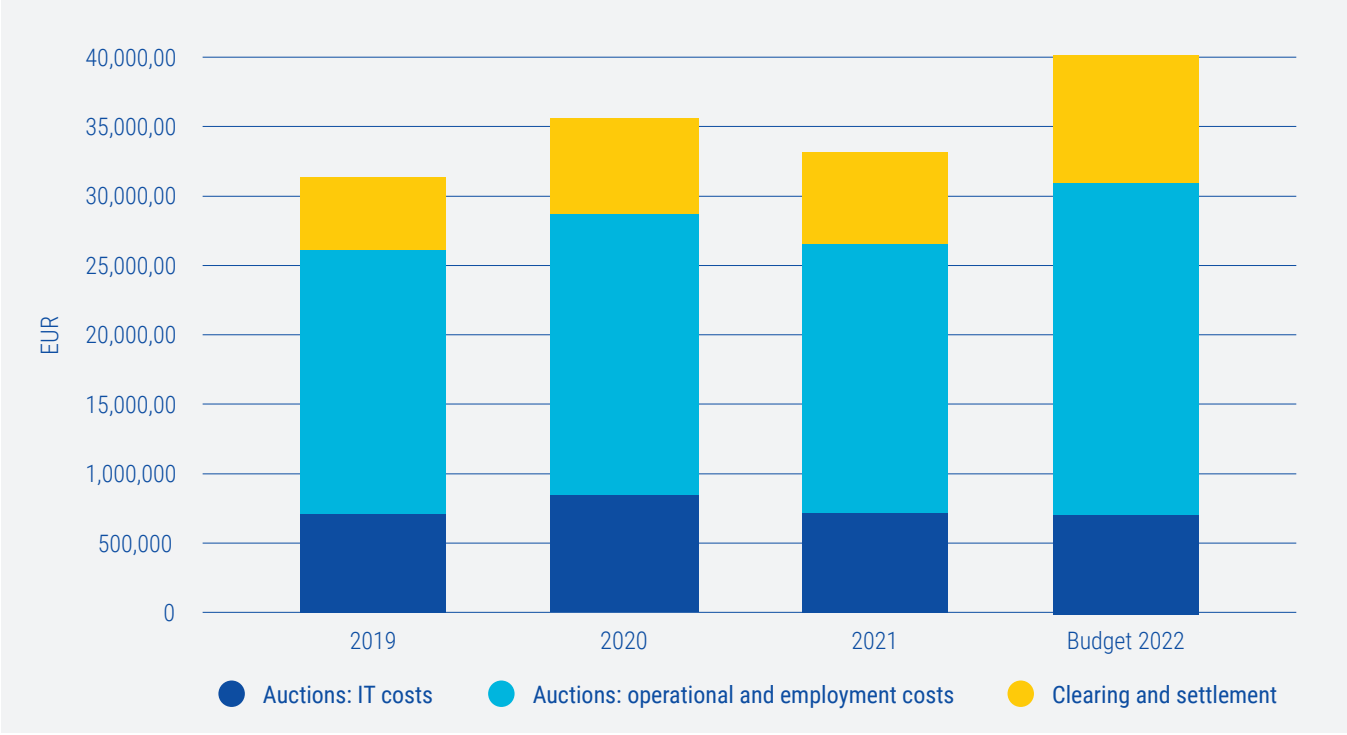


Figure 14 – Overview of the SAP operating cost

89 In line with the regulatory guidance, costs for coupling projects are planned and shared between TSOs and/or NEMOs as of 14 February 2017.

The reported establishment and development costs consist of annual depreciation and amortisation of investments to establish and develop SAP on top of existing tools in JAO. The operational costs for SAP consist of annual depreciation and amortisation of the tools and other assets used for long-term auctions. Furthermore, they consist of financial clearing and settlement of auction revenues (including bank fees), and operational support covering the entire long-term allocation process, contact with market participants, the service desk, risk management, and other related services. Compared to SDAC/SIDC projects, the SAP costs cover the whole business chain for capacity allocation to market participants. The organisation and meeting of the SAP Council did not cause any direct costs.

The fee principles for the SAP are defined based on the SAP methodology, which is derived from the all-TSO proposal for the establishment of the SAP in accordance with Article 49 and the cost-sharing methodology in accordance with Article 59 of the FCA regulation.

The SAP methodology is applicable to costs of running the long-term auctions on the SAP borders only, and to the relevant SAP tasks, as defined in Article 9 of the rules establishing the SAP as of October 2018 (i.e. the date the SAP was established).

4.4. Evolution of services

The SAP operator has implemented and operates all obligations stemming from the FCA regulation. All TSOs focus on continuous improvement of SAP operator services provided to both TSOs and market participants.

4.4.1. Operations

With the go-live of the day-ahead flow-based market coupling in the Core CCR, a shift is expected from PTR to mostly FTR options for the Core CCR bidding zone borders.

With the introduction of 15-minute day-ahead market products, the SAP operator will also need to adapt IT tools and procedures to this new market scheme.

4.4.2. Harmonised Allocation Rules update

In 2021, the HAR were reviewed according to the periodical review of the rules. The changes introduced in the HAR were mainly clarifying and implementing changes that were already implemented in practice.

The following changes were introduced:

1. Qualified electronic signatures were introduced as a valid alternative to the signature procedure of the participation agreement.

2. The information to be submitted to participate in auctions and transfer was clarified, such as tax identification information and Energy Identification Coding (EIC) codes that need to be listed in the Centralised European Register of Energy Market Participants (CEREMP) to ensure consistency for REMIT reporting purposes. Additionally, bank account information was also requested to be evidenced by a bank account identification document and to be used for payments to the market participant to minimise the risk of fraud.

3. To allow for more flexibility in the communication channels used between market participants and the SAP, the term 'email' was replaced by 'electronic means as specified on JAO's website'.

4. Following recent experiences, the rules were extended regarding the possibility of refusal of application of a market participant and suspension of a registered market participant. The rules were modified to include the possibility of the SAP refusing to register a market participant or trade with it. This applies not only in the event of trade or economic sanctions beyond EU scope, but whenever a sanction could have a significant impact on the SAP. This covers, for example, limiting the possibility to receive or send payments, or administering collaterals on the dedicated business account opened for the market participant.

5. Following the digitalisation needs accelerated by the COVID-19 pandemic, the addition of electronically signed bank guarantees was included in the rules.

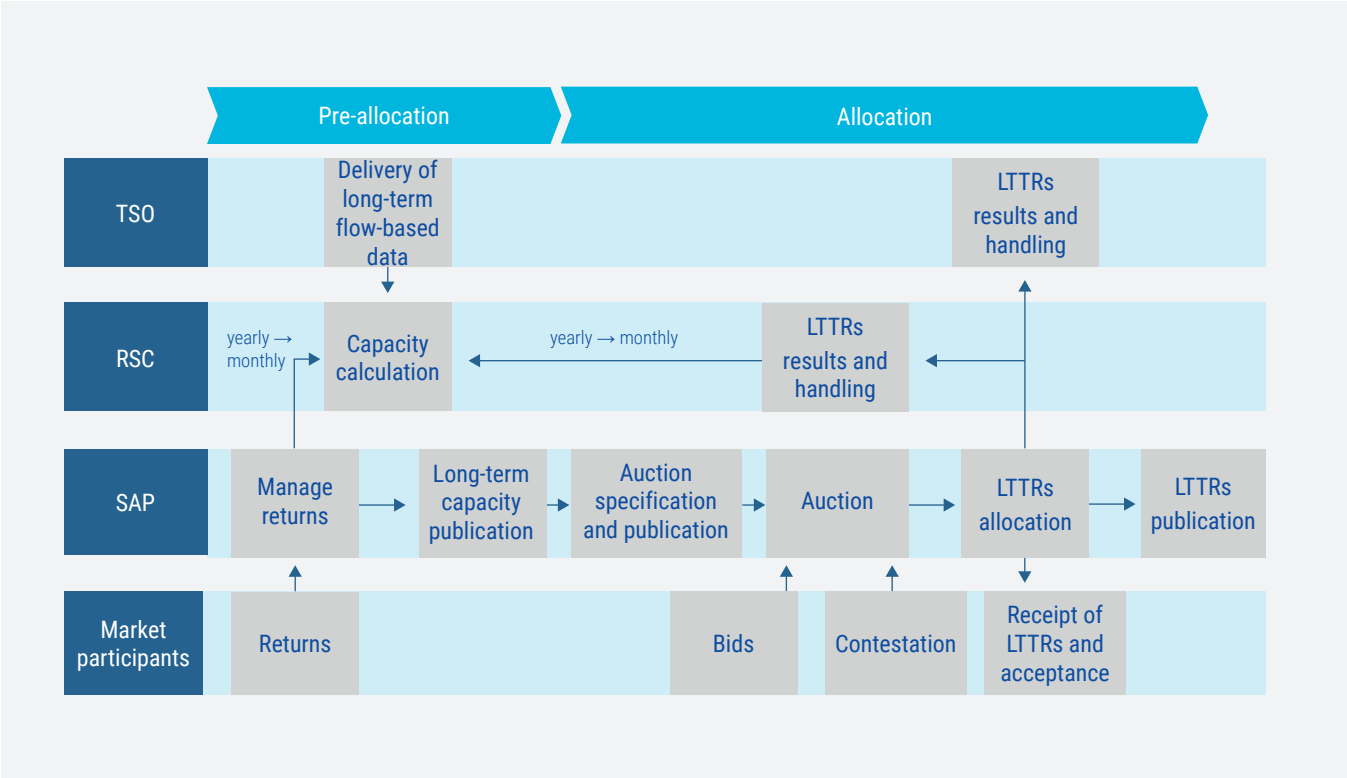
4.4.3. Long-term flow-based allocation

A project was established within the SAP Council to monitor and coordinate the launch of the LTFBA as requested by the CCMs of the Core CCR and Nordic CCR. This project significantly affects the main SAP operator IT tools (auction system and web pages), market rules, and operational procedures. The LTFBA Project Board met for the first time in January 2022 to discuss and propose the LTFBA project status. JAO prepared a project budget estimation and plan, as well as a list of key deliverables.

Two ACER workshops on long-term flow-based capacity calculation and LTFBA were held on 27 January and 24 May 2022. The go-live of the Nordic CCR is foreseen for March 2024 for the monthly auctions and for 2025 for the yearly auction. The go-live of the Core CCR is foreseen for January 2025 for the monthly auction and for 2025 for the yearly auction. After a thorough gap analysis, the FCA methodologies that need to be updated have been identified[90]. According to calculations performed by ACER, the flow-based allocation will lead to an economic surplus (welfare) increase of 27%[91].

There is also intensive cooperation with market participants to design the system as close as possible to their preferences. From a procedural point of view, no crucial changes are expected for market participants as the bidding system will be maintained, which includes the long-term capacity rights results received. The main change will be that only one auction per time frame will be performed for the whole region. This will have an impact on the input data, including their transparent provision before the auction starts, and the allocation optimisation system.

To handle external communication, JAO created a new section[92] on their web page dedicated to the LTFBA project.



RSC = regional security coordinator.

Figure 15 – LTFBA process overview

90 Establishment of a SAP in accordance with Article 49, CID methodology in accordance with Article 57, sharing costs incurred to ensure firmness and remuneration of long-term transmission rights in accordance with Article 61, and HAR for LTTRs in accordance with Article 51.

91 ACER workshop on the Long Term Flow-Based Capacity Calculation and Allocation – www.acer.europa.eu/public-events/acer-workshop-long-term-flow-based-capacity-calculation-and-allocation.

92 Available from www.jao.eu/long-term-flow-based-allocation.

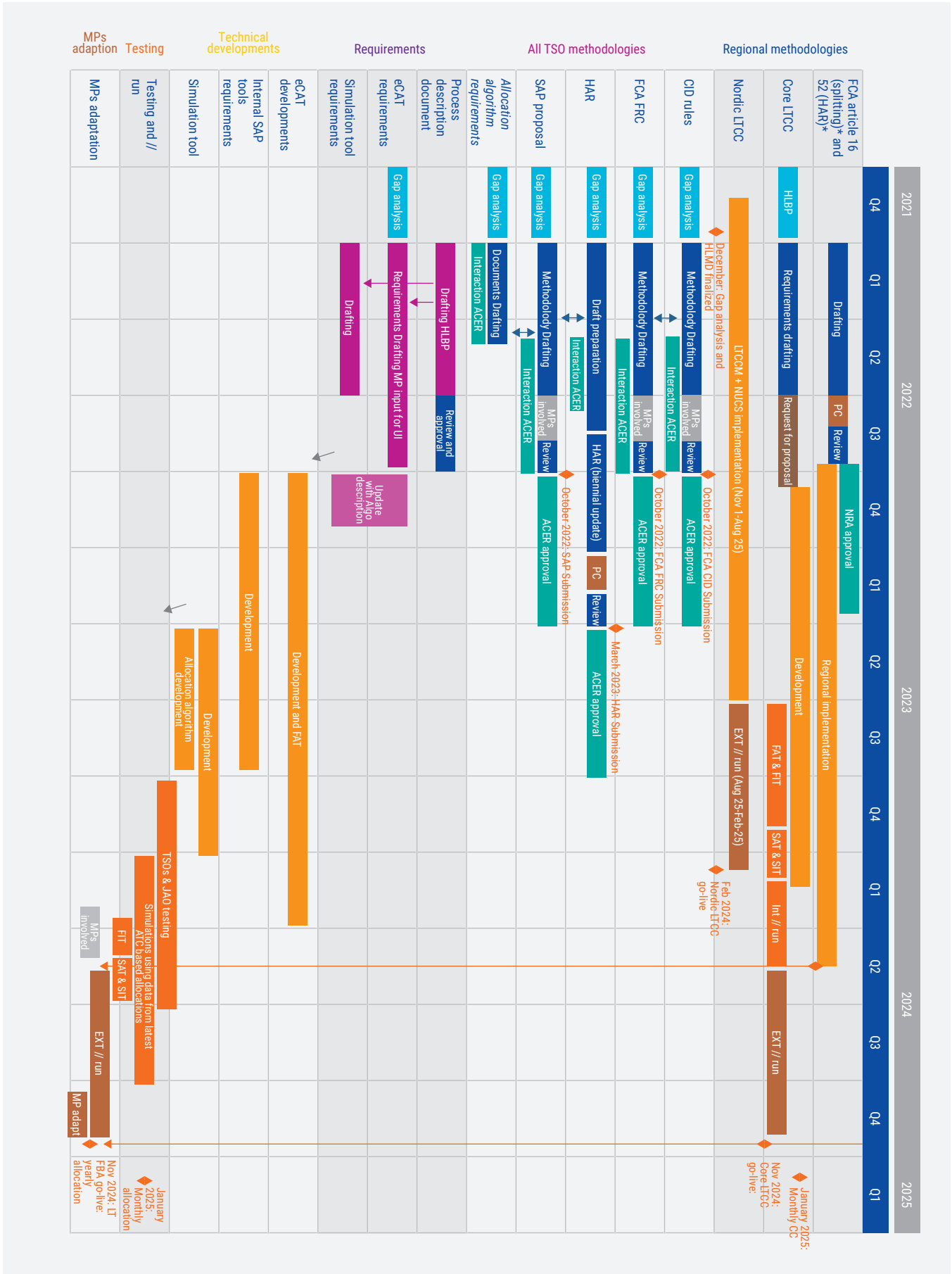


Figure 16 – LTFBA timeline planning

4.4.4. New initiative from the single allocation platform (Joint Allocation Office) – analyses of historical market results

Transparency is essential for the implementation of the internal electricity market and for the creation of efficient, liquid and competitive wholesale markets. It is also critical for creating a level playing field between market participants. JAO currently offers the publication of market data on its website and within its publication tools. To enhance fairness all market participants, JAO intends to publish historical market result analyses, comparing the average day-ahead price spread to the historical long-term auction price per border for the given market period prior to upcoming long-term auctions.

5. Market coupling

This chapter has been prepared in cooperation with the All NEMO Committee. The All NEMO Committee has reviewed the content and accompanying illustrations for compliance, taking into account confidentiality requirements. The information on costs provided by this report is a summary of the full content from the *CACM Cost Report 2021* to be released by all NEMOs and TSOs in the second quarter of 2022.

5.1. Governance

On 14 January 2022, the new joint governance structure of pan-European SDAC and SIDC entered into force. Both time frames are now governed by a joint steering committee called the Market Coupling Steering Committee[93]. As part of this governance change, the legal and communication task forces of both projects were merged. This evolution will make the decision-making process more efficient and generate synergies. TSOs and NEMOs continue developing ideas to further improve market coupling and to streamline the market coupling organisation. At the end of the third quarter of 2022, qualified majority voting at the steering committee level will be introduced. Furthermore, a dedicated market participants consultative group (MCCG) with regular meetings has been established.

5.1.1. Single day-ahead coupling

At the time of this report, SDAC serves 27 countries[94]. In total, 32 TSOs[95] and 17 NEMOs[96] cooperate under the agreement that aims to govern the SDAC, namely the Day-ahead Operational Agreement (DAOA)[97]. The SDAC makes use of the day-ahead MCO function, with an algorithm called the Pan-European Hybrid Electricity Market Integration Algorithm (EUPHEMIA), to calculate electricity prices and matched volumes across Europe and to implicitly allocate auction-based cross-border capacity.

93 See www.entsoe.eu/news/2022/02/07/tsos-and-nemos-significantly-enhance-their-cooperation-around-market-coupling-in-the-day-ahead-and-intraday-timeframe/.

94 Northern Ireland is still part of the SDAC.

95 50Hertz, Amprion, APG, AST, Baltic Cable, ČEPS, Creos, HOPS, EirGrid, ESO, Elering, ELES, Energinet, Elia, Fingrid, IPTO, Kraftnät Åland, Litgrid, MAVIR, Transelectrica, PSE, REE, REN, RTE, SEPS, System Operator for Northern Ireland Ltd. (SONI), Statnett, Svenska Kraftnät, TenneT NL, TenneT DE, Terna and TransnetBW.

96 BSP SouthPool, CROPEX, EirGrid and SONI acting jointly as SEMOpx, EPEX SPOT, EXAA, GME, Hellenic Energy Exchange SA (HEnEx), Hungarian Power Exchange (HUPX), Independent Bulgarian Energy Exchange (IBEX), Nasdaq, Nord Pool European Market Coupling Operator AS (Nord Pool EMCO), OMI, Polo Español S.A. (OMIE), Czech electricity and gas market operator (OTE), OKTE, Operatorul Pieței de Energie Electrică și de Gaze Naturale (OPCOM) and Towarowa Giełda Energii S.A. (TGE).

97 For details, see published version of the agreement, available from www.entsoe.eu/network_codes/cacm/implementation/sdac/#publication-of-contracts-according-to-article-207-of-the-algorithm-methodology. EMS, Electricity Market Operator of North Macedonia (MEMO), Macedonian Transmission System Operator AD (MEPSO), OST sh.a – Albanian Transmission System Operator (OST) and Swissgrid are observers of SDAC.

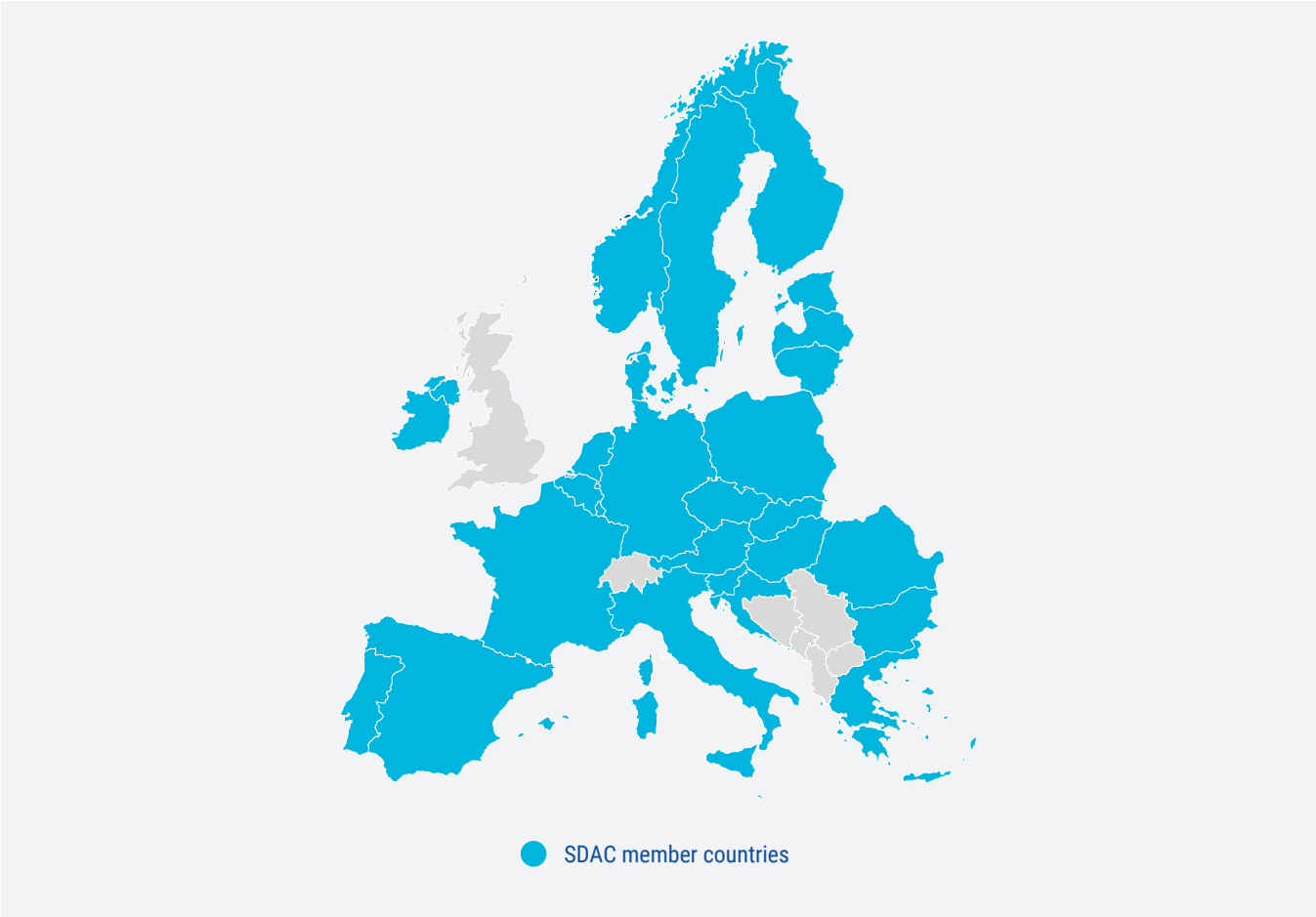


Figure 17 – SDAC member countries (as at June 2022)

5.1.2. Single intraday coupling

SIDC enables continuous cross-border trading across Europe. It is based on a common IT system with a shared order book, a single capacity management module (CMM) and a shipping module. The common IT system facilitates the continuous matching of orders from market participants from several bidding zones, provided that CZC is available. The IT system also enables multiple NEMOs to participate per country.

At the time of this report, the pan-European SIDC serves 27 countries (see Figure 18), 23 of which are operational with at least one border[98]. In total, 30 TSOs and 15 NEMOs cooperate under the Intraday Operational Agreement (IDOA) aimed at governing the SIDC.

98 SIDC currently couples the continuous intraday markets of 23 countries: Austria, Belgium, Bulgaria, Croatia, Czechia, Denmark, Estonia, Finland, France, Germany, Hungary, Italy, Latvia, Lithuania, Luxembourg, Norway, Netherlands, Poland, Portugal, Romania, Slovenia, Spain and Sweden.

IDOA governs the pan-European SIDC. This agreement regulates the cooperation of TSOs and NEMOs regarding the establishment, amendment and operation of the market coupling. It was agreed by all TSOs[99] and NEMOs[100] of the EU Member States plus Norway. Some TSOs and NEMOs from non-EU Member States (such as the Serbian TSO, EMS) are currently observers to SIDC.

The TSO Cooperation Agreement for Single Intraday Coupling (TCID) and a NEMO-only agreement, the All NEMO Intraday Operational Agreement (ANIDOA)[101] complement the contractual framework. Local arrangements contribute to the operation of the SIDC by specifying or completing the general principles described in the IDOA. These contracts were amended in 2019 to bring them in line with the IDOA.

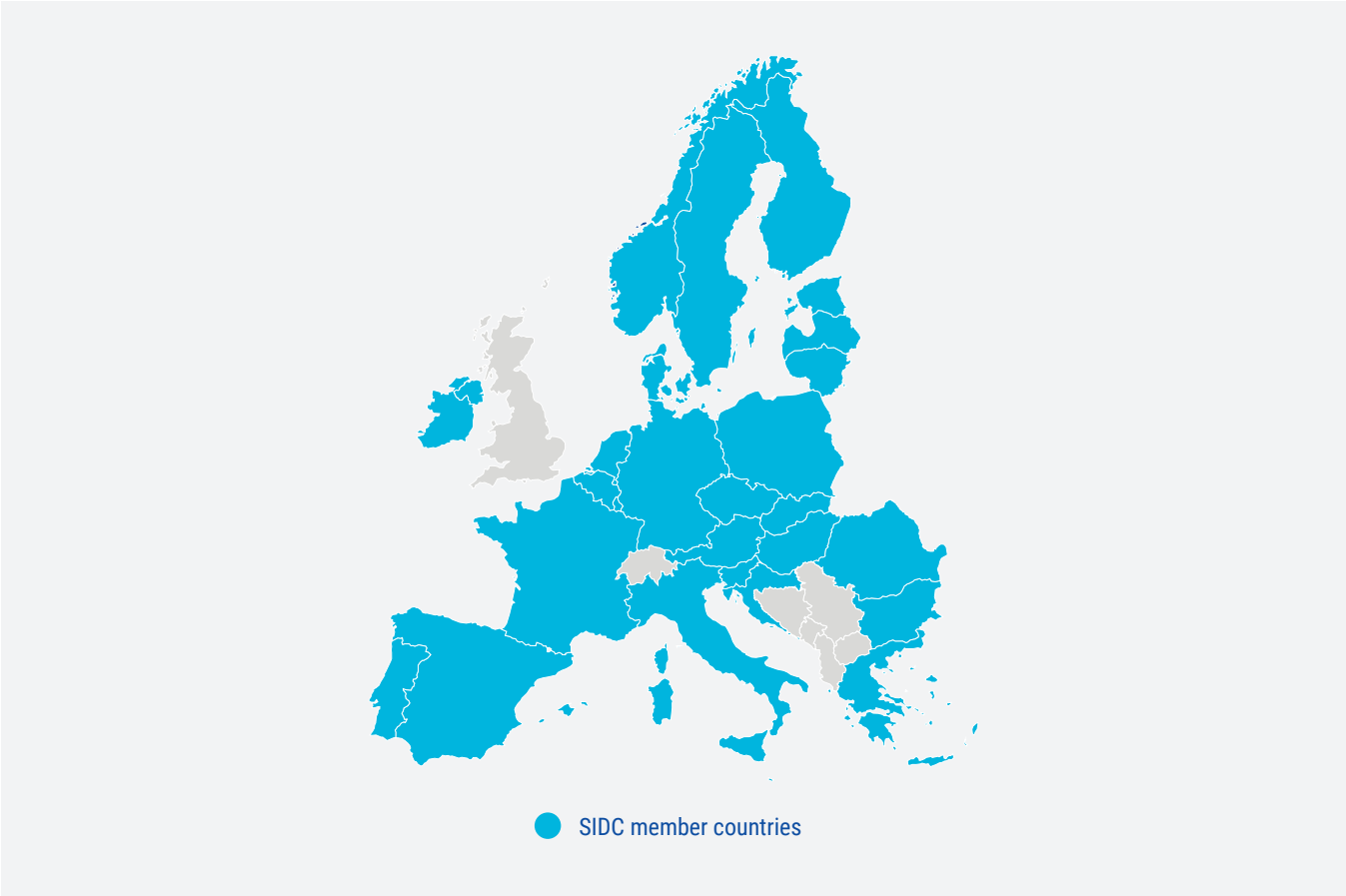


Figure 18 – SIDC member countries (as at June 2022)

99 50Hertz, Amprion, AST, APG, ČEPS, Creos, ESO, Elering, ELES, Elia, Energinet, EirGrid, Fingrid, HOPS, IPTO, Litgrid, MAVIR, Transelectrica., PSE, REE, REN, RTE, SONI, Statnett, Svenska Kraftnät, TenneT Germany, TenneT NL, Terna and Transnet BW.

100 BSP SouthPool, Croatian Power Exchange Ltd (CROPEX), EirGrid and SONI acting jointly as SEMOpx, EPEX SPOT, EXAA, GME, HEnEx, HUPX, IBEX, Nasdaq, Nord Pool EMCO, OMIE, OTE, OKTE, OPCOM and TGE.

101 The ANIDOA sets forth the rights and obligations of NEMOs and TSOs with respect to the implementation of the CACM regulation, which requires the cooperation of all TSOs and NEMOs at the European level, including sharing of common NEMO and TSO costs.

5.2. Operations

5.2.1. Single day-ahead coupling

The integration of the 4M market coupling between Czechia, Hungary, Romania and Slovakia (4M MC) countries' day-ahead market in the pan-European day-ahead power market on 17 June 2021 marked a milestone for the integration of European electricity markets. **One SDAC is in operation now**. Prior to that, two couplings operated in parallel using infrastructure based on EUPHEMIA: MRC and 4M MC[102]. **Figure 19** depicts the current status of SDAC markets.

At the time of this report, SDAC integrates 27 countries[103], representing 100% of EU Member States' electricity consumption[104] and averaging circa 1 530 TWh/year, in one market solution. SDAC continues to operate successfully without full decoupling. In fact, no full decoupling of markets has occurred since the operation began in February 2014. However, there have been three partial decouplings during this period. The first two occurred on 7 June 2019 and 4 February 2020[105]. The third occurred on 13 January 2021[106].

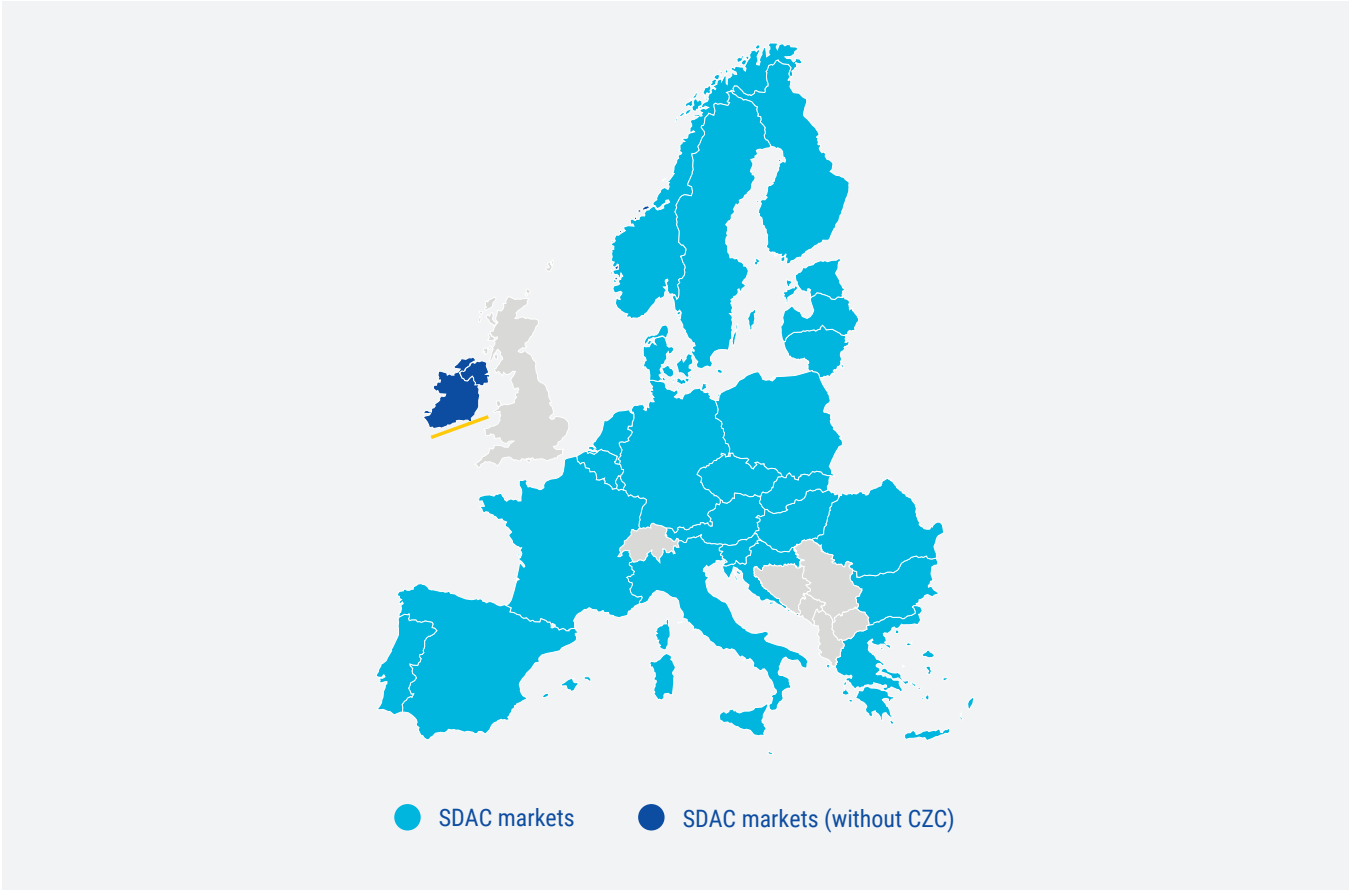


Figure 19 – Operational status of SDAC countries (as at June 2022)[107]

102 Details on SDAC operations (MRC and 4M MC) are published via the CACM Annual Report: the 2018 version is available from www.nemo-committee.eu/assets/files/cacm-annual-report-2018.pdf and the 2019 version is available from www.nemo-committee.eu/assets/files/cacm-annual-report-2019.pdf.

103 The SDAC operational countries are Austria, Belgium, Bulgaria, Croatia, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden. Ireland and Northern Ireland are also operational, albeit currently in isolated mode.

104 EU countries falling under the application of CACM, including Norway and Northern Ireland.

105 For more information, see *Market Report 2019* and *Market Report 2020*.

106 For more information, see *Market Report 2021*.

107 The Single Electricity Market (SEM), representing the joint bidding zone of Ireland and Northern Ireland, operates under SDAC without CZC.

Other minor operational incidents have occurred since the previous report, some of which have been communicated actively to market participants in line with the SDAC operational procedures. All operational incidents are monitored and analysed on a regular basis. Updates of the processes are introduced via the SDAC operational steering committee (OPSCOM) to mitigate relevant risks. **Figure 20** depicts these two types of incidents.

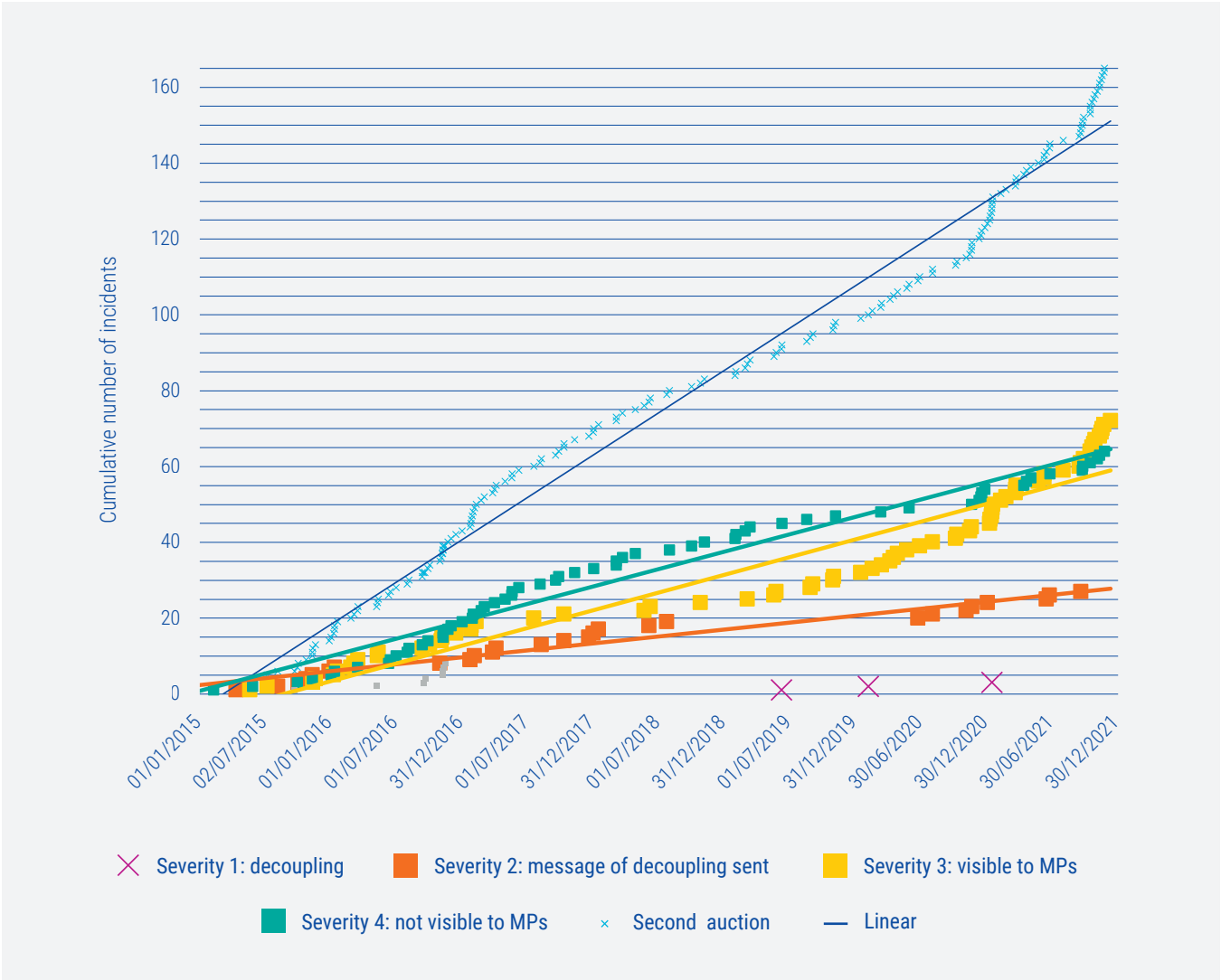


Figure 20 – Incidents between 2015 and 2021 (as at December 2021)[108]

Details on the incidents can be found in the annual CACM report[109].

Training market participants

Although partial decoupling incidents rarely happen, regular training sessions have been recommended, involving all operational parties: TSOs, NEMOs, central clearing counterparties, shadow auction entities (JAO) and market participants. The training sessions aim to ensure that market parties are properly prepared to handle a day-ahead market decoupling incident in real operations and real-life conditions. In the future, other scenarios such as partial decoupling and situations with extreme prices will be considered. So far, training sessions have been held on 30 September 2020, 3 March 2021 and 3 November 2021.

108 Until 16 June 2021, only multi-region coupling (MRC) incidents counted.

109 See *CACM Cost Report of 2018* – https://eepublicdownloads.entsoe.eu/clean-documents/news/2019/2018%20and%202019_SDAC%20and%20SIDC_Cost%20report_vFinal.pdf; *CACM Cost Report of 2019* – https://eepublicdownloads.entsoe.eu/clean-documents/news/2020/NEMOs_TSOS_CACM_cost_report_2019_final.pdf; *CACM Cost Report of 2020* – https://eepublicdownloads.entsoe.eu/clean-documents/Network%20codes%20documents/NC%20CACM/211220_NEMO_CACM_cost_report_2020_web.pdf, and *CACM Cost Report of 2021* (forthcoming).

5.2.2. Single intraday coupling

SIDC has been operational in 15 countries since 12 June 2018. The first delivery was on 13 June 2018[110] and it was subsequently extended by the second go-live wave to seven additional countries (Bulgaria, Croatia, Czechia, Hungary, Poland, Romania and Slovenia), with the first deliveries taking place on 20 November 2019[111]. The third go-live wave on 21 September 2021 integrated the Northern Italian borders (IT–FR, IT–AT and IT–SI) as well as the Italian internal bidding zones borders into the already coupled intraday region. **Figure 21** shows the current status of SIDC markets.

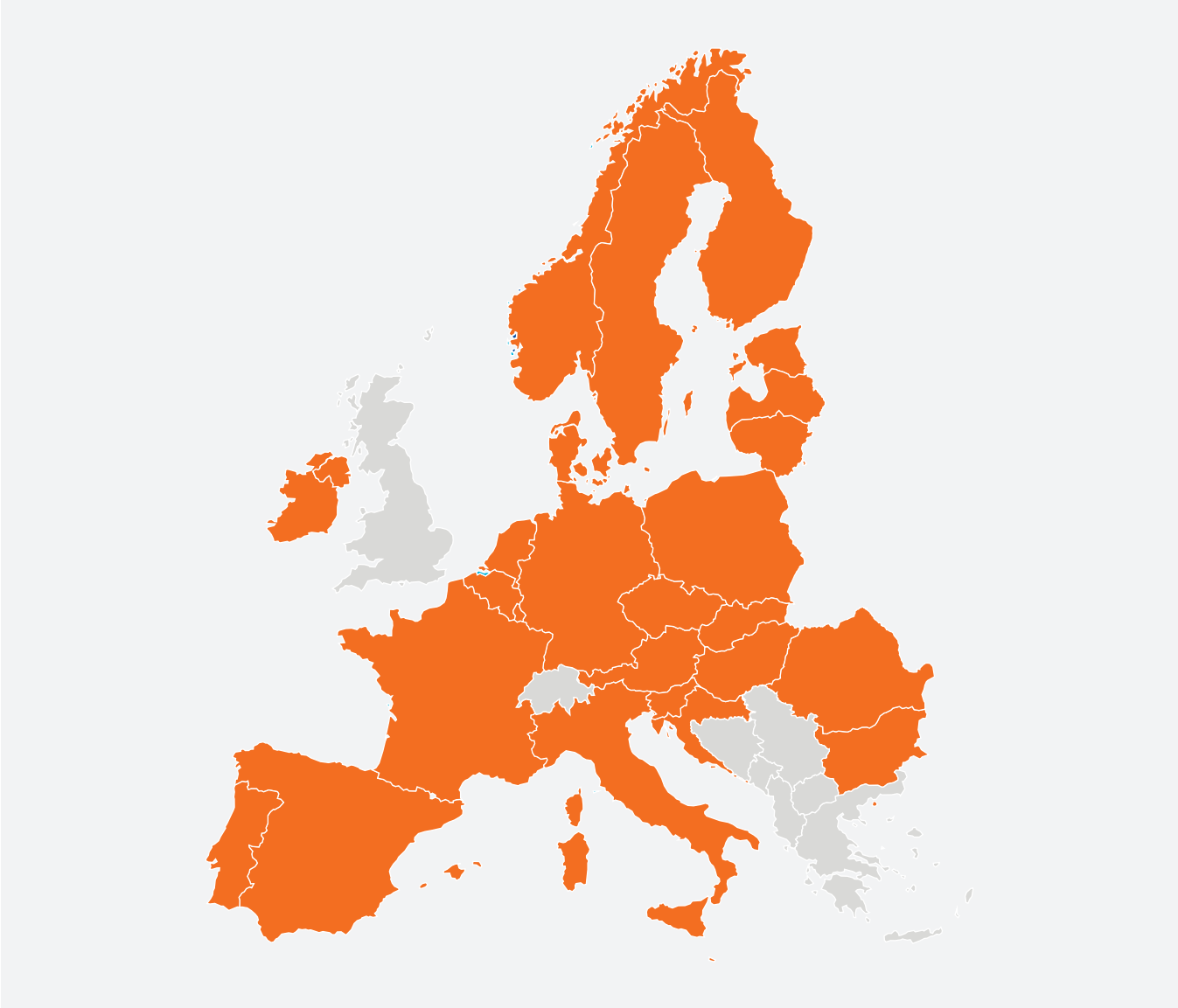


Figure 21 – Operational status of SIDC countries (as at June 2022)[112]

As at June 2022, the joint TSOs and NEMOs single intraday coupling IT system with one shared order book, the CMM and a shipping module continues to perform operationally robustly[113]. In total, almost 132 million trades have been executed within SIDC since its inception in June 2018 (counting until end of February 2022) (see Figures 22, 23 and 24).

110 See www.entsoe.eu/news/2018/06/14/european-cross-border-intraday-xbid-solution-and-10-local-implementation-projects-successful-go-live/.

111 See https://eepublicdownloads.entsoe.eu/clean-documents/Network%20codes%20documents/Implementation/cacm/xbid/20191106_%20Press%20Release%20for%20Publication.pdf.

112 Luxemburg is part of the Amprion Delivery Area. Market participants in Luxemburg have access to SIDC through the Amprion Delivery Area.

113 See www.entsoe.eu/network_codes/cacm/implementation/sidc/.

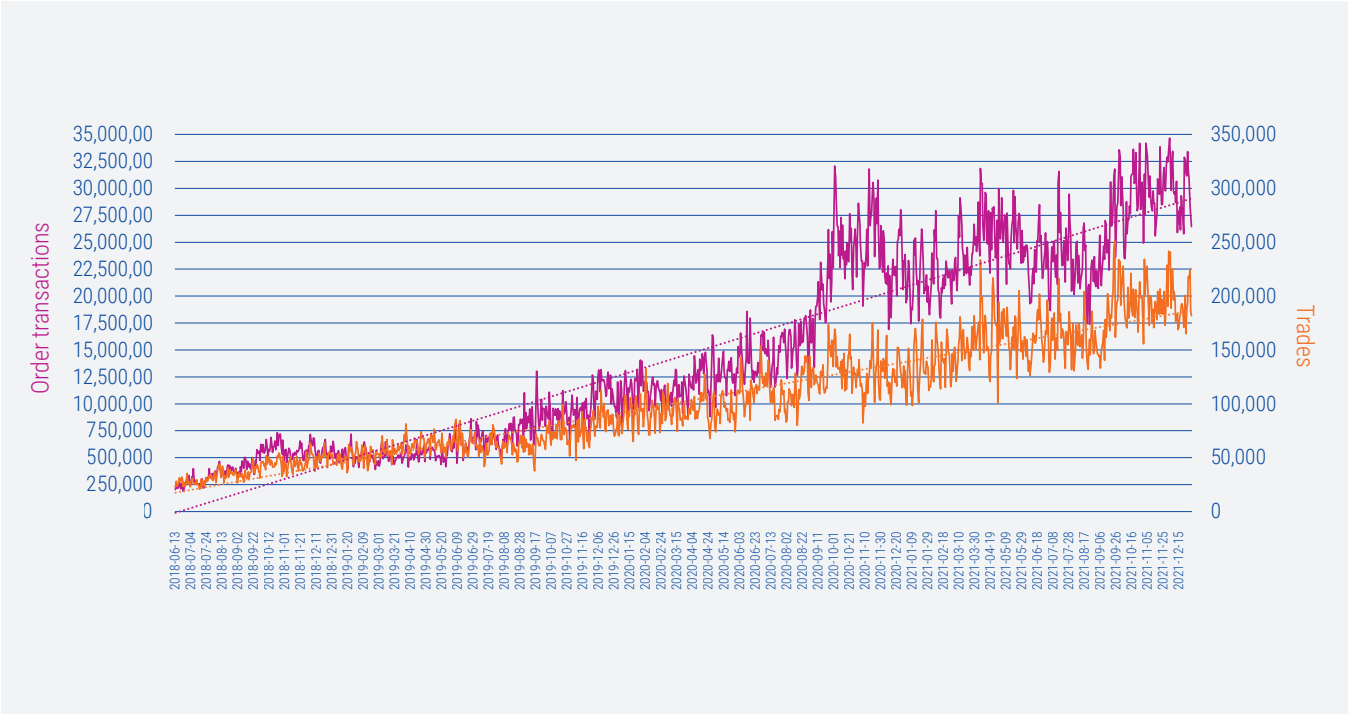


Figure 22 – SIDC order transactions/trades

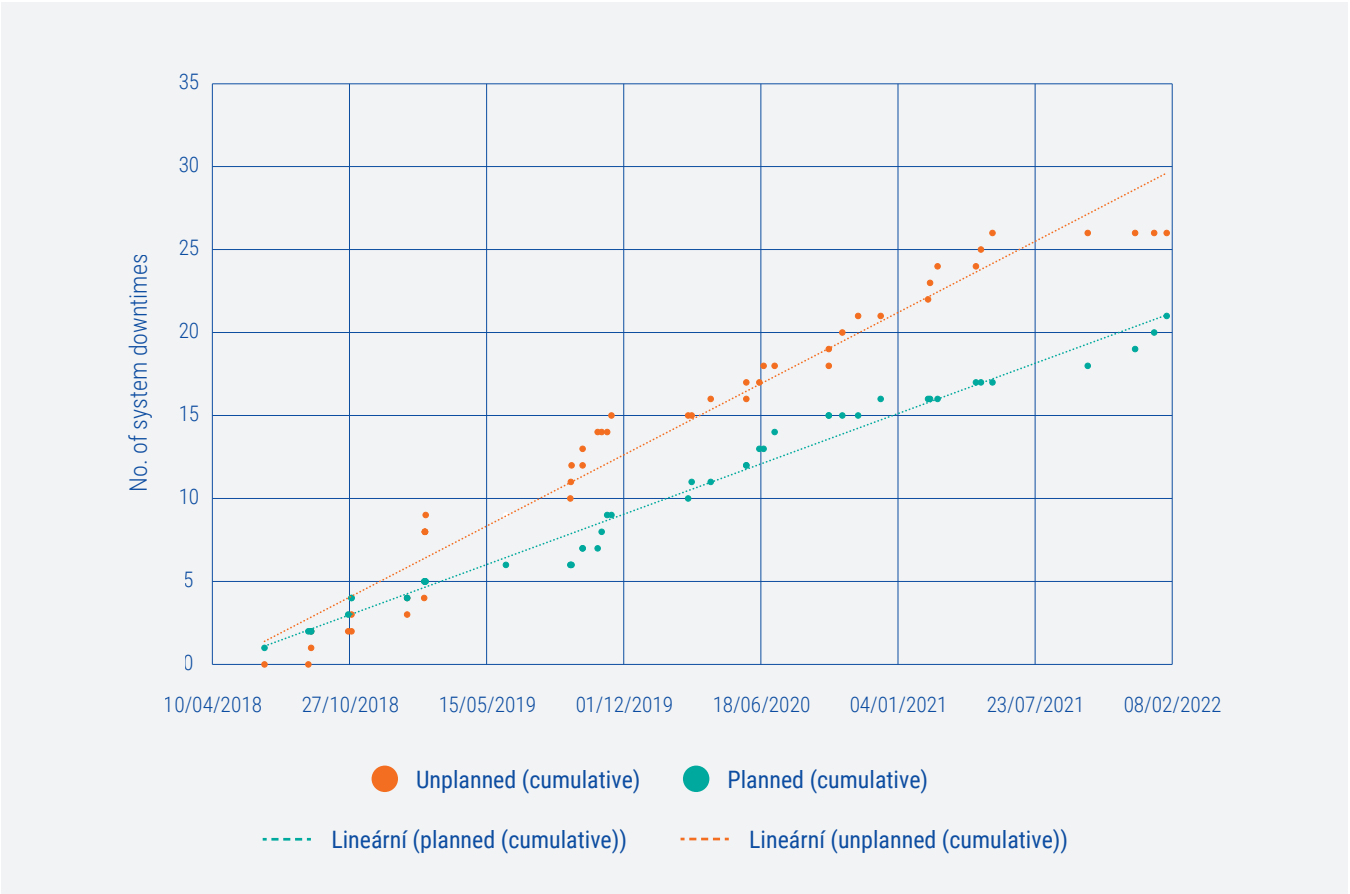


Figure 23 – Number of unplanned and planned non-availabilities of SIDC (as at February 2022)

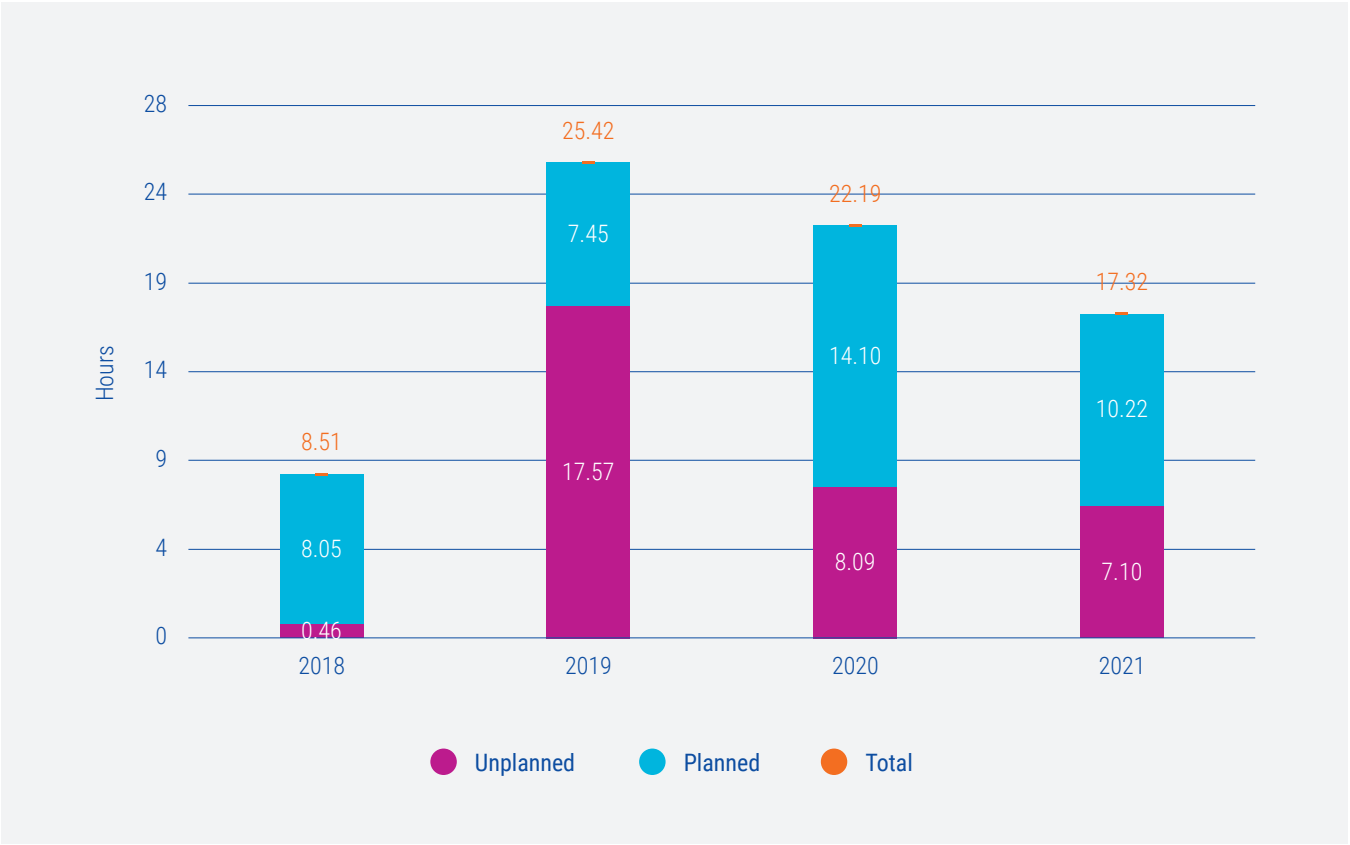


Figure 24 – Time of unplanned and planned non-availabilities of SIDC (as at December 2021)

In the period covered by this report, a fourth release (called Release 3.1) was deployed into production. This release introduces a CMM graphical user interface refresh function, which makes operation more secure. It also includes additional reporting features related to the introduction of new indicators according to algorithm monitoring requirements. It aligns existing reporting on the life cycle of orders and trades in the cross-border intraday system with REMIT requirements.

CCR	Bidding zone border	Effective gate opening time (GOT) as of time of this report	Cross-border capacities published at effective GOT	The point in time cross-border capacity is made available after effective GOT
Baltic	EE–FI EE–LV LV–LT LT–SE4	15.00 CET D-1	0	N/A
	LT–PL	15.00 CET D-1		18.00 CET D-1
Core	DE–NL FR–BE BE–NL BE–DE DE–FR DE–AT DE–PL DE–CZ CZ–PL CZ–AT HU–RO SI–AT HR–SI HR–HU	15.00 CET D-1	0	22.00 CET D-1[114]
Hansa[115]	DE–DK1 DK1–NL DE–DK2 NO2–NL PL–SE4 DE–NO2 DK1–DK2	15.00 CET D-1	0	18.00 CET D-1
Nordic	DK1–NO2 DK1–SE3 DK2–SE4 FI–SE1 FI–SE3 NO1–NO2 NO1–NO3 NO1–NO5 NO1–SE3 NO2–NO5 NO3–NO5 NO3–SE2 NO3–SE4 NO4–SE1 NO4–SE2 SE1–SE2 SE2–SE3 SE3–SE4 NO3–NO4	15.00 CET D-1	Calculated cross-border capacity	N/A

114 At the latest.

115 SE4-DE/LU is currently under the 'start-up phase' of entering Hansa CCR.

CCR	Bidding zone border	Effective gate opening time (GOT) as of time of this report	Cross-border capacities published at effective GOT	The point in time cross-border capacity is made available after effective GOT
SEE	RO–BG	15.00 CET D-1	0	16.30 CET D-1
SWE	FR–ES	22.00 CET D-1	Under the NRA's assessment	22.00 CET D-1
	ES–PT	15.00 CET D-1	Calculated cross-border capacity	15.00 CET D-1
Italian Borders	IT–FR IT–AT	15.00 CET D-1	0	22.00 CET (D-1)
	IT–SI[116]	15.00 CET D-1	0	22.30 CET (D-1)
	Italian internal borders[116]	15.00 CET D-1	Calculated cross-border capacity	N/A

Table 13 – Opening times of all currently operational borders

116 The capacity is not available during the complementary regional intraday auction (CRIDA) process.

5.3. Expenditures

TSOs and NEMOs provide an annual detailed cost report to ACER and the NRAs in accordance with Article 80 of the CACM regulation[117].

5.3.1. Single day-ahead coupling

This section provides a summary of the costs of establishing, amending and operating the SDAC, categorised by TSO-only costs, NEMO-only costs and joint costs (all TSOs and all NEMOs).

Figure 25 and Figure 26 show the budgeted and actual costs since 2017[118].

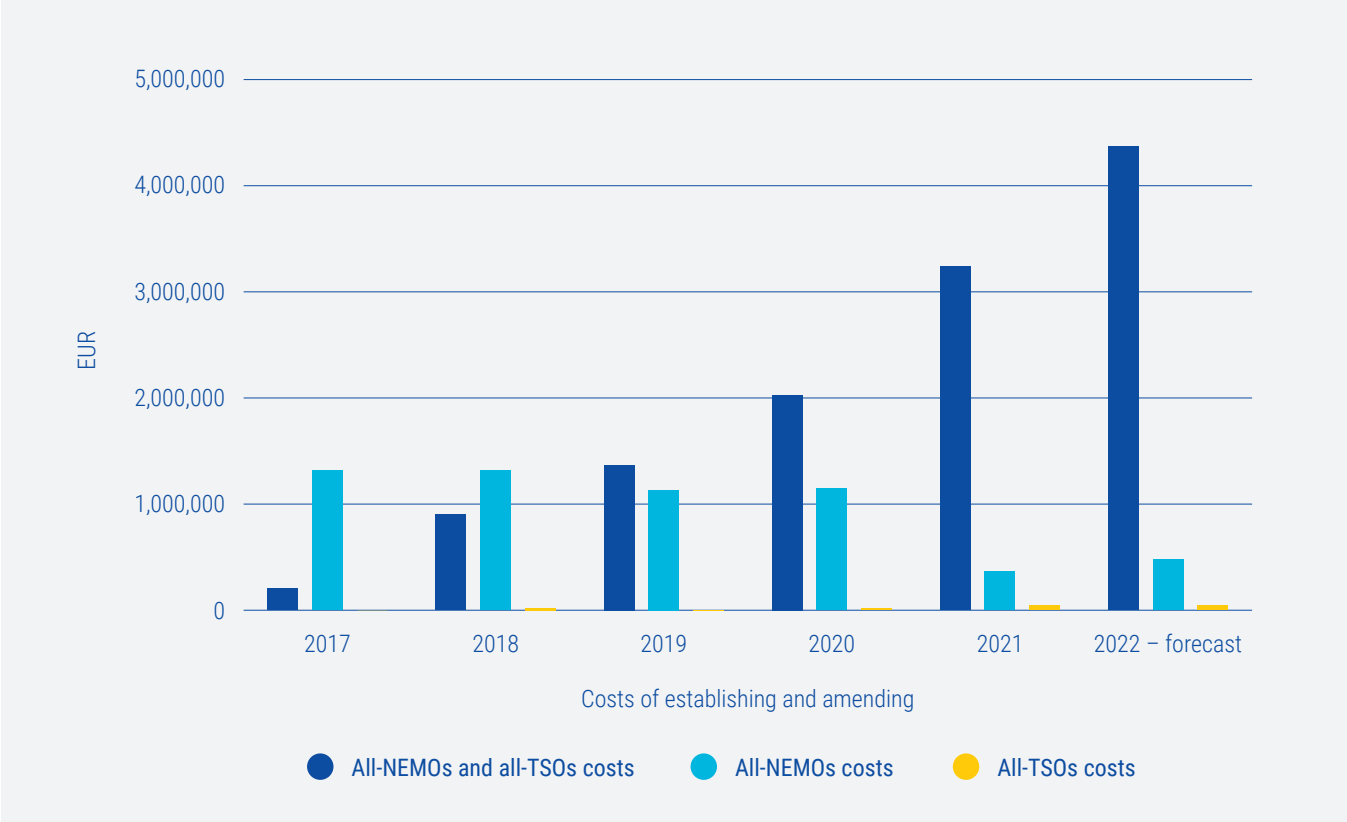


Figure 25 – Overview of SDAC for "all-TSOs costs", "all-NEMOs costs" and "all-NEMOs and all-TSOs costs" of establishing and amending

117 *CACM Cost Report of 2018* – https://eepublicdownloads.entsoe.eu/clean-documents/news/2019/2018%20and%202019_SDAC%20and%20SIDC_Cost%20report_vFinal.pdf; *CACM Cost Report of 2019* – https://eepublicdownloads.entsoe.eu/clean-documents/news/2020/NEMOs_TSOS_CACM_cost_report_2019_final.pdf; *CACM Cost Report of 2020* – https://eepublicdownloads.entsoe.eu/clean-documents/Network%20codes%20documents/NC%20CACM/211220_NEMO_CACM_cost_report_2020_web.pdf, and *CACM Cost Report of 2021* (forthcoming).

118 In line with the regulatory guidance, costs for the coupling projects are planned and shared between TSOs and/or NEMOs as of 14 February 2017.

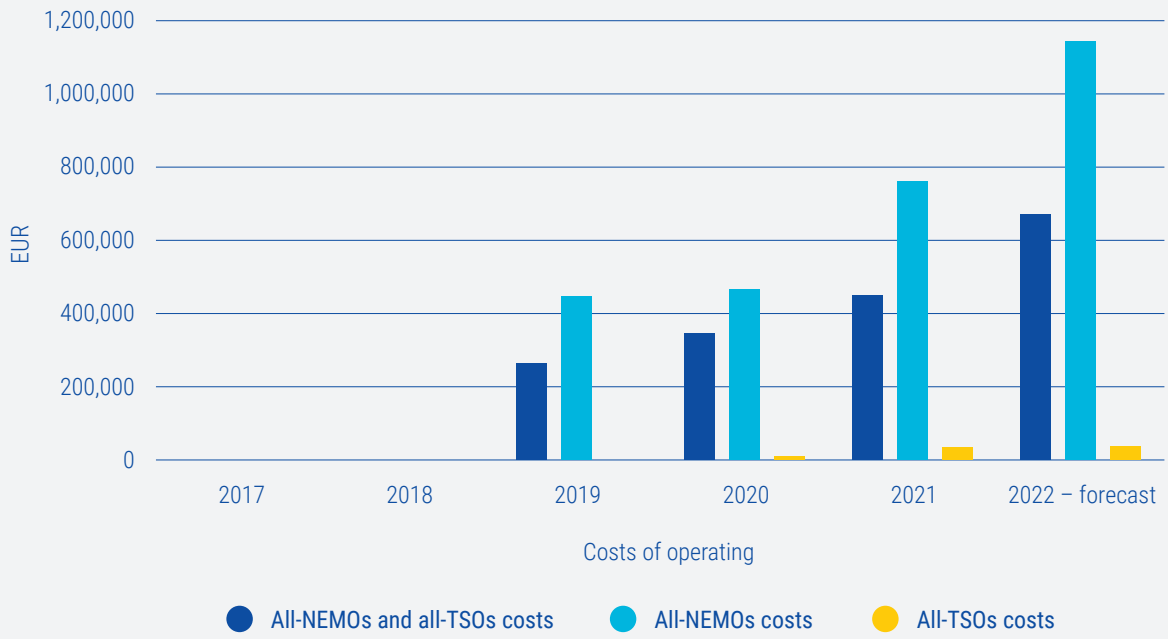


Figure 26 – Overview of SDAC for "all-TSOs costs", "all-NEMOs costs" and "all-NEMOs and all-TSOs costs" of operating

5.3.2. Single intraday coupling

This section provides a summary of common costs of establishing, amending and operating the SIDC, categorised by TSO-only costs, NEMO-only costs and joint costs. **Figures 27** and 28 show the budgeted and actual costs since 2017[119] .

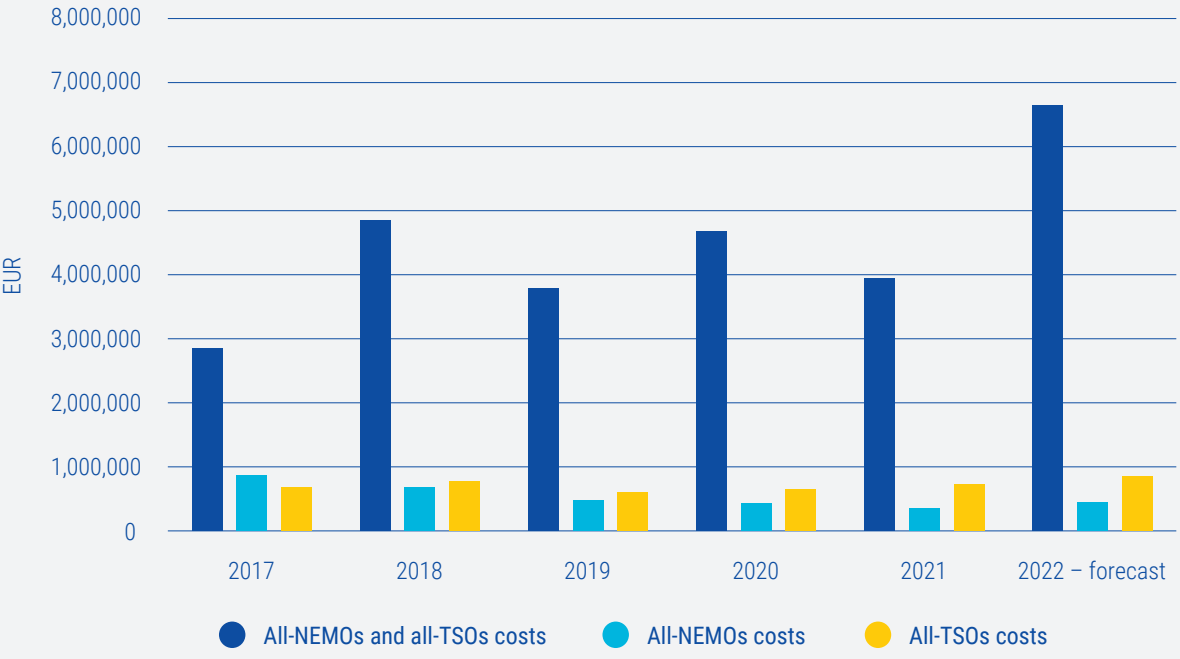


Figure 27 – Overview of SIDC for "all-TSOs costs", "all-NEMOs costs" and "all-NEMOs and all-TSOs costs" of establishing and amending

119 In line with the regulatory guidance, costs for the coupling projects are planned and shared between TSOs and/or NEMOs as of 14 February 2017.

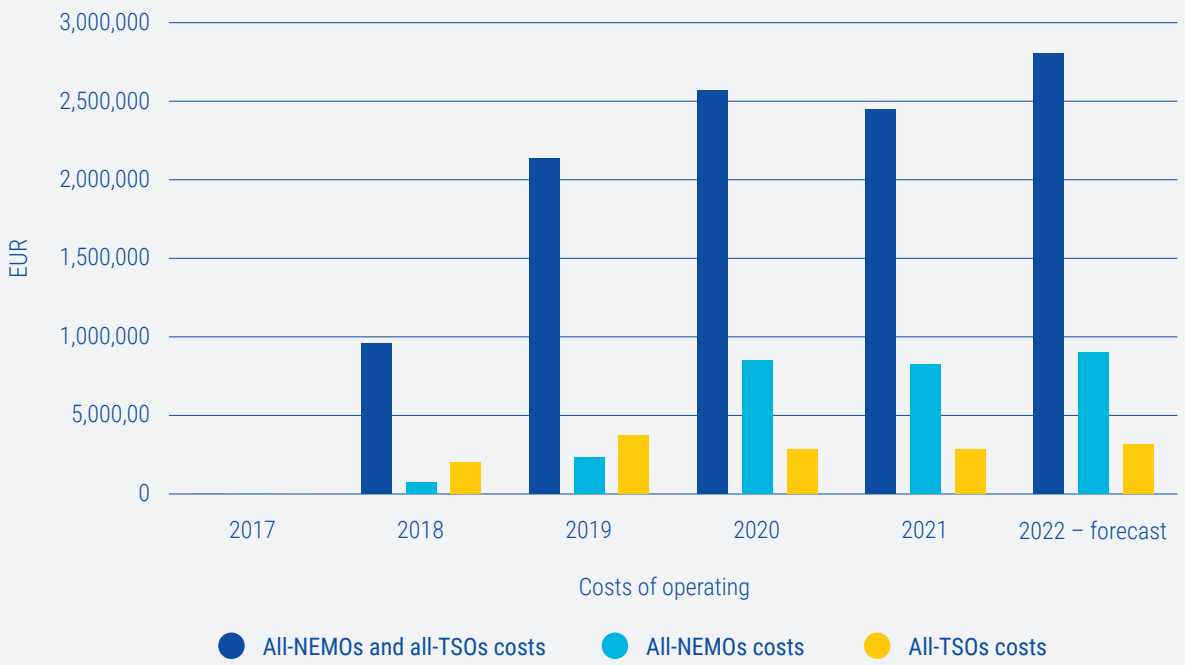


Figure 28 – Overview of SIDC for "all-TSOs costs", "all-NEMOs costs" and "all-NEMOs and all-TSOs costs" of operating

All-TSOs costs (e.g. external TSO support), all-NEMOs costs (e.g. third-party services) and all-TSOs and all-NEMOs cost (e.g. advanced SIDC solution) are governed by the respective cooperation agreements (i.e. TCID, All NEMO Cooperation Agreement [ANCA] and Single Intraday Coupling Operations Agreement).

5.4. Evolution of services

5.4.1. Single day-ahead coupling

Extensions

The SDAC is continuously being developed with respect to topology and system functionalities. Over the current reporting period, the following SDAC extensions and/or functional projects went live:

1. the operational 'merge' of MRC and 4M MC, which constitutes the SDAC enduring phase on 17 June 2021[120];
2. inclusion of the Bulgarian-Romanian border in the SDAC on 27 October 2021[121];
3. Core Flow-Based Market Coupling (Core FB MC) project on 8 June 2022.

Table 14 lists all bidding zone borders adhering to the CACM regulation that are not fully coupled (as at May 2022). The dates displayed are only indicative and do not account for unforeseen events.

120 For more information, see *Market Report 2021* and https://eepublicdownloads.azureedge.net/clean-documents/Network%20codes%20documents/NC%20CACM/210617_Press_release_successful_go-live_ICP.pdf.

121 For more information, see https://eepublicdownloads.azureedge.net/clean-documents/Network%20codes%20documents/NC%20CACM/SDAC%202021/211027_PR_successful_go-live_BG-RO_border.pdf.

CCR	Bidding zone border	Project/s	Planned go-live
Core	HU–HR	Core FB MC project	8 June 2022
Core	HU–SI	N/A	End of June 2022
To be defined	FR–SEM (representing the joint bidding zone of Ireland and Northern Ireland)	N/A	2026

SEM = single electricity market.

Table 14 – SDAC extension roadmap (as at May 2022)

In addition to the geographical extensions, various technical advancements have been planned and implemented within the period covered by this report, as part of the SDAC research and development programme.

Algorithm improvements are made through the change control procedure and NEMO algorithm methodology. Both frameworks aim to address changes efficiently with minimal disruption and controlled risk: the change control procedure sets out the process for implementing changes in the SDAC operations, while the NEMO algorithm methodology sets out transparent rules and principles for the management (submission, evaluation, decision and implementation) of requests for changes related to the SDAC algorithm (EUPHEMIA).

Since its launch, EUPHEMIA has been continuously developed further. With the latest releases, changes such as shadow prices for maximum import and export allocation constraints, functionalities to support Core FB MC, and the calculation of aggregated curves have been implemented.

Multi-NEMO arrangement

The functionality of handling multiple NEMOs in and between bidding zones was first utilised in the CWE CCR in July 2019. Since then, this functionality has been sequentially introduced in the Nordics (June 2020), for the Hansa CCR (for NorNed in November 2020; for the Cobra cable and the Danish borders in June 2021), in Poland (for the SwePol cable and LitPol Link in February 2021 and for the remaining borders in June 2021), and the Italian Borders Working Table (IBWT) (June 2022). The Baltic CCR is also a multiple-NEMO region. However, so far only one NEMO is active and arrangements for handling multiple NEMOs have not been activated.

Changes of operational timing

In June 2021, a change of operational timing was implemented, which allows 10 additional minutes for the day-ahead algorithm calculation.

To secure robust and reliable operations in the period to come, SDAC investigated mitigation measures. These will provide more time for the daily operational process in case of incidents and reduce the risk of partial and full decoupling. The most promising measure to obtain some additional time was the removal of the second auction process in CWE and Hungary from the fallback operational process in case of a full decoupling. So far there have been no full decouplings, but in the daily operational (fallback) process 20 minutes are always reserved for running second auctions in the very unlikely event of this happening. The existing second auction process will continue to be facilitated in all other cases. The 20 minutes gained will be used by TSOs and NEMOs to solve issues in the market coupling process. The new operational timing was implemented together with the Core FB MC go-live on 8 June 2022.

Both changes had an impact on the shadow auction rules and on fallback procedure methodologies for some of the CCRs (Core, Italy North, Greece-Italy, SWE and Channel). The updated documents were submitted to the relevant NRAs and approved before the new operational timings were put in place.

Implementation of a 15-minute market time unit considering the granted 15-minute imbalance settlement period derogations

Article 8(2) of the CEP requires that NEMOs provide market participants with the opportunity to trade in energy in time intervals which are at least as short as the ISP for both day-ahead and intraday markets.

Furthermore, according to the EB Regulation, TSOs should apply an ISP of 15 minutes in all scheduling areas. The deadline for introducing this ISP in all scheduling areas was 1 January 2021, unless regulatory authorities had granted a derogation or an exemption. Article 8 of the EU Electricity Regulation obliges NEMOs to provide market participants with the opportunity to trade energy in time intervals that are at least as short as the ISP for both day-ahead and intraday

markets. The NEMO algorithm methodology (Article 4(14)(d)) states that NEMOs are obliged to implement 15-minute products together with other future requirements by August 2022. Consequently, a project has been established under the SDAC Joint Steering Committee to coordinate the implementation of 15-minute products in the day-ahead time frame across the EU (15-minute MTU implementation).

Figure 29 illustrates the current status of ISP readiness/derogations in each country.

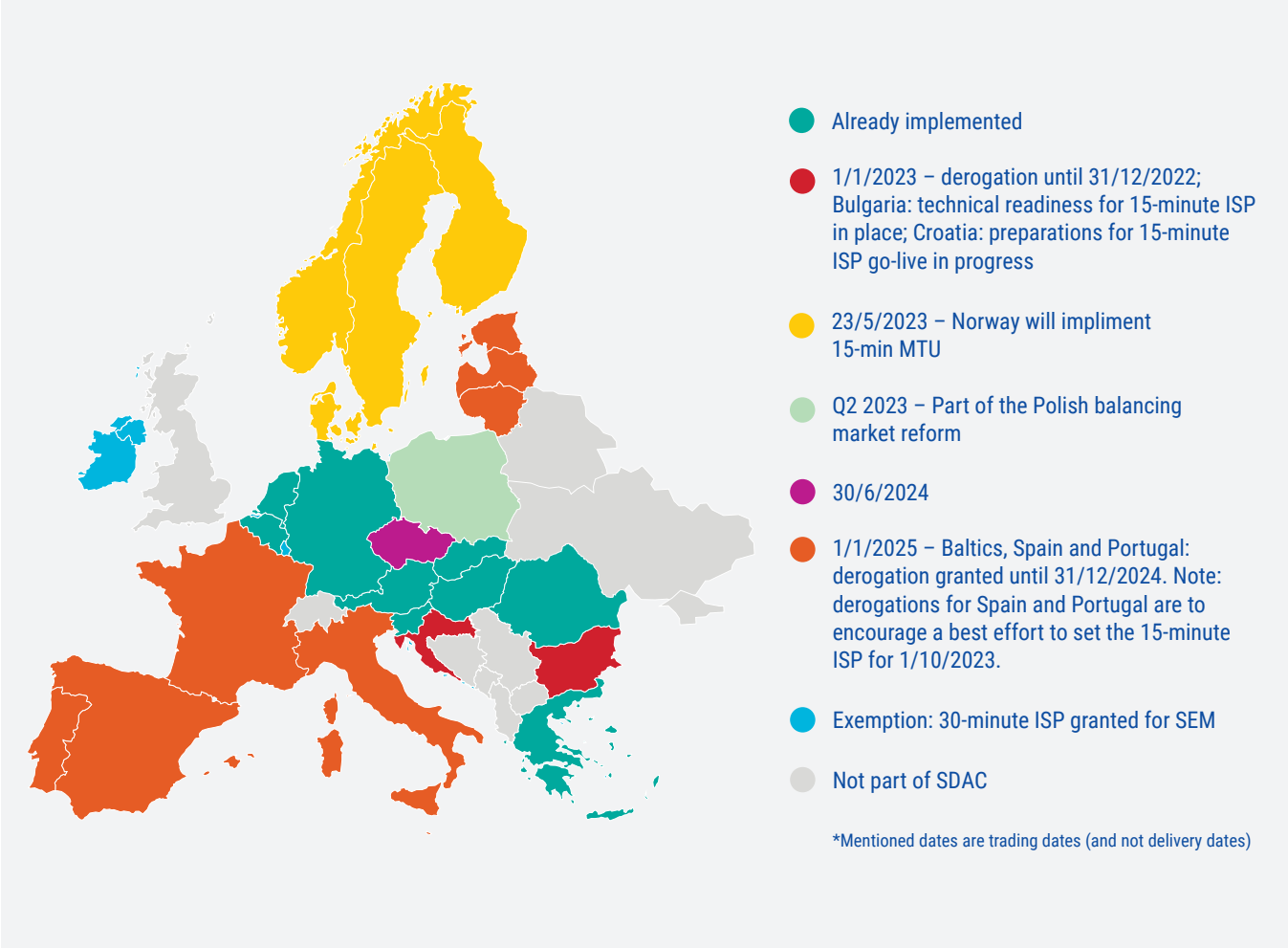


Figure 29 – 15-minute ISP readiness/derogation status map (as at May 2022)

NRAs decided on gradual implementation of 15- or 30-minute ISPs, which also requires cross-matching[122] (product cross-matching and network cross-matching[123]).

Given the impact on the whole chain of market coupling processes, regional implementation projects were established. Regional implementation projects are expected to go live in consecutive waves. The first go-live wave is expected for the first half of 2024. If a party is not ready to join a particular go-live wave, it will be able to join the subsequent wave.

The description of the changes to EUPHEMIA required to process 15- and 30-minute products in addition to hourly products was finalised in 2021. Implementation of this functionality is planned for the EUPHEMIA release in the third quarter of 2022. This will be done in close coordination with the SIDC, which will use the same algorithm version for testing the intraday auctions.

In parallel, the SDAC is working on the performance and scalability of the algorithm and the cross-matching functionality technical design, as part of the research and development programme. The latest diagnosis study results indicated that big performance challenges remain even if some difficulties or requirements are eliminated. The challenges identified will be further investigated. At the end of 2021, concrete actions were initiated to optimise the future performance of EUPHEMIA in order to support the

122 This means that products can be matched with different time granularities.
123 Possibility to define network constraints under different time granularities.

implementation of the 15-minute MTU functionality in SDAC.

Research and development programme

A significant part of the SDAC budget is spent investigating ways to improve the performance of the algorithm so that it can accommodate all required changes. Research is carried out under the umbrella of the EUPHEMIA Lab programme, which shows positive results overall and is leading to the industrialisation of promising improvements in the algorithm. Some improvements have already been implemented in 2021.

The improvements to be implemented over the next few years will be challenging and require SDAC to revisit the current design. This applies, in particular, to the 15-minute MTU, cross-matching functionality, the implementation of a co-optimisation balancing allocation, increased volume of trades and flow-based in the Nordic CCR. Heuristics or distributed computing are considered an intermediary mid-term solution but are not expected to improve performance up to the required level to handle the 15-minute MTU implementation. Ongoing discussions within SDAC foresee a disruptive solution to meet these and other challenges in the long term. Non-uniform pricing has been identified as the most promising option.

Flow-based capacity allocation

In line with the legal requirements, flow-based market coupling (FBMC) will be sequentially extended beyond the CWE CCR, where it went live in May 2015. On 8 June 2022, the Core CCR, comprising the former CWE CCR and CEE CCR, introduced FBMC. Following this go-live, evolved flow-based is planned to be implemented in the Nordic CCR during 2023. Other CCRs will follow in the years thereafter, in line with the requirements of the respective CCMs.

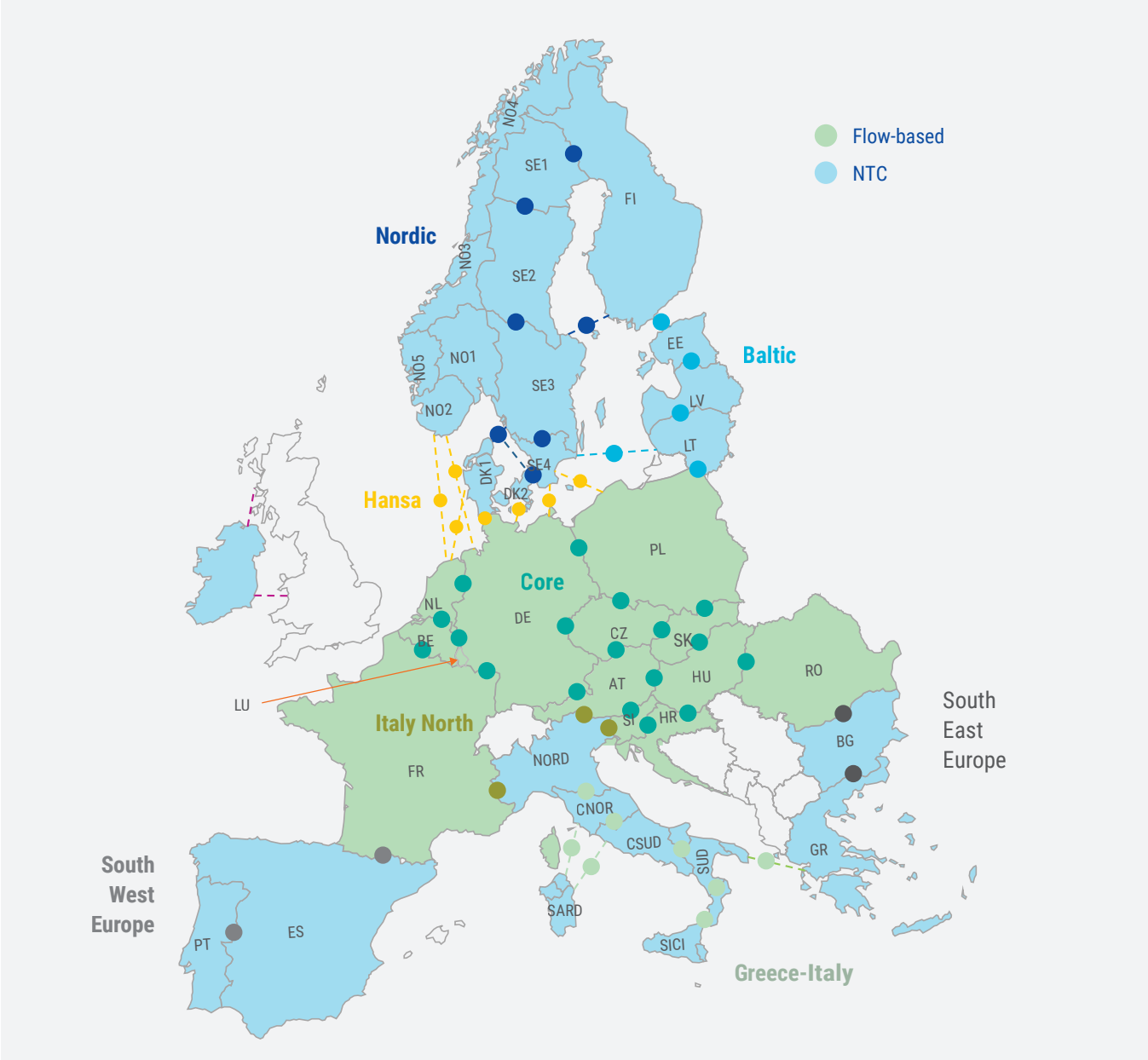


Figure 30 – Flow-based capacity allocation

5.4.2. Single intraday coupling

Extensions

The SIDC is continuously being developed with respect to topology and system functionalities. The next SIDC topology extension is the planned go-live of the fourth wave, which aims to integrate the Greek borders (GR–IT and GR–BG) and Slovak borders (SK–CZ, SK–HU and SK–PL).

- The SIDC integration of Greece has been postponed and it was decided to merge the integration of Greek borders with integration of Slovak borders.
- The integration of Greece is governed under SIDC LIP14 with the aim of integrating the GR–IT and GR–BG bidding zone borders into SIDC, and involves the TSOs[124] and NEMOs[125] of Bulgaria, Greece and Italy.
- The integration of Slovakia is governed under SIDC LIP17 with the aim of integrating the CZ–SK, PL–SK and SK–HU bidding zone borders into SIDC and involves the TSOs[126] and NEMOs[127] of Czechia, Hungary, Poland and Slovakia.
- This project is expected to go live in the last quarter of 2022.

CCR	Bidding zone border	Project	Planned go-live date
Greece-Italy	IT–GR	LIP 14	Q4 2022
SEE	GR–BG	LIP 14	Q4 2022
Core	CZ–SK	LIP 17	Q4 2022
Core	SK–HU	LIP 17	Q4 2022
Core	PL–SK	LIP 17	Q4 2022

LIP = Local Implementation Project.

Table 15 – Overview of all the SIDC extensions described

New functionalities

The development of the market and a geographical extension contribute to an increase in system performance needs. The performance is constantly monitored and improved if needed. Analysis of the first set of performance optimisation measures was finalised and will be implemented as part of the next release (R3.3), which is scheduled for the third quarter of 2022. SIDC is also planning a major release (R4.0) for which scoping is ongoing.

(a) **European intraday auctions**

The current SIDC continuous trading mechanism does not allow for congestion rent generation. Consequently, the transmission capacity is not priced; any remaining or newly released capacity after the day-ahead market clearing is allocated for free, on a first-come first-served basis.

Work on the implementation of intraday auctions to enable capacity pricing as stipulated in the CACM regulation has been carried out under SIDC responsibility. The detailed design for the integration of the continuous (SIDC, cross-border intraday project) and the day-ahead auction infrastructure (price coupling of regions) has been finalised by SIDC. The provider of the intermediary module between the cross-border intraday project and the NEMOs, the intraday auction central interface point (IDA CIP), was selected, and a discussion on the analytical documents was initiated. The change request was drafted and provided to SDAC. Initial conceptual tests are being prepared, and regional implementation projects scoping and set-up are ongoing. An overall testing approach discussion was completed on the SIDC side; the next iteration with the involvement of SDAC is ongoing.

(b) **Cross-product matching**

The purpose of the cross-product matching feature is to enable products with different delivery periods to be matched and involves matching one order with several

124 Terna, ESO and IPTO.
125 Gestore dei Mercati Energetici SpA (GME), IBEX and HEnEx.
126 ČEPS, MAVIR, PSE and SEPS.
127 EPEX SPOT, EMCO, HUPX, OKTE, OTE and TGE.

others. It enables the matching of 15-minute and 60-minute products, 30-minute and 60-minute products, 15-minute and 30-minute products, and any combination of these (such as two 15-minute products and one 30-minute product with one 60-minute product).

The design of central system changes with the SIDC service provider is largely finalised. The first part of the design has been completed, and the development of the first part of this functionality (minimum viable product) started in September 2021 ahead of the original schedule. The expected impact on performance remains a significant challenge and is therefore closely monitored through a staged development process, in which development slices are validated by SIDC parties before development continues. Regulators have been regularly informed about the challenges related to cross-product matching. SIDC will organise a stakeholder event to inform market participants of the forthcoming changes once the design is sufficiently developed.

The 60-minute cross-border products are available by default. Several bidding zones have implemented additional border adaptations to extend cross-border trading opportunities for smaller granularity – 15- and 30-minute cross-border products (see **Figure 31**).

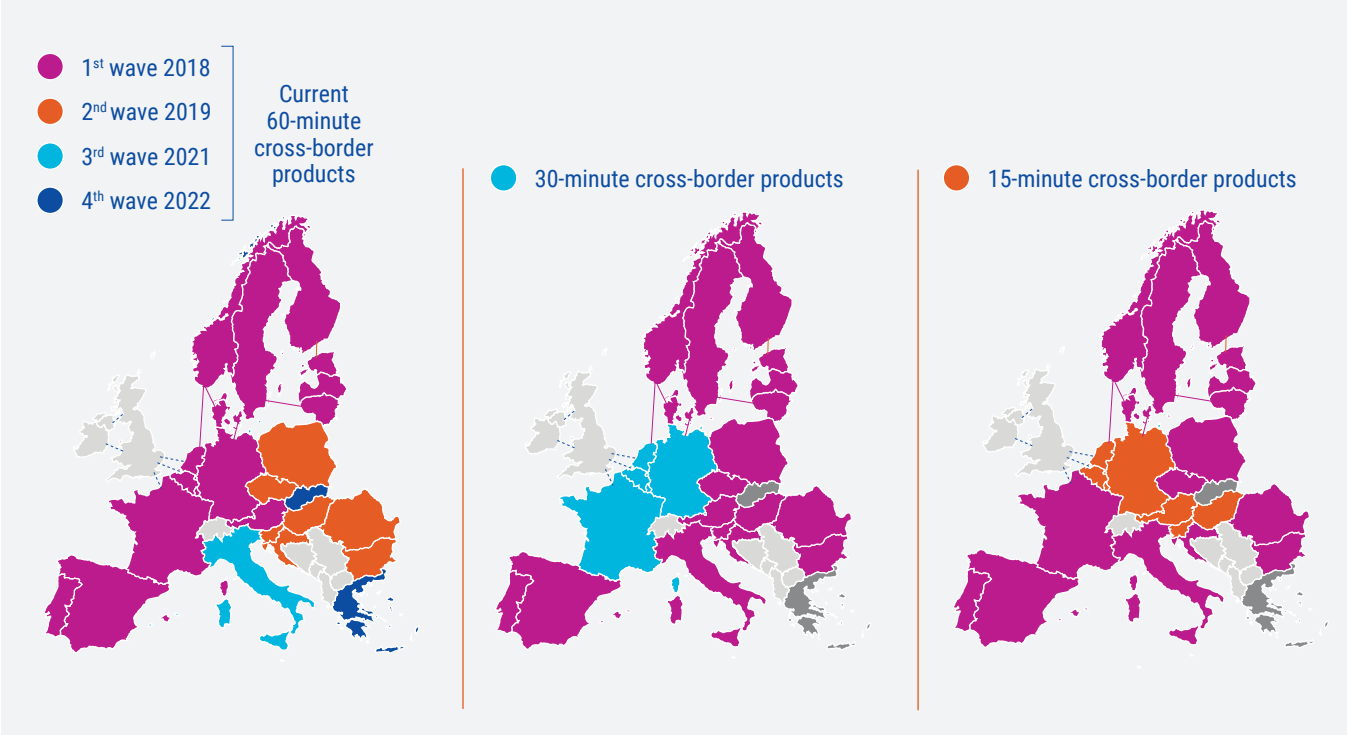


Figure 31 – Map of the implementation of 30-minute and 15-minute cross-border products

(c) Flow-based allocation in continuous trading

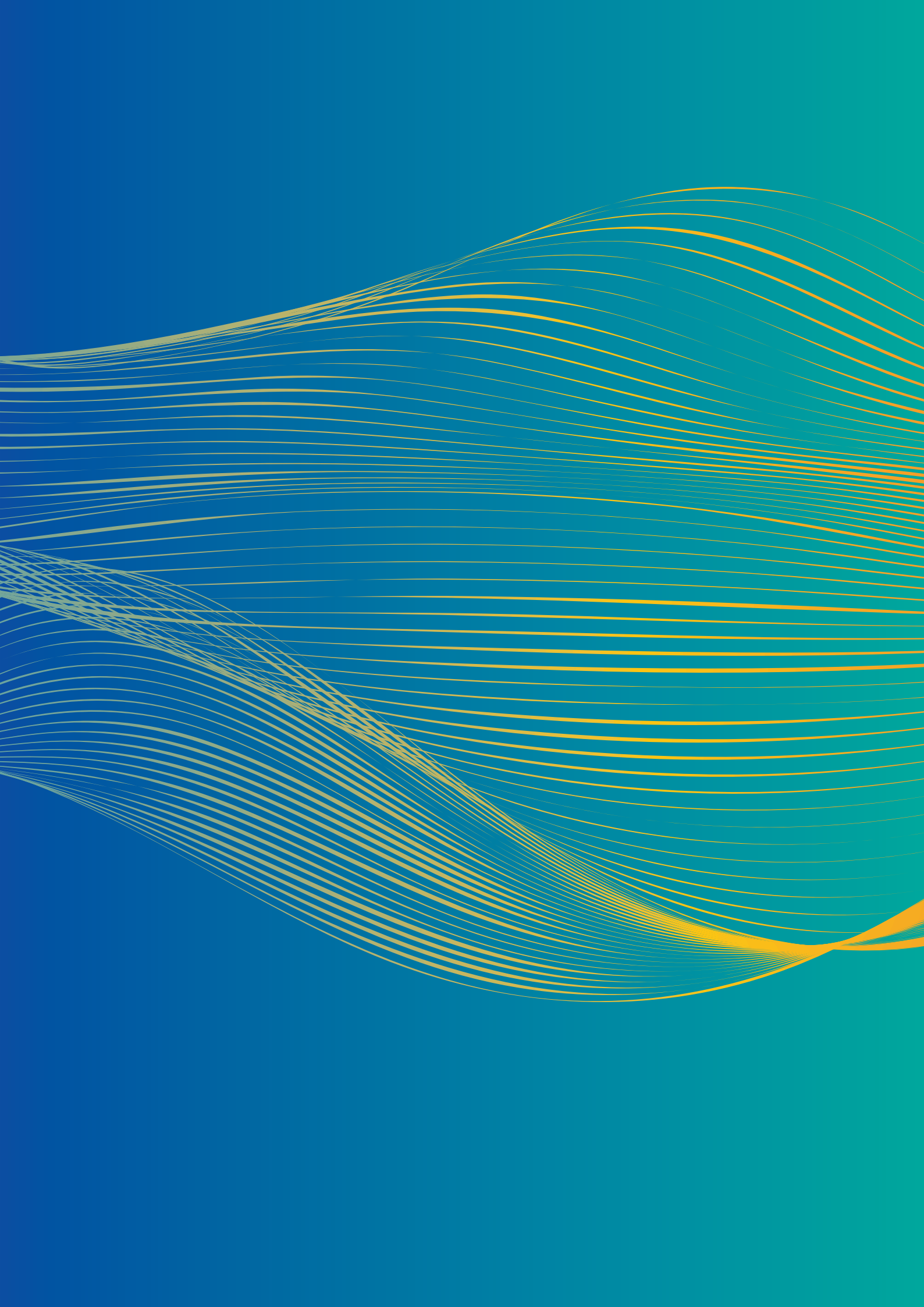
SIDC is required to implement flow-based allocation by August 2023. Two CCRs within the SIDC are currently implementing flow-based: Core and Nordics. The draft of the high-level design has been prepared on the project level. A detailed design review with the IT provider will be launched in the next step, including proof of concept and performance analysis.

(d) Transit shipping: a short-term and enduring solution

Following the request made by ACER (Board of Regulators), the interim rotational scheme for transit shipping is in operation until a long-term shipping solution is implemented. To decide on a long-term shipping solution, the NRAs asked the SIDC parties to conduct a cost-benefit analysis on the feasible options. This analysis was delivered by SIDC in three parts, the last of which was submitted to the NRAs in April 2021. Exchanges with NRAs/ACER continued to prepare the decision on the enduring shipping option, which is dependent on the finalisation of the CACM 2.0 amendment process and will be impacted by the implementation of the flow-based allocation.

(e) Implicit intraday losses

In line with algorithm methodology requirements, the continuous trading matching algorithm shall incorporate losses on interconnectors between bidding zones during capacity allocation. Applying the losses will, in most cases, require regulatory approval. Implicit losses prevent electricity from flowing on the interconnector if the price difference between adjacent bidding zones is lower on the losses on the interconnector. As at spring 2022, a solution in the intraday time frame is still being designed, and high-level design adjustments were proposed. A detailed design review with the IT provider will be launched.



6. Balancing markets

The European harmonisation of balancing markets and the implementation of the frameworks and methodologies are organised in various projects and cooperations. The European platforms for the exchange of balancing energy play a key role in their implementation and are described in detail in section 6.1.

Following the EB Regulation, the TSOs define the allocation process of CZC for the exchange of balancing capacity or sharing of reserves through the establishment of a cooperation of two or more TSOs.

6.1. European platforms for the exchange of balancing energy

The EB Regulation lays out a detailed set of rules for the integration of the balancing energy markets in Europe. A core element of this regulation is the establishment of platforms for the operation of IN and the exchange of balancing energy from FRRs and RRs, so that the balancing demand in each country is met by activation of the overall economical bids in Europe under consideration of operational security constraints. TSOs of these countries are required to implement these common European platforms. Each one of the platforms is designed and implemented after one of the following projects:

- TERRE for the RR platform;
- the Manually Activated Reserves Initiative (MARI) for the mFRR platform;
- PICASSO for the aFRR platform;
- the IGCC for the IN platform[128].

6.2. Framework to implement and operate the platforms

See *Market Report 2021* for an overview of the contractual agreements scheme linked to the respective platforms' implementation frameworks[129].

As a reminder, the contractual agreements are composed of:

(a) all TSOs' overarching principal agreement common to all the platforms;

(b) a cooperation agreement between participating TSOs, specific to each platform;

(c) common service provider agreements signed with Amprion (as host TSO of the MARI platform), TransnetBW (as host TSO of both the PICASSO and IGCC platforms) and ČEPS (as host TSO of the CMM module).

The aim of this contractual scheme is to exploit TSOs' synergies and expertise as much as possible, based on a collaborative approach.

A key milestone for the PICASSO and IGCC platforms is the transition of IGCC to using the same IT tool as PICASSO, scheduled for the second quarter of 2022.

Besides this, different platform-specific contracts focused on

128 The IN platform, contrary to the other platforms presented in this chapter, is not for the exchange of balancing energy, but for IN.

129 Pp. 74–75. Available from https://ee-public-nc-downloads.azureedge.net/strapi-test-assets/strapi-assets/ENTSO_E_Market_report_2021_2e499deda8.pdf.

invoicing tasks have been developed in cooperation with JAO throughout 2021 and the first quarter of 2022. According to these contracts, JAO will serve as a common invoicing entity for the whole set of aFRR, mFRR and RR balancing energy processes. JAO is already carrying out the invoicing function for both the FSkar process since 1 June 2021 (Fskar go-live for continental Europe) and the RR process since the TERRE go-live in the first quarter of 2020.

To improve the management of CZC available for balancing purposes in the different time frames, CMM design development has been carried out throughout 2021. Currently, two implementation phases are foreseen and the CMM go-live is expected around the third to final quarter of 2023:

(a) a first phase where CMM will use residual capacity remaining after intraday market or from previous balancing energy platform available transfer capacity allocations for the next balancing energy platform, while also considering the CZC allocation outputs;

(b) a second phase where CMM will improve the real-time management of capacities for connected TSOs by implementing the affected TSO procedure. The further development of the CMM will also take into account the outputs of the CCR harmonised CCMs.

6.3. Replacement reserves platform

The TERRE project was designated to implement the platform for exchanging replacement reserves in line with the EB Regulation. The primary objective of the RR platform is to coordinate the activation of reserves among TSOs. By doing so, TSOs are able to minimise FRR activation, using slow balancing energy bids activated in advance to counteract forecasted system imbalances. Contrary to FCR and FRR, not all TSOs in Europe use RR products.

Further information on the RR platform can be found in Chapter 6 of the *Market Report 2021*[130].

Main achievements during the covered period (June 2021 to May 2022)

The RR platform (TERRE) has been operational since January 2020. Since then, six TSOs have been connected to the platform, with the latest connection taking place in January 2021. The TERRE project is continuously working towards enabling stable operations and improving the optimisation algorithm, to better align it with current market characteristics. In parallel, the TERRE project is preparing connection of the TSO PSE (Poland), which is foreseen for the first half of 2023 (which will allow regional RR energy exchange between ČEPS and PSE).

Another of the TERRE project's main contributions is its cooperation with MARI and Nordic LIBRA projects. The aim of this is to identify synergies on the intended adaptations, and make use of the lessons learned from the TERRE project and RR platform operations for more recent projects.

Finally, to reflect the evolutions of the platform, the TERRE project has initiated two amendments to the RRIF. The first amendment was approved by RR NRAs on the 18 October 2021 and the second amendment was submitted to RR NRAs on 31 March 2022. Further information on the approval of the amendments can be found in section 3.3 of this report.

6.4. Frequency restoration reserves with manual activation platform

General information

Since 2017, the MARI project has been responsible for implementing the European mFRR platform. According to the EB Regulation, July 2022 is the legal deadline for the go-live of the platform. On 26 April 2022, the Electricity Balancing Implementation Group (EBIG) was informed by the MARI project that the go-live will be delayed. A go-live window from mid-August to mid-September 2022 was announced. At the time of this report, the go-live date is expected to be confirmed by the end of July.

All TSOs will use the mFRR platform to submit standard mFRR balancing energy bids, exchange mFRR balancing energy bids, and strive to fulfil their corresponding balancing energy needs.

Due to the participation of all EU TSOs from all synchronous areas, as requested by the EB Regulation, the MARI project is the largest implementation project in terms of the number of TSOs involved.

130 Pp. 76–84. Available from https://ee-public-nc-downloads.azureedge.net/strapi-test-assets/strapi-assets/ENTSO_E_Market_report_2021_2e499deda8.pdf.

Further information on the design of the MARI platform can be found in Chapter 3 of *Balancing Report 2020*[131].

Main achievements

Between June 2021 and May 2022, the following main goals have been achieved in the scope of the MARI project:

- updated accession roadmap and other stakeholder engagement;
- finalisation of the go-live release design and testing;
- finalisation and signature of the agreement on the transfer and co-ownership of intellectual property rights relating to LIBRA software and the TSO-TSO Invoicing Agreement;
- transparency reporting design.

The main achievements are further detailed in section 3.1.1 of *Balancing Report 2022*.

Governance

The governance of the MARI project was updated in the first quarter of 2022, including the transition of the Testing Task Force to a Testing Working Group due to the extended scope of the body. Further information on the organisation structure of the MARI project can be found in Chapter 3 of *Balancing Report 2022*.

Expenditures

2021 saw a steep increase in expenditures from 2020, which can be explained by the fact that development activities ramped up significantly in 2021, and that intellectual property rights costs for the LIBRA software were included in the 2021 budget. An overview of the expenditures of the MARI project can be found in Chapter 3 of *Balancing Report 2022*.

Implementation timeline and TSOs accession roadmap

According to the mFRR implementation framework, all TSOs shall establish the roadmap for the implementation of the mFRR Platform and update it regularly, at least twice per year. This information, including national derogations details, is included in section 3.1.1. of *Balancing Report 2022*. Further detailed information can be found in the fifth accession roadmap developed by TSOs[132].

Further detailed information on implementation and TSO accession can be found in *Balancing Report 2022*.

6.5. Frequency restoration reserves with automatic activation platform

General information

The PICASSO project is leading the design and implementation of the aFRR platform, which comprises 30 TSO members and observers. Since 2017, the PICASSO project has been responsible for TSOs implementing the aFRR European platform. According to the EB Regulation, the legal deadline for the go-live of the platform is 24 July 2022. All TSOs will use the aFRR platform to submit all standard aFRR balancing energy bids, exchange all aFRR balancing energy bids, and strive to fulfil all their corresponding balancing energy needs.

The PICASSO project leads the development of the aFRR platform in close coordination with other implementation projects via ENTSO-E and the IGCC project (see section 6.6 of this report).

Further information on the governance or the high-level design can be found in *Market Report 2021*[133] and *Balancing Report 2020*[134]. These reports also provide further details regarding (optimisation) functions, and aFRR standard products and bids.

131 Pp. 15–16. Available from https://eepublicdownloads.azureedge.net/clean-documents/Publications/Market%20Committee%20publications/ENTSO-E_Balancing_Report_2020.pdf.

132 *mFRR-Platform Accession Roadmap* – https://eepublicdownloads.entsoe.eu/clean-documents/Network%20codes%20documents/NC%20EB/2022/MARI_Accession_roadmap_April_2022_Update_Final.pdf.

133 Pp. 90–94. Available from https://ee-public-nc-downloads.azureedge.net/strapi-test-assets/strapi-assets/ENTSO_E_Market_report_2021_2e499deda8.pdf.

134 Pp. 19–20. Available from https://eepublicdownloads.azureedge.net/clean-documents/Publications/Market Committee publications/ENTSO-E_Balancing_Report_2020.pdf.

Main achievements

Between June 2021 and May 2022, the following main goals were achieved in the scope of the PICASSO project:

- updated accession roadmap and other stakeholder engagement;
- finalisation of the go-live release design and testing;
- completion of factory acceptance tests and site acceptance tests in line with different interoperability tests;
- development of a transparency and reporting concept for stakeholders.

The main achievements are further detailed in section 3.1.2 of *Balancing Report 2022*.

Expenditures

2021 saw an increase in expenditures from 2020, because the development and testing activities ramped up significantly in 2021 close to go-live.

An overview of the expenditure of the PICASSO project can be found in Chapter 3 of *Balancing Report 2022*.

Implementation timeline and TSOs accession roadmap

According to the aFRR implementation framework, all TSOs shall establish the accession roadmap[135] for the implementation of the aFRR Platform and update it regularly, at least twice per year. This information, including national derogations details, is included in section 3.1.2 of *Balancing Report 2022*.

6.6. Imbalance netting process platform

Imbalance netting is the process agreed between TSOs of two or more LFC areas that prevents the simultaneous activation of aFRR in opposite directions. This is done by taking into account the respective frequency restoration control errors as well as the activated FRR, and by correcting the input of the involved frequency restoration processes accordingly.

The IN platform performs imbalance netting of aFRR. In other words, the goal of the IN platform is to reduce the inefficient counter-activation of balancing reserves.

Further information on the IN implementation framework can be found in Chapter 3 of *Market Report 2020*[136] and section 6.1.5 of *Market Report 2021*[137].

Main achievements during the covered period (June 2021 to May 2022)

The establishment of a common European platform for operating IN has been officially achieved by the legal deadline of 24 June 2021, following the successful completion of all requirements as defined in Article 22 of the EB Regulation[138], and established in the implementation framework for a European platform for the IN implementation framework[139].

The IGCC project continues working towards enabling the accession of the remaining continental European TSOs, to further increase efficiency and operational security in the European power system. In that vein, the Greek TSO, IPTO, began its operational participation in IGCC in June 2021, followed by the Romanian TSO, Transelectrica, in December 2021. At the time of this report, two TSOs are foreseen to connect to the platform in the coming months: EMS (Serbia) in April 2022 and ESO (Bulgaria) in June 2022. The accession of ESO (Bulgaria) is foreseen in June 2022 and will be covered in *Market Report 2023*.

The increase in participation of TSOs in IN has enabled energy savings to reach more than 2 700 GWh per quarter, corresponding to quarterly savings of EUR 118.5 million.

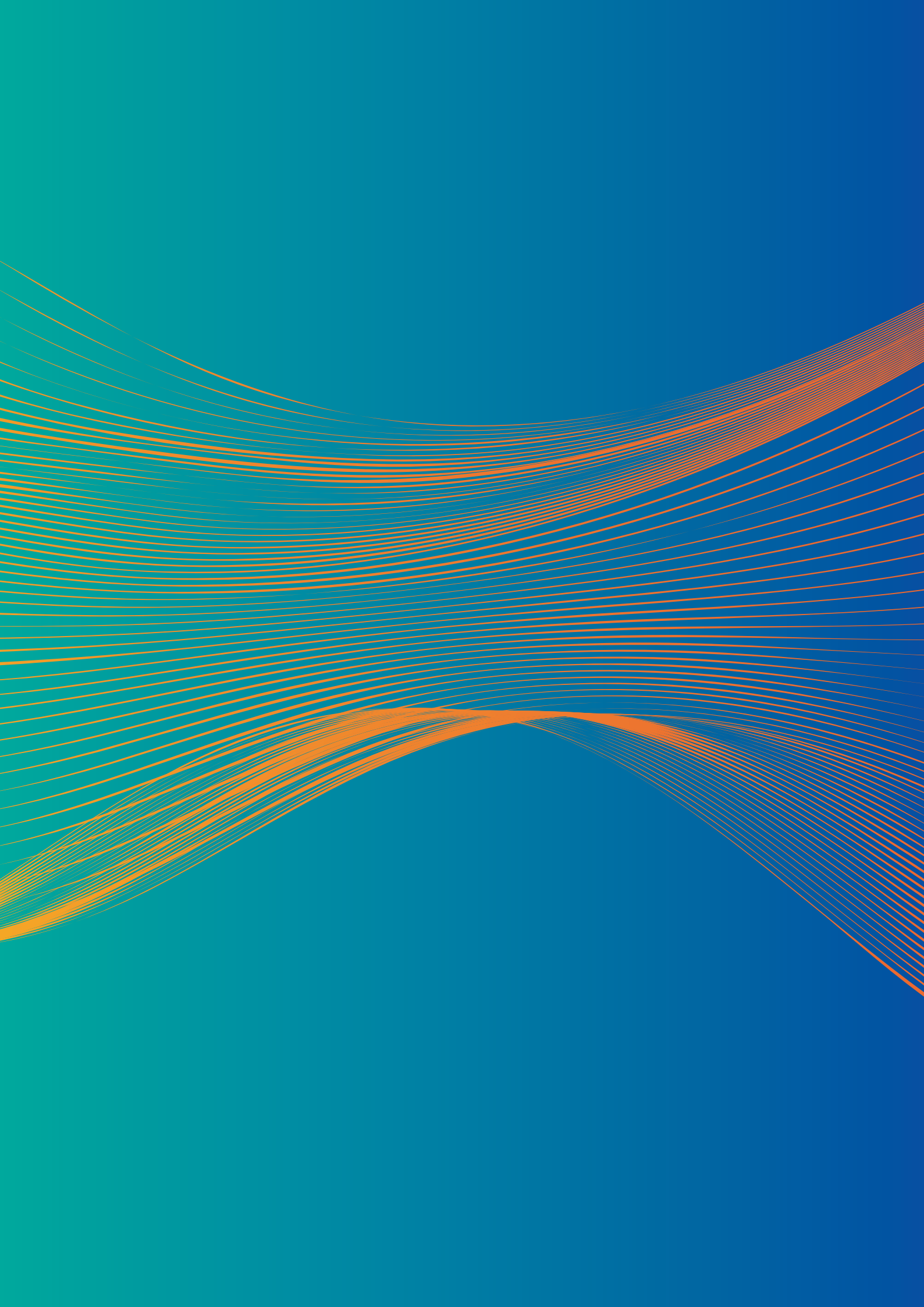
135 aFRR-Platform Accession Roadmap – https://eepublicdownloads.entsoe.eu/clean-documents/Network%20codes%20documents/Implementation/picasso/PICASSO_5th_Accession_roadmap_external_final.pdf.

136 Pp. 28–30. Available from https://eepublicdownloads.entsoe.eu/clean-documents/Publications/Market Committee publications/ENTSO-E_Market_Report_2020.pdf.

137 Pp. 95–97. Available from https://ee-public-nc-downloads.azureedge.net/strapi-test-assets/strapi-assets/ENTSO_E_Market_report_2021_2e499deda8.pdf.

138 Available from https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017R2195&from=EN.

139 *All TSOs' proposal for the implementation framework for a European platform for the imbalance netting process in accordance with Article 22 of Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing* – https://eepublicdownloads.entsoe.eu/clean-documents/Network%20codes%20documents/NC%20EB/180618_ALL%20TSOs_INIF_final.pdf.



Annex

1.1. Legal references and requirements

The report is based on previous ENTSO-E legal monitoring obligations pursuant to Regulation (EC) No. 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity and repealing Regulation (EC) No 1228/2003 (previous EU Electricity Regulation). Nevertheless, the entry into force of the Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity (recast EU Electricity Regulation) repealed the previous EU Electricity Regulation. The recast EU Electricity Regulation does not include an equivalent of Article 8(8) of the previous EU Electricity Regulation and does not foresee new monitoring tasks of network codes and guidelines implementation for ENTSO-E. Therefore, general monitoring obligations in the network codes and guidelines linked to the previous EU Electricity Regulation cannot be considered binding after the recast Electricity Regulation enters into force. However, ENTSO-E has decided to continue with the monitoring activities as a good project management practice to ensure high-quality deliverables of network codes and guidelines.

This report focuses on Article 82(2)(a) of the Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management (CACM regulation); Articles 63(1)(a) and 63(1)(d) of the Commission Regulation (EU) 2016/1719 of 26 September 2016 on forward capacity allocation (FCA regulation); and Article 63(3) of the Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing (EB Regulation).

1.2. Country-by-country assessments of the state of CEP70

In section 2.4 of this report, TSOs provided an overview on their performance in relation to the CEP70 provisions from 2021 (Table 1) and the underlying assumptions (Table 2).

This annex provides further information and detailed graphs of the analysis performed by TSOs. The information is organised by country/TSO and provides the following:

1. the current status of the implementation of the CEP70 provisions;
2. further information on the assessment methodology (if needed in addition to the information provided in Table 2);
3. assessment results;
4. additional information provided by the relevant TSO.

1.2.1. Austria

1. Current status of the implementation of the CEP70 provisions

In December 2020, an action plan was adopted by the Austrian government, which came into force on 1 January 2021. Besides improvements and projects to increase the available capacity for cross-zonal trade, it also includes a linear trajectory for reaching a 70% margin available for cross-zonal trade (MACZT) by the end of December 2025. According to this action plan, the MACZT target for 2021 (starting point of the linear trajectory) is 18.4% for coordinated net transfer capacity (cNTC) (AT<>CZ/HU/SI) and Italy North (AT<>IT), and 20% for CWE (AT<>DE).

Furthermore, Austrian Power Grid AG (APG) requested a derogation regarding foreseeable grounds affecting the security of system operation when applying the MACZT criterion. In line with this granted derogation, the minimum capacity target for cross-zonal trade (expressed as a percentage of MACZT per critical element network and contingency [CNEC]) was not applied in 2021 for neither Core nor Italy North CCR borders for the time periods without operational tools, for a secure calculation and validation of capacities respecting the minimum capacity criterion of the Austrian action plan. This derogation due to missing tools covers the following periods:

- Central West Europe (CWE) (AT<>DE): 1 January 2021 – 27 July 2021
- cNTC (AT<>CZ/HU/SI): 1 January 2021 – 30 July 2021
- Italy North (AT<>IT): 1 January 2021 – 28 October 2021.

For the time periods after implementation of the required tools, the minimum capacity value according to the Austrian action plan was applied, considering the methodological/systemic mitigation measures of the granted derogation. These measures deal with foreseeable grounds affecting the security of system operation, such as the uncertainties from the non-existence of a common net position forecasting process, excessive loop and phase shifting transformer (PST) flows over a certain threshold, and the impact of flows resulting from non-EU country trades.

The derogation allows for the application of a margin reflecting the uncertainties of margin from non-coordinated capacity calculation (MNCC) flows due to a missing common net position forecasting process, as well as the possible reduction of the MACZT target in case of excessive loop and PST flows exceeding a predefined threshold. It also allows the consideration of trade flows from non-EU countries in the MNCC. These mitigations are necessary as the transmission system of APG is located centrally in the interconnected system between the two CCRs Core and Italy North, in the direct neighbourhood of non-EU countries, and is being exposed to high loop and PST flows.

2. Assessment methodology

The time periods before go-live of the necessary operational tools for capacity calculation and validation respecting the respective MACZT target were not considered in the assessment, as those days are covered by the derogations. Therefore, only the data of the following periods are taken into account for the assessment:

- CWE (AT<>DE): 28 July 2021 – 31 December 2021[140]
- cNTC (AT<>CZ/HU/SI): 1 July 2021 – 31 December 2021[141]
- Italy North (AT<>IT): 29 October 2021 – 31 December 2021[142].

For CWE, all real CNECs of the final domain of each hour in the time period listed are relevant. For cNTC and Italy North, only the limiting CNECs of each hour in the time period listed are relevant. Under consideration of the approved derogations, the MACZT of each relevant CNEC entry is calculated. The distribution of the MACZT for all relevant CNECs can be found in Figure A1. For the assessment of compliance, those values are compared with the MACZT target in the dedicated report according to Article 15(4) of the EU Electricity Regulation, which was submitted to the Austrian national regulatory authority (NRA) on 1 April 2022 for approval. The compliance values of each coordination area are:

- CWE (AT<>DE): 99.99%
- cNTC (AT<>CZ/HU/SI): 99.92%
- Italy North (AT<>IT): 100.00%.

3. Assessment results

Based on the assessment touched on in section 2.4, Figure A1 shows the distribution of MACZT for all relevant CNECs.

140 *Twenty-six hours in the relevant time span are not considered due to fallbacks like default flow-based parameters or spanning.*

141 *Thirty-four hours in the relevant time span have a missing export NTC AT>CZ/HU/SI. This is due to technical problems in the capacity calculation software which was not able to determine limiting CNECs in these hours. Therefore, only one limiting CNEC (import direction) can be provided in these hours for the assessment.*

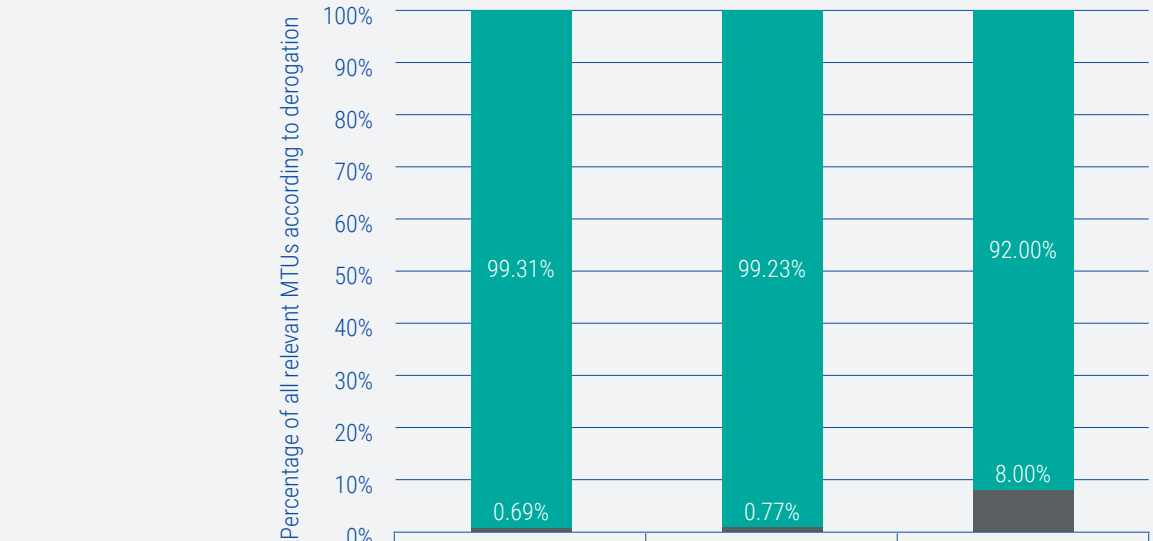
142 *One-hundred-and-twenty-three hours in the relevant time span could not be calculated in the common capacity calculation process, due to process failure.*

Figure A1 – Relative cross-zonal trading margin of Austria, taking into account all CNECs in the respective time frame

Figure A1 shows that there was no Austrian limiting CNEC in the Italy North CCR in the relevant time period (29 October 2021 – 31 December 2021). Therefore, the monitoring for this border is not possible on a MACZT basis, which is reflected in the report from APG to the Austrian NRA. APG considers this border compliant as there was no impact from APG's network elements on the provided capacities in Italy North in this time frame.

For the Core CCR (CWE (AT<>DE) and cNTC borders (AT<>CZ/HU/SI)), **Figure A1** shows the distribution of MACZT values, considering the approved derogation, for all relevant CNECs in the relevant time period (CWE: 28 July 2021 – 31 December 2021; cNTC 1 July 2021 – 31 December 2021).

Figure A2 provides an overview of the time monitored in 2021. The category 'normal operation/process' represents all MTUs of 2021 that have been monitored. The category 'no IC capacity available' indicates the amount of MTUs during which no interconnector capacity was available in 2021. Yet, it has to be noted that for flow-based borders, this category will always be empty as it is impossible that no interconnector capacity is available in the entire flow-based system. However, the category is kept for the sake of comparability with other borders. The category "application of fallback procedure" represents the share of MTUs during which MTUs have not been monitored due to problems in capacity calculation.



	CWE (AT<>DE)	cNTC (AT<>CZ/HU/SI)	Italy North (AT<>IT)
Normal operation / process	99.31%	99.23%	92.00%
No IC capacity available	0%	0%	0%
Application of fallback procedure	0.69%	0.77%	8.00%

Figure A2 – Overview of time monitored in 2021

1.2.2. Belgium

1. **Current status of the implementation of the CEP70 provisions**

For its alternating current (AC) CNECs in the CWE CCR, Elia System Operator SA (Elia) was granted a derogation for excessive loop flows in 2021.

2. **Assessment methodology**

Elia applies the Agency for the Cooperation of Energy Regulators (ACER)'s recommendation, complementing the "lowest MACZT per MTU" view expressed in Table 2 with an "All CNECs" view for which the assessment results are as follows. From this, a complete picture can be built.

In November 2020, Amprion and Elia put into operation the first direct electricity interconnection between Germany and Belgium, called Aachen – Liège Electricity Grid Overlay (ALEGrO). ALEGrO is integrated as a direct current (DC) interconnection into the CWE capacity calculation via the evolved flow-based methodology, enabling the allocation to optimise the exchanges over ALEGrO. The relevant metric for assessing the MACZT is the maximum transmission capacity made available on the ALEGrO interconnector, upon which the allocation then performs its optimisation.

Please note that the overview on the underlying assumptions of the assessment methodology is provided in Table 2.

3. Assessment results

ALEGrO

Based on the assessment methodology, the results for Belgium are as follows.

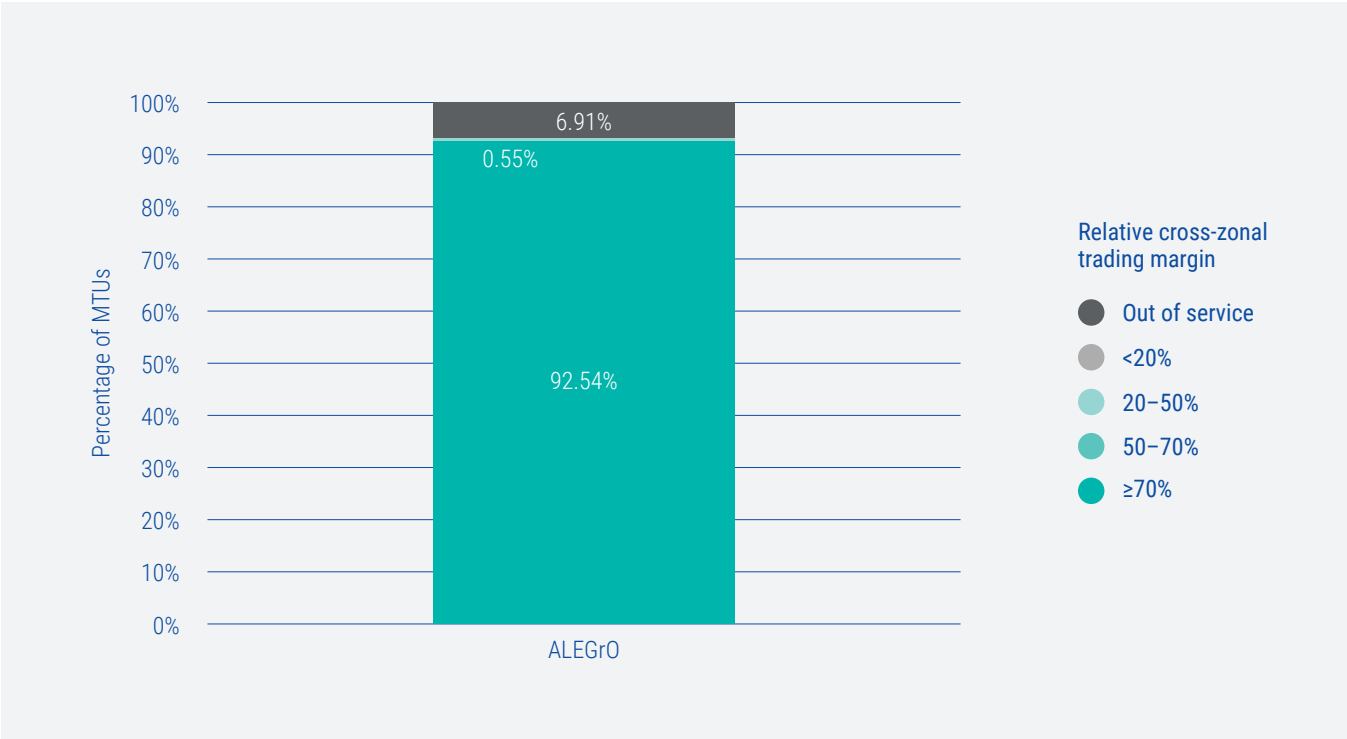


Figure A3 – Relative cross-zonal trading margin of Belgium's high-voltage direct current (HDVC) link on the BE–DE border

Figure A3 illustrates that for almost all hours where ALEGrO was in operation, at least 70% of the 1000 MW capacity is provided. In fact, both Elia and Amprion provided the full 1000 MW capacity of the interconnector to the allocation in these hours, both for exchanges from Belgium to Germany and from Germany to Belgium.

The 0.55% of hours for which the full 1000 MW capacity is not provided can be explained by a temporary limitation that was set in place in January 2021 as a mitigation measure for the increased risk of decoupling. The capacity on ALEGrO was reduced to 250 and this was transparently communicated to the market[143].

CWE

This section depicts the results of the Belgian AC CNECs participating in the CWE flow-based day-ahead capacity calculation.

The basis are all hours from the CWE day-ahead capacity calculation process from which the following hours have been excluded:

- 53 hours where the CWE day-ahead capacity calculation process resulted in default flow-based parameters;
- 48 hours for which a local tooling issue prevented the calculation of the minimum MACZT target. In case of a local tooling issue, Elia applies a minimum of 20% remaining available margin (RAM) for CWE exchanges as a fallback approach.

The target of minMACZT is defined as per the rules embedded in the derogation on excessive loop flows that was granted to Elia. Here, 70% is taken as a starting point and reduced only for the amount of excessive loop flows observed during the capacity calculation on that particular CNEC in that particular MTU.

143 See www.jao.eu/news?&created%5Bmin%5D=01/15/2021%2000:00:00&created%5Bmax%5D=01/22/2021%2023:59:59.

From **Figure A4** and Figure A5, it can be observed that:

- For more than 93% of CNECs, Elia already provides the minimum 70% of capacity.
- For ~62% of the time, the minimum target is reached on all CNECs – in other words, for ~38% of the time, the minimum target is not reached on the least-performing CNEC in a given MTU.

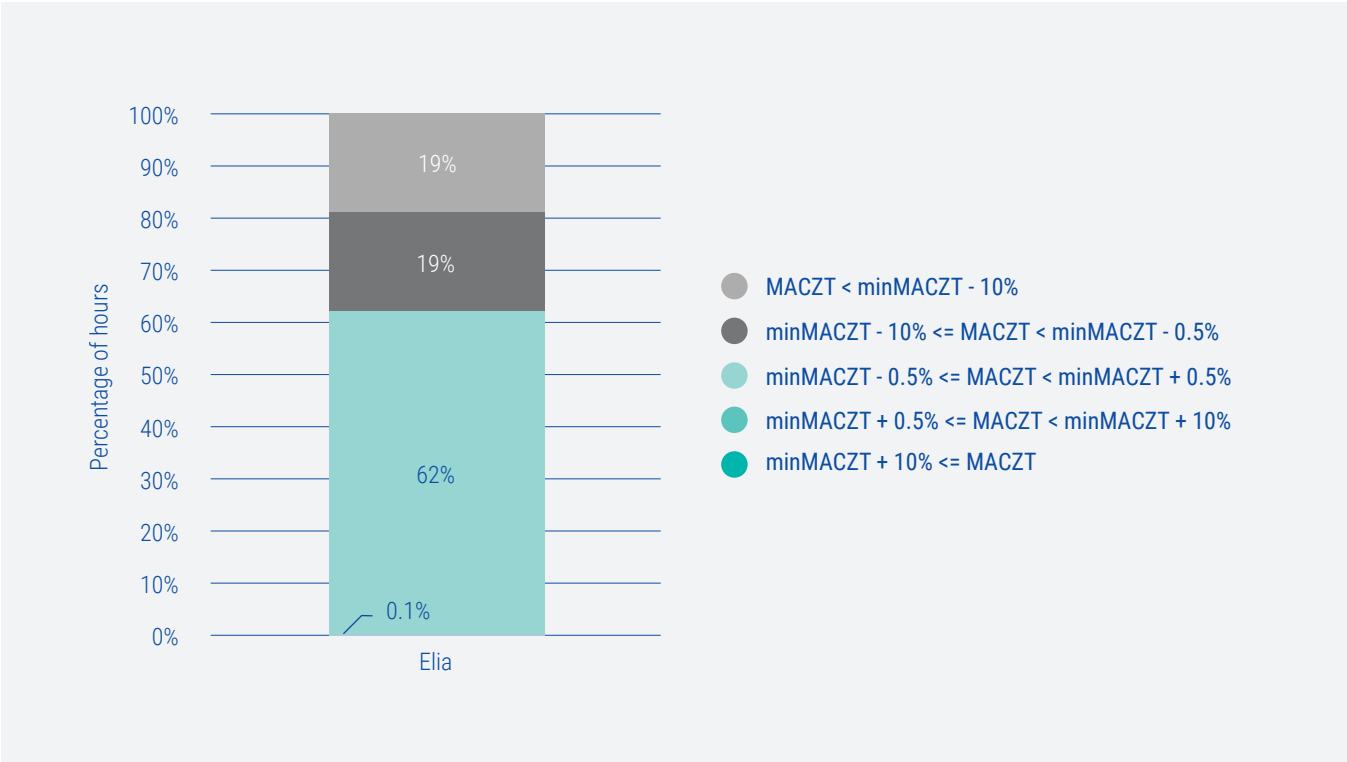


Figure A4 – Percentage of time when the relative MACZT of the least-performing Belgian CNEC per MTU is above its minimum MACZT or within a certain range below its minimum MACZT. For each MTU, the CNEC with the lowest MACZT was selected and categorised in one of the ranges.

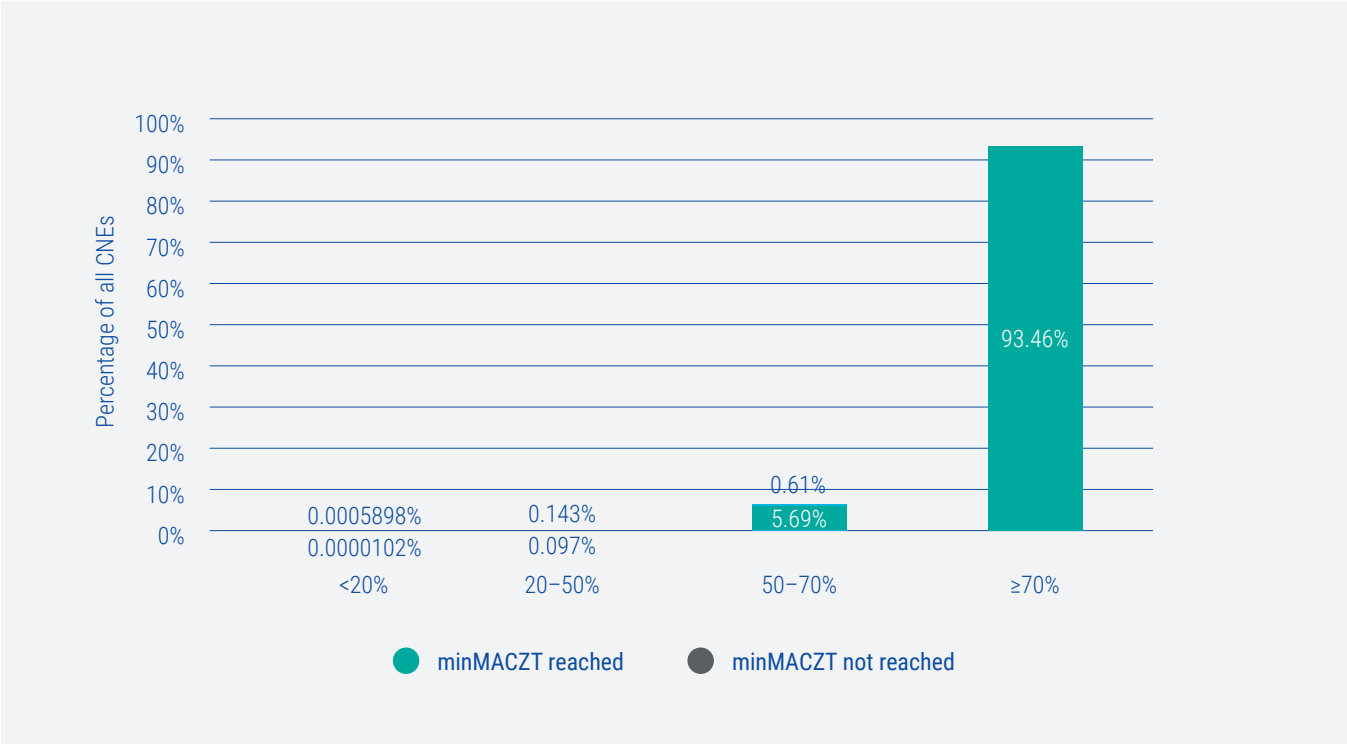


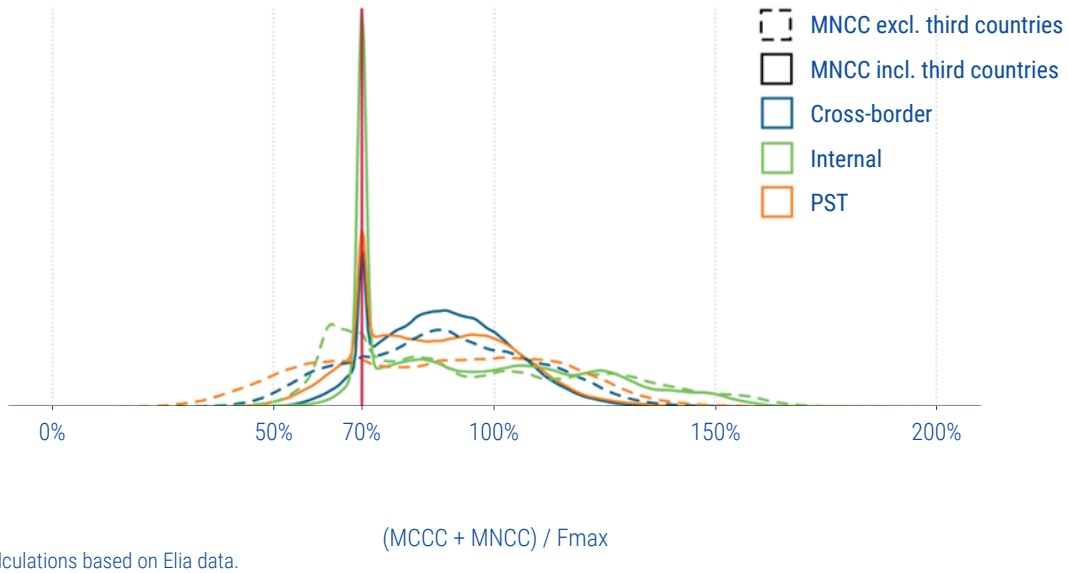
Figure A5 – MACZT categories for all Belgian CNECs

4. Additional information

On 24 March 2022, the Belgian NRA, the Federal Commission for Electricity and Gas Regulation (CREG), published its study on the performance of Elia's compliance in 2021. For the purpose of this study, CREG performed calculations using the data provided by Elia, whereas these data are aligned with the principles laid down in ACER's recommendation on how to monitor the implementation of 70%.

As illustrated in **Figures A6**, A7 and A8, the study highlights the following for Belgian CNECs in CWE:

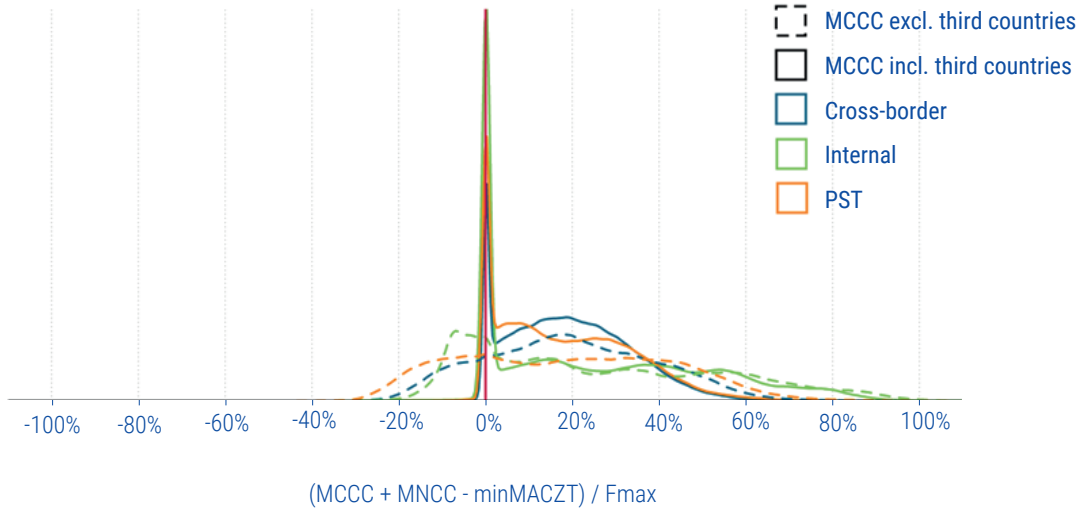
- On the vast majority of CNECs, 70% or more capacity has been offered for market exchanges.
- CNECs on which less than 70% capacity is offered can be compliant. This follows from the application of the derogation for excessive loop flows.
- In 62.2% of MTUs, the minimum capacity target (taking into account derogation on excessive loop flows) is reached simultaneously on each CNEC, whereas looking at the totality of all CNECs across all MTUs, the minimum capacity in reached on 99.2% of the more than 20 million CNECs.
- It is rather rare that a Belgian grid element on which the minimum capacity target was not reached limited the market, i.e. it happened on 100 CNECs spread over 96 hours in 2021.



Source: CREG calculations based on Elia data.
(Number of observations: 20.378.999)

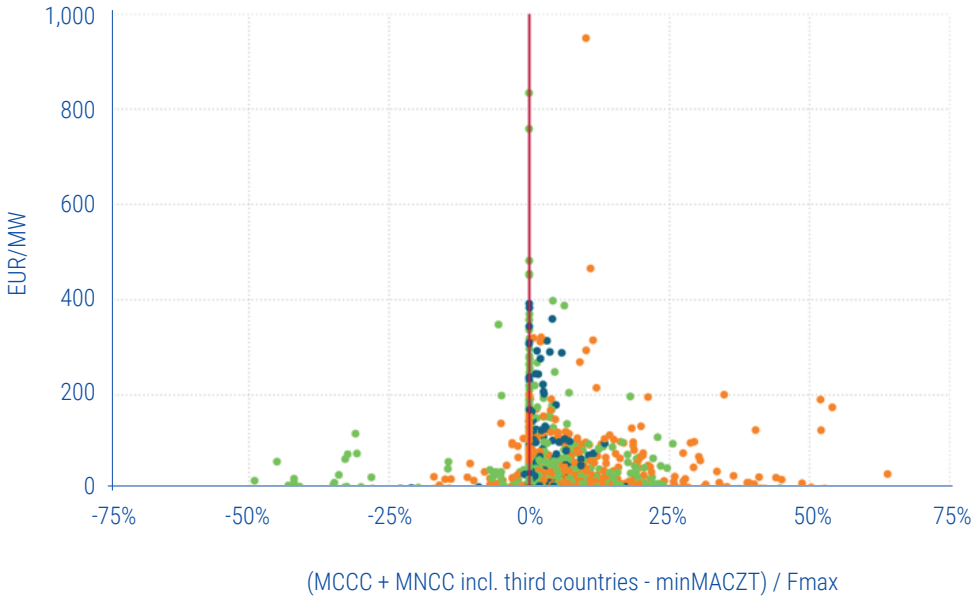
Fmax = maximum allowable power flow; MCCC = margin from coordinated capacity calculation.

Figure A6 – Density plot of all Belgian CNECs in relation to the 70% target



Source: CREG calculations based on Elia data.
(Number of observations: 20.378.999)

Figure A7 – Density plot of performance of all Belgian CNECs in relation to the minimum MACZT target, taking into account the derogation on excessive loop flows



Source: CREG calculations based on Elia data.
(n = 1.786)

Figure A8 – Relationship between reaching the minimum MACZT target and limitations in market coupling

1.2.3. Bulgaria

1. Current status of the implementation of the CEP70 provisions

As in 2020, Bulgaria has been granted a derogation for 2021.

2. Assessment methodology

The MACZT data in this report are the net transfer capacity (NTC) values agreed bilaterally between ESO (Bulgaria) and Transelectrica (Romania), and between ESO (Bulgaria) and Independent Power Transmission Operator SA (IPTO) (Greece) respectively. These NTC values have been published on the ESO website. The results are based on AC load-flow calculations using the Common Grid Model (CGM) of the SEE CCR. The MACZT takes into account the voltages and other additional operational specifics, which are not yet possible to consider based only on ACER Recommendation No. 01/2019 on MACZT calculation. The results take into consideration the long-term available capacities on the given borders and on operational experience with neighbouring non-EU countries (Turkey, North Macedonia, Serbia). The provided MACZT data are the calculated NTCs on a given border in both directions, divided by the rating(s) of the interconnection line(s).

Please note that the overview on the underlying assumptions of the assessment methodology is provided in Table 2 in Chapter 2.

3. Assessment results

Based on the assessment methodology, the results for Bulgaria are as follows.

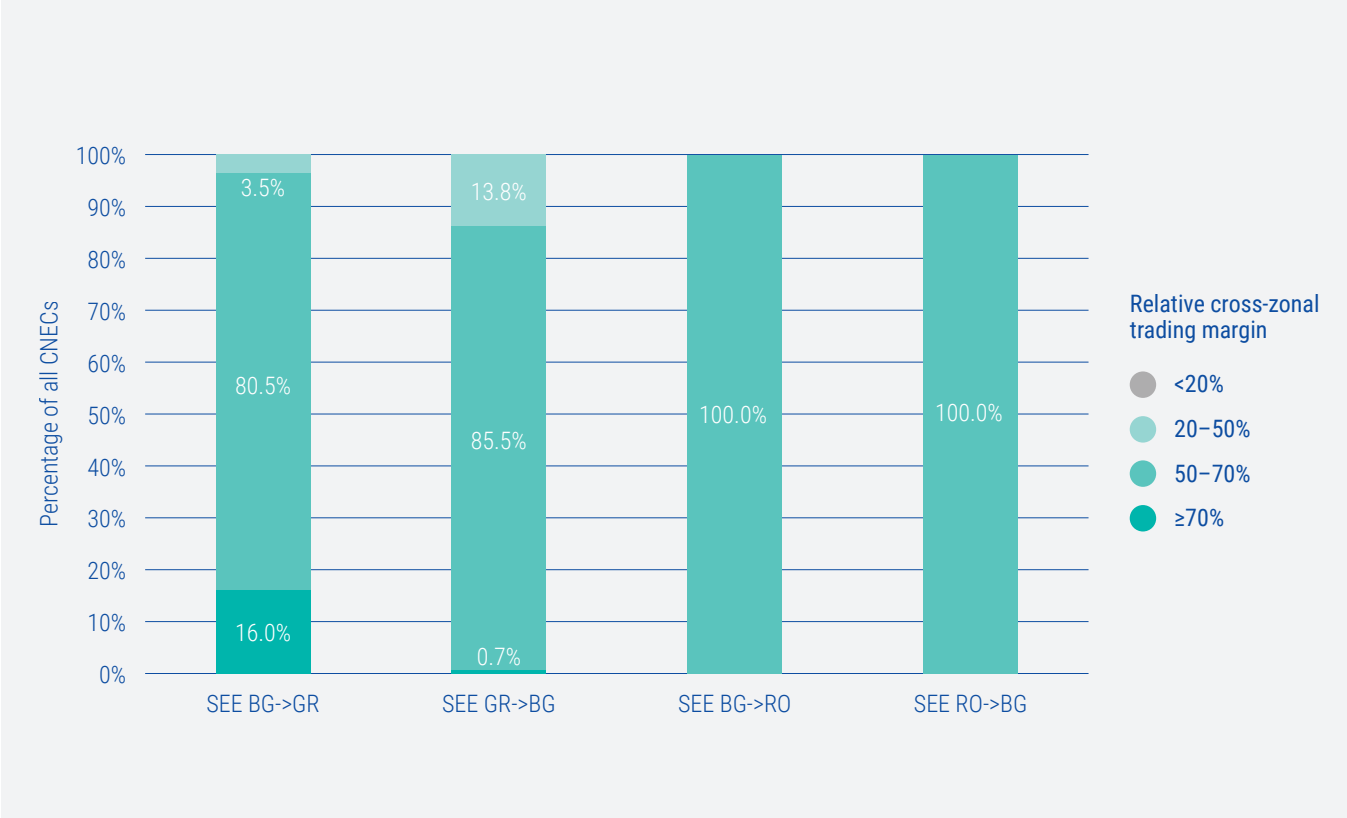
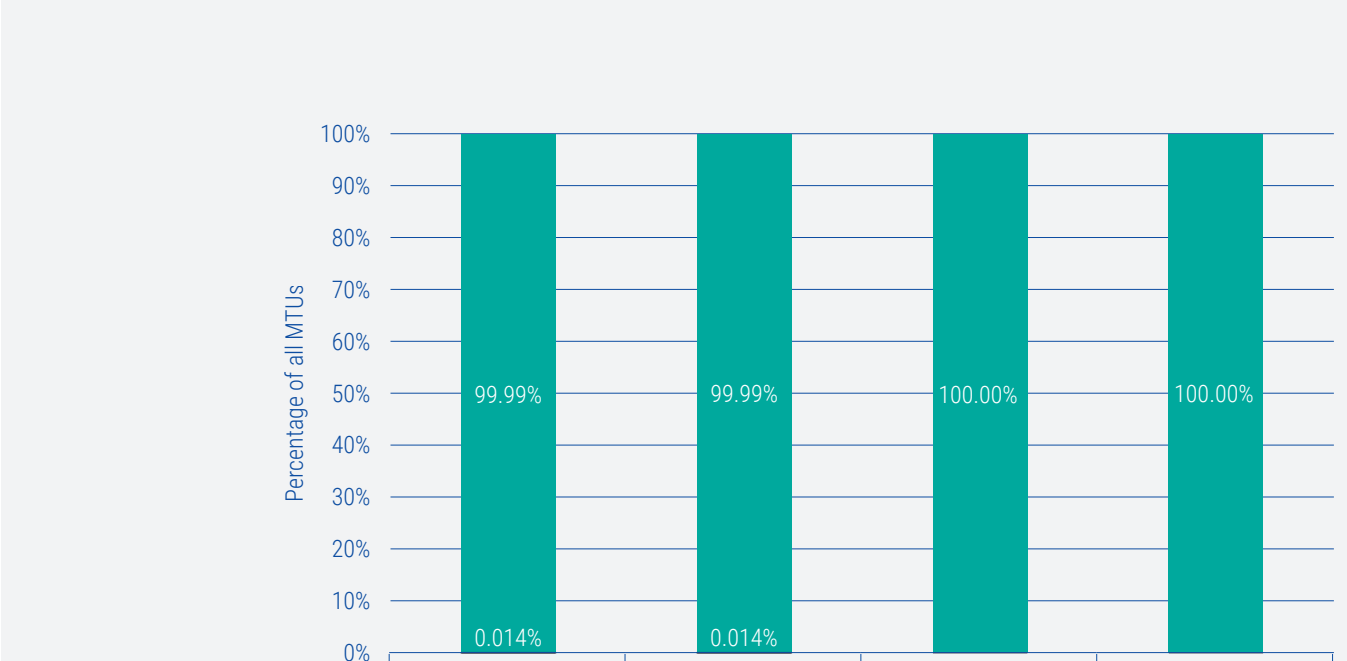


Figure A9 – Relative cross-zonal trading margin of Bulgaria



	SEE BG->GR	SEE GR->BG	SEE BG->RO	SEE RO->BG
Normal operation / process	99.99%	99.99%	100.00%	100.00%
No IC capacity available	0.014%	0.014%	0.000%	0.000%
Application of fallback procedure	0.000%	0.000%	0.000%	0.000%

Figure A10 – Overview of time monitored in 2021

4. Additional information

The computation of the MACZT is assumed to be performed by SEE regional security coordinators (RSC) in Thessaloniki (Southeast Electricity Network Coordination Center – SEleNe). The SEE RSC in Thessaloniki started to implement the coordinated capacity calculation methodology (CCM) of the SEE CCR for the day-ahead time frame on 1 July 2021. The SEE TSOs have already taken first steps towards the initiative for concluding agreements with non-EU countries in the region (Serbia, North Macedonia and Turkey), taking into account the EU Commission letter regarding the capacity calculation and non-EU countries flows sent to ENTSO-E and ACER on 16 September 2019. On 5 October 2020, a letter was sent on behalf of the three SEE EU TSOs (Bulgaria, Romania and Greece) to the non-EU TSOs of Albania, Turkey, North Macedonia and Serbia. Taking into account the recommendations given by the European Commission, it was proposed to conclude agreements with neighbouring countries to address in a common coordinated way the treatment of the capacity calculation process and the cost-sharing of remedial actions in the region. The signing of such agreements with neighbouring non-EU countries would be a good starting point for an amendment of the methodology for calculating cross-zonal capacity (CZC) for the day-ahead and intraday time frame, the first version of which has already been adopted by national regulators in SEE. Currently, SEE TSOs are in the process of changing the existing methodology where the TSOs are aiming to include the BG–MK, BG–SR, BG–TR, GR–AL, GR–MK, GR–TR and RO–SR borders in the estimation process of the MACZT. In this way, a balance will be achieved between more efficient CZC calculation and consideration of all the peculiarities, while maintaining the secure operation of the electricity systems in the region. So far, there has been no official response to the letter sent and it is not clear whether the countries mentioned are willing to apply the SEE CCM to their borders with Bulgaria, Romania and Greece. Without the consent of these parties, we cannot include these borders in our methodology for day-ahead and intraday capacity calculation time frames, or adequately calculate the MACZT according to the ACER recommendations.

1.2.4. Croatia

1. Current status of the implementation of the CEP70 provisions

As in 2020, Croatia has been granted a derogation for 2021. A derogation with no minimum capacity is applied in 2020. For the duration of the derogation in 2021, the Croatian Transmission System Operator (HOPS) is committed to allocating no less than the minimum capacity allocated for each market unit in the period 2018 to 2020, and no less than the capacity that corresponds to 20% of the load for each CNEC. A structural congestion report was approved at the end of 2021.

2. Assessment methodology

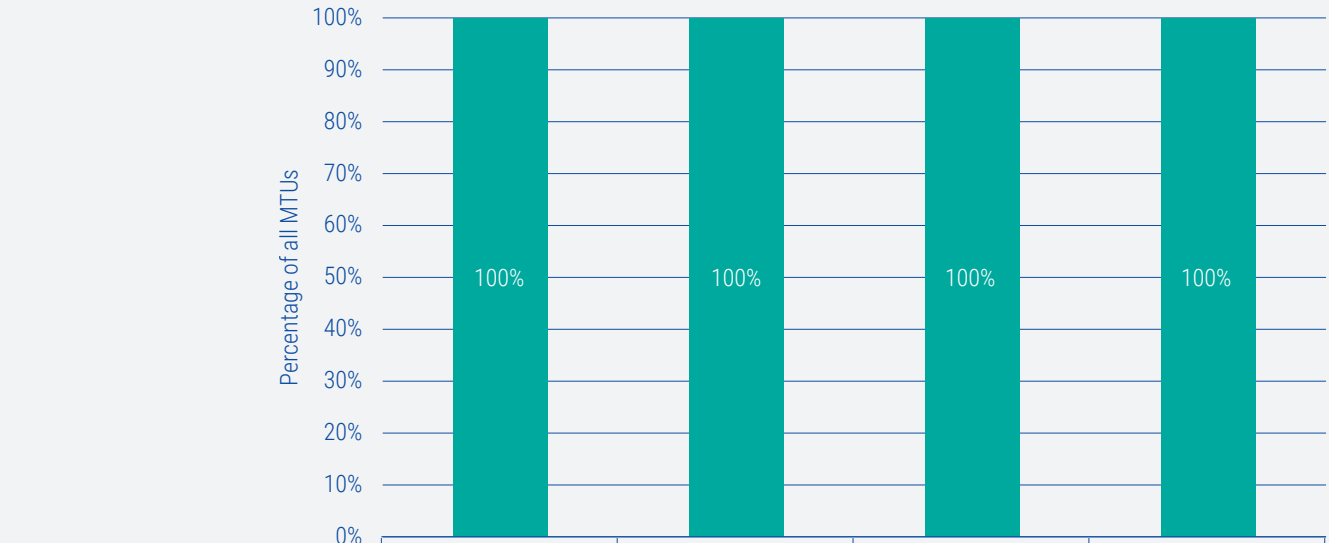
The methodology according to ACER Recommendation No. 01/2019 is applied. Croatia uses a (un)coordinated unilateral NTC approach for calculating CZCs on all borders.

Please note that the overview on the underlying assumptions of the assessment methodology of Croatia is provided in Table 2 in Chapter 2.

3. Assessment results

Based on the assessment methodology, the results for Croatia are as follows. Results of the MACZT include exchanges with non-EU countries.

Figure A11 – Relative cross-zonal trading margin of Croatia



	HR>SI	SI>HR	HR>HU	HU>HR
Normal operation / process	100%	100%	100%	100%
No IC capacity available	0%	0%	0%	0%
Application of fallback procedure	0%	0%	0%	0%

Figure A12 – Overview of time monitored in 2021 for Croatia

1.2.5. Czechia

1. Current status of the implementation of the CEP70 provisions

ČEPS derogation in 2021 was set to reach the 60% threshold in at least 90% of MTUs in the export direction, and the 40% threshold in at least 90% of MTUs in the import direction. This applies to MTUs that are not considered special operational states, for which no minimum capacity applies. ČEPS was compliant with the approved derogation in both directions in 2021. The same derogation is approved for 2022 until the flow-based day-ahead capacity calculation go-live, after which we expect to set minRAM parameter to 70%.

2. Assessment methodology

The methodology according to ACER's Recommendation No. 01/2019 is applied.

Please note that the overview on the underlying assumptions of the assessment methodology of Czechia is provided in Table 2 in Chapter 2.

3. Assessment results

Based on the above assessment methodology, the results for Czechia are as follows.

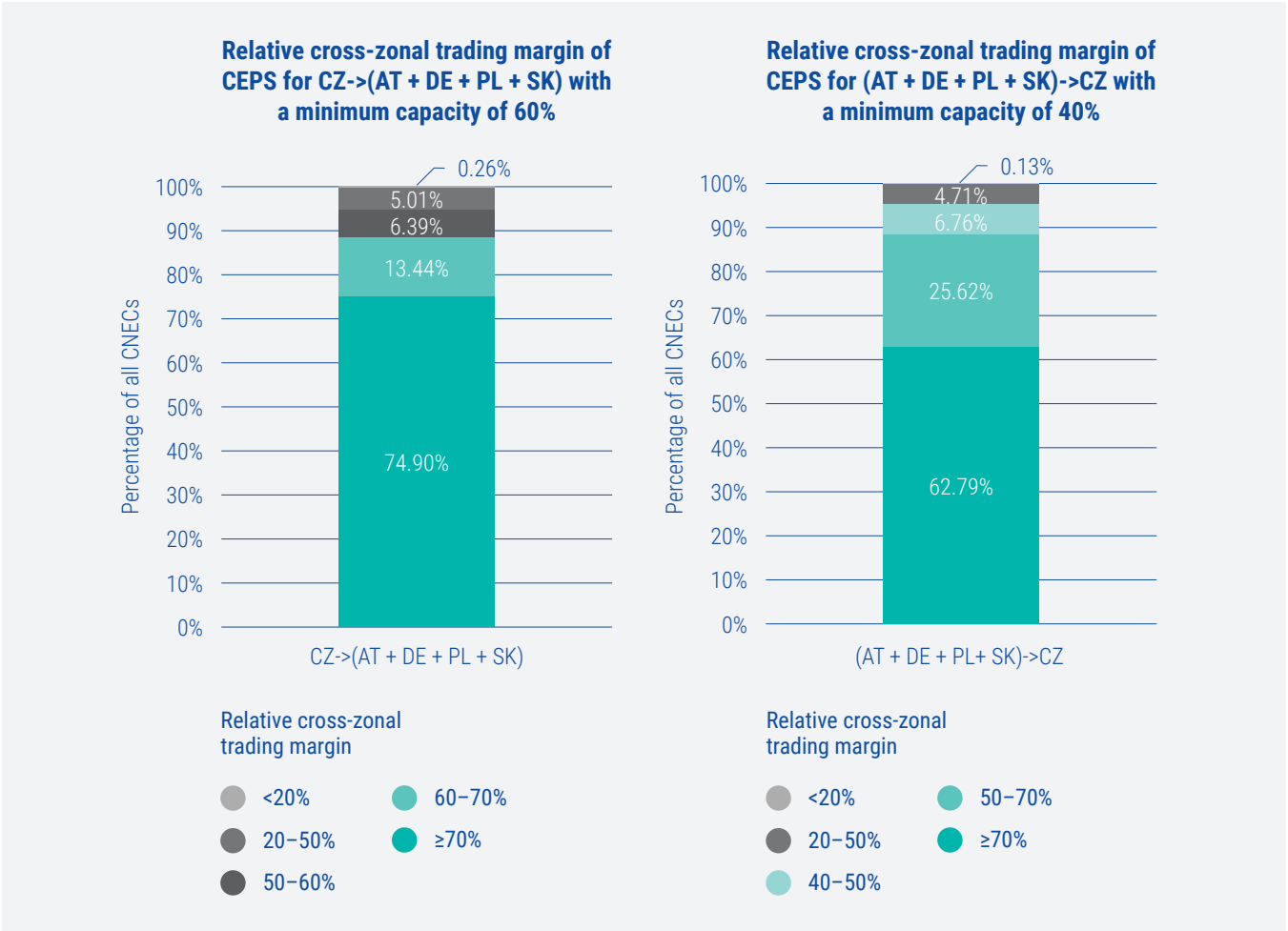


Figure A13 – Relative cross-zonal trading margin of Czechia

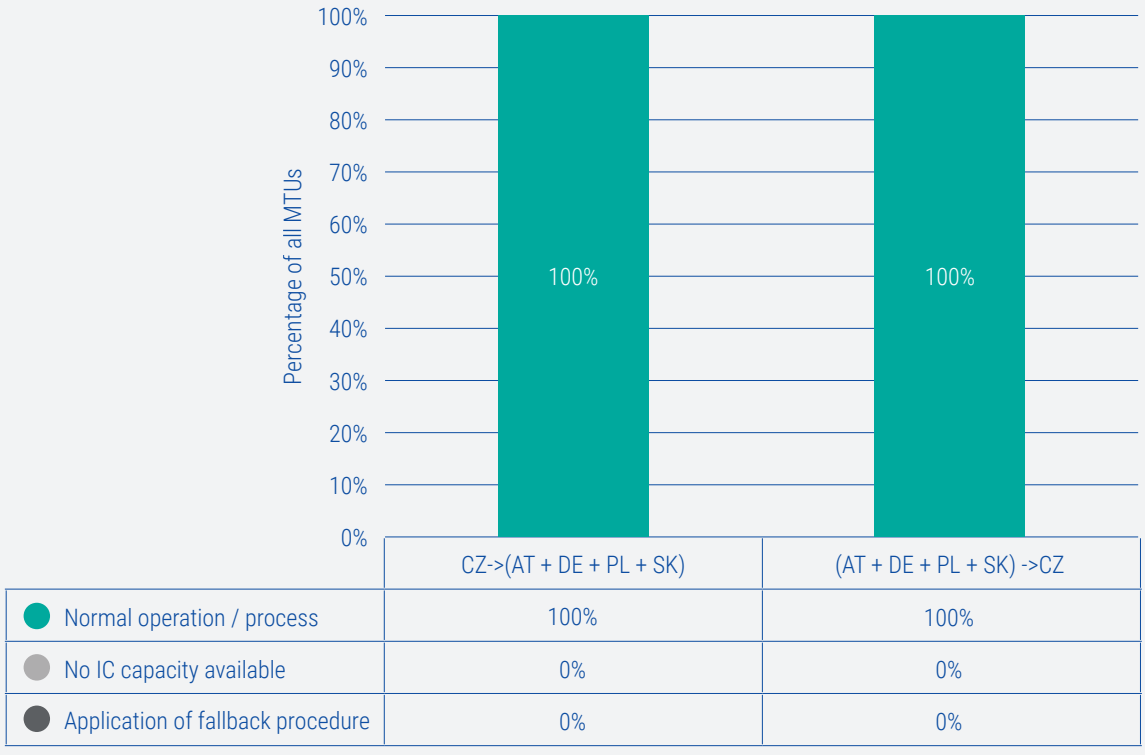


Figure A14 – Overview of time monitored in 2021 for Czechia

1.2.6. Denmark

1. Current status of the implementation of the CEP70 provisions

The 70% rule is applied in 2021.

2. Assessment methodology

The methodology according to ACER's Recommendation No. 01/2019 is applied.

Please note that the overview of the underlying assumptions of the assessment methodology of Denmark is provided in Table 2 in Chapter 2.

3. Assessment results

Based on the assessment methodology, the results for Denmark are as follows.

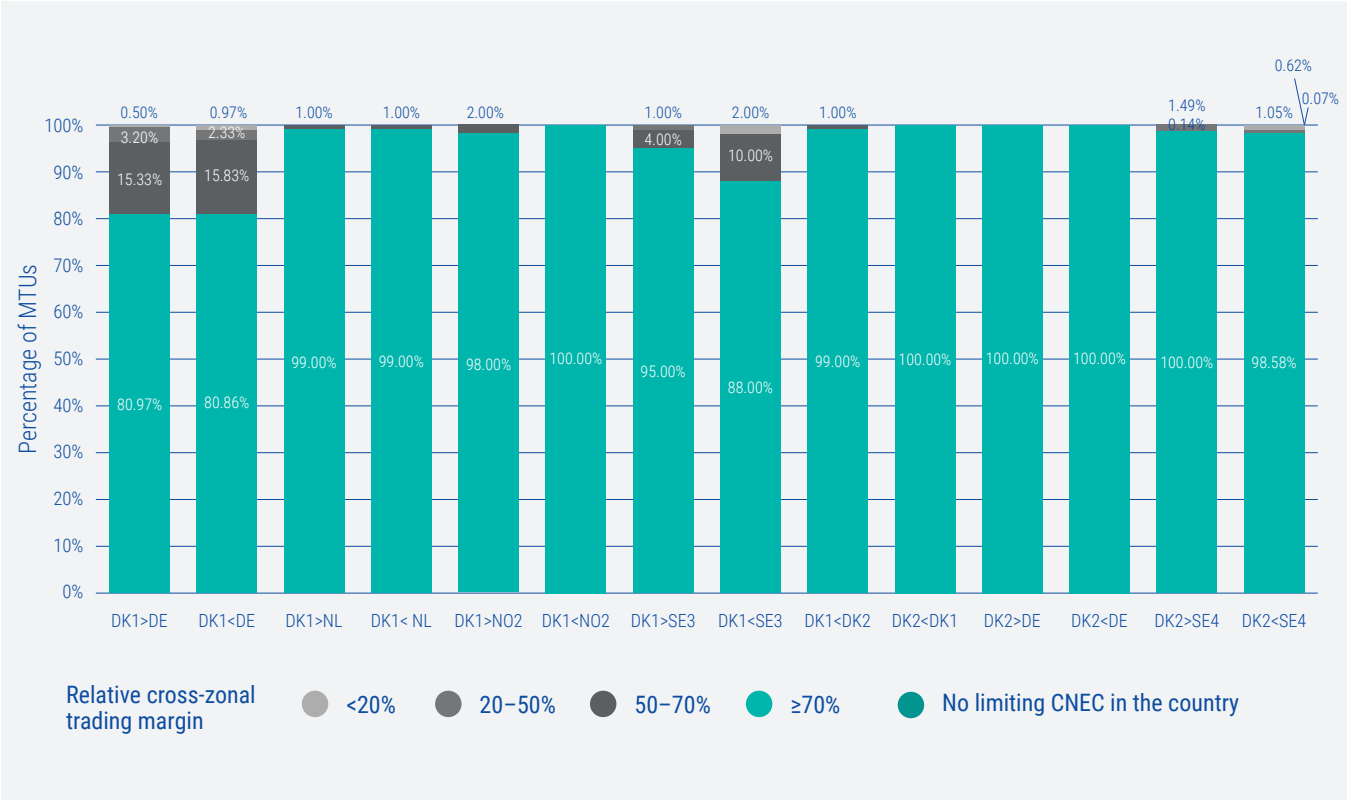


Figure A15 – Relative cross-zonal trading margin of Denmark

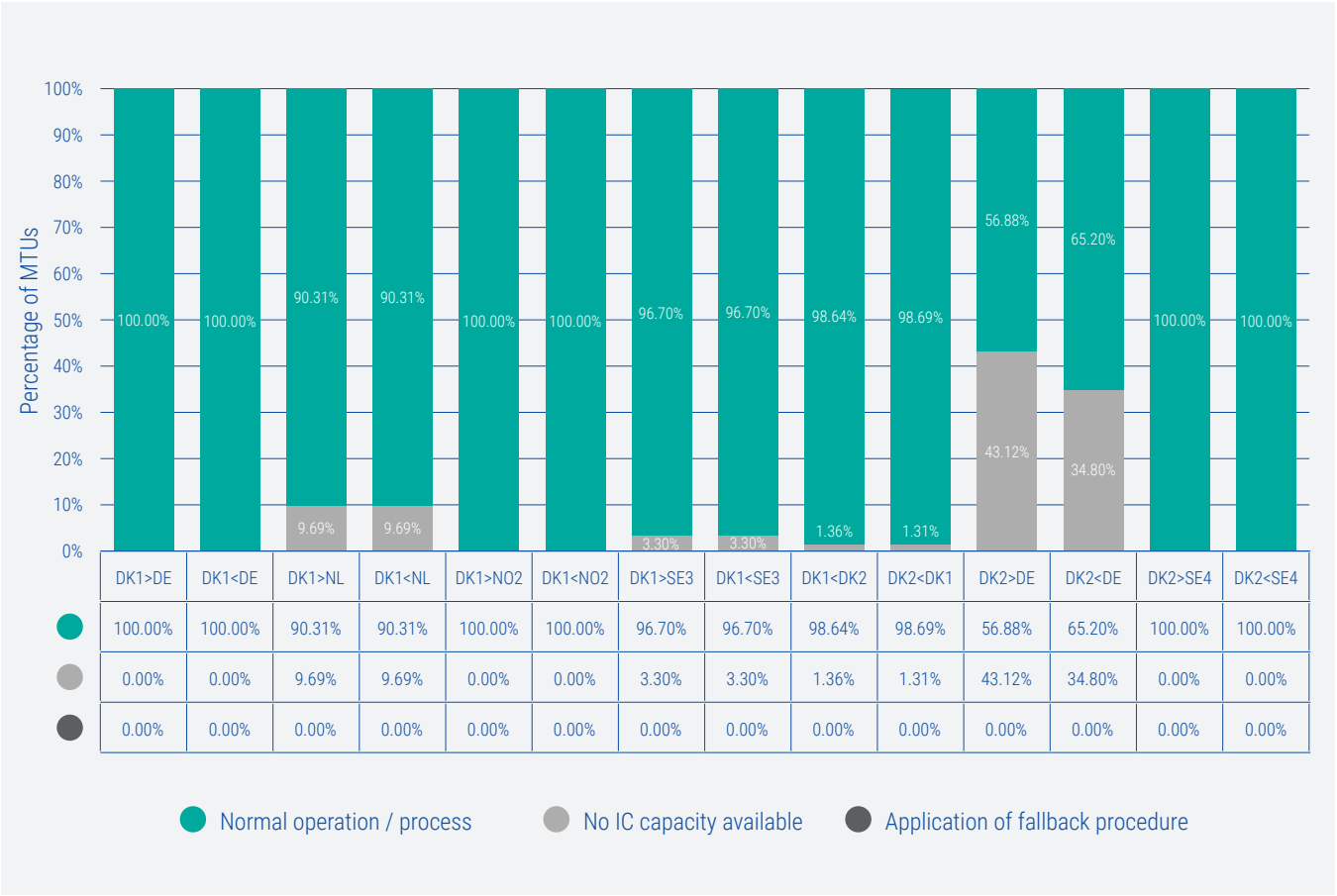


Figure A16 – Overview of time monitored in 2021 for Denmark

1.2.7. Estonia

1. Current status of the implementation of the CEP70 provisions

The 70% rule is applied in 2021.

2. Assessment methodology

The 70% rule according to Article 16(8) of the EU Electricity Regulation and the ACER recommendation is applied.

Please note that the overview of the underlying assumptions of the assessment methodology of Estonia is provided in Table 2 in Chapter 2.

3. Assessment results

Based on the assessment methodology, the results for Estonia are as follows.

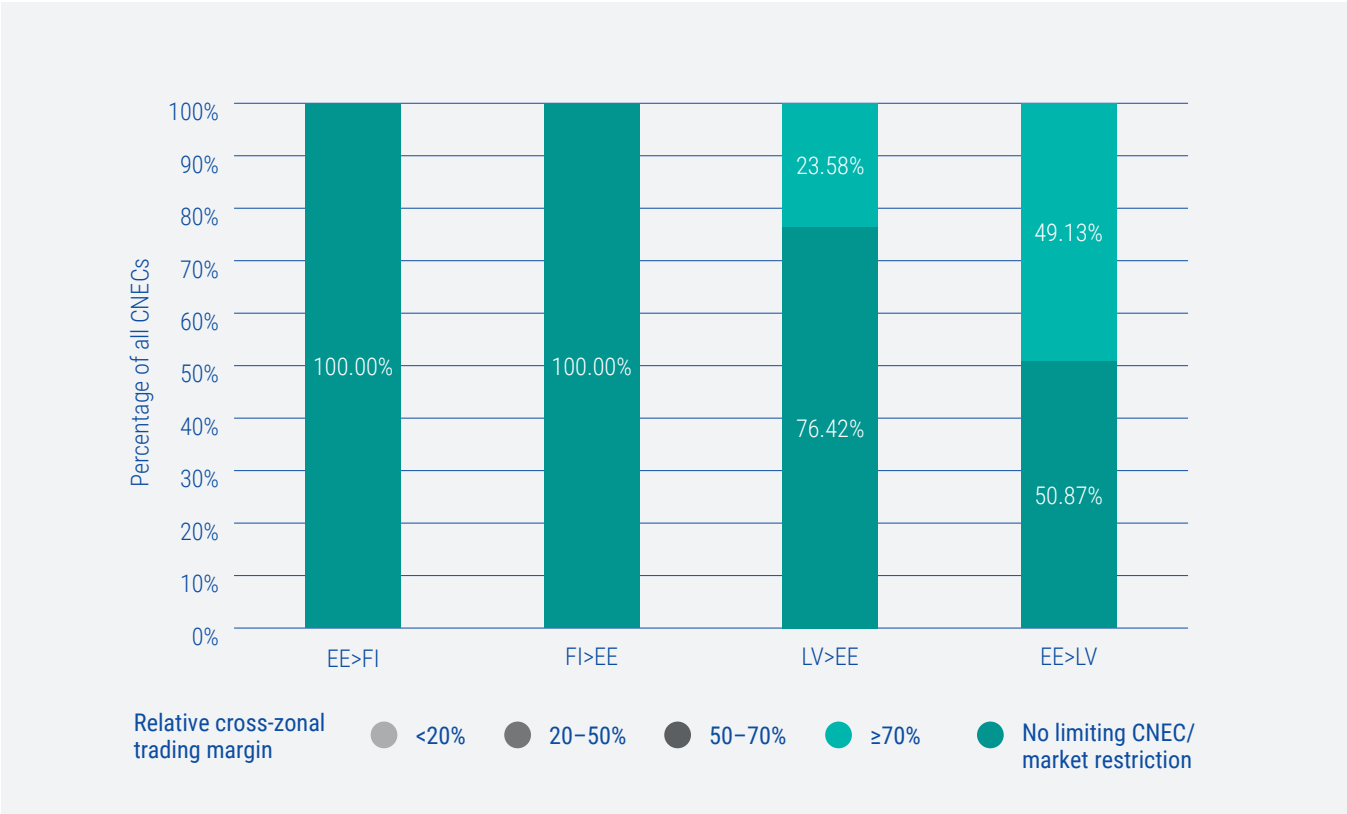


Figure A17 – Relative cross-zonal trading margin of Estonia

4. Additional information

According to the approved CACM CCM in the Baltic CCR, the capacity calculation process does not foresee a daily capacity calculation process with the CGM. Therefore, critical network elements (CNEs) and their loading cannot be efficiently identified and data related to CNEs cannot be provided. There is an ongoing discussion among three Baltic TSOs and three Baltic NRAs on the 70% threshold evaluation approach.

1.2.8. Finland

1. Current status of the implementation of the CEP70 provisions

The 70% rule is applied in 2021.

2. Assessment methodology

For the border FI–SE1, AC-tielines include a 100 MW transmission reliability margin (TRM) as a market constraint. Below 70% would be reached only with an NTC lower than 240 MW.

For the borders FI–SE3 and FI–EE, Fingrid does not apply any market constraints to DC-tielines.

Please note that the overview of the underlying assumptions of the assessment methodology of Finland is provided in Table 2 in Chapter 2.

3. Assessment results

Based on the assessment methodology, the results for Finland are as follows.

Figure A18 – Relative cross-zonal trading margin of Finland

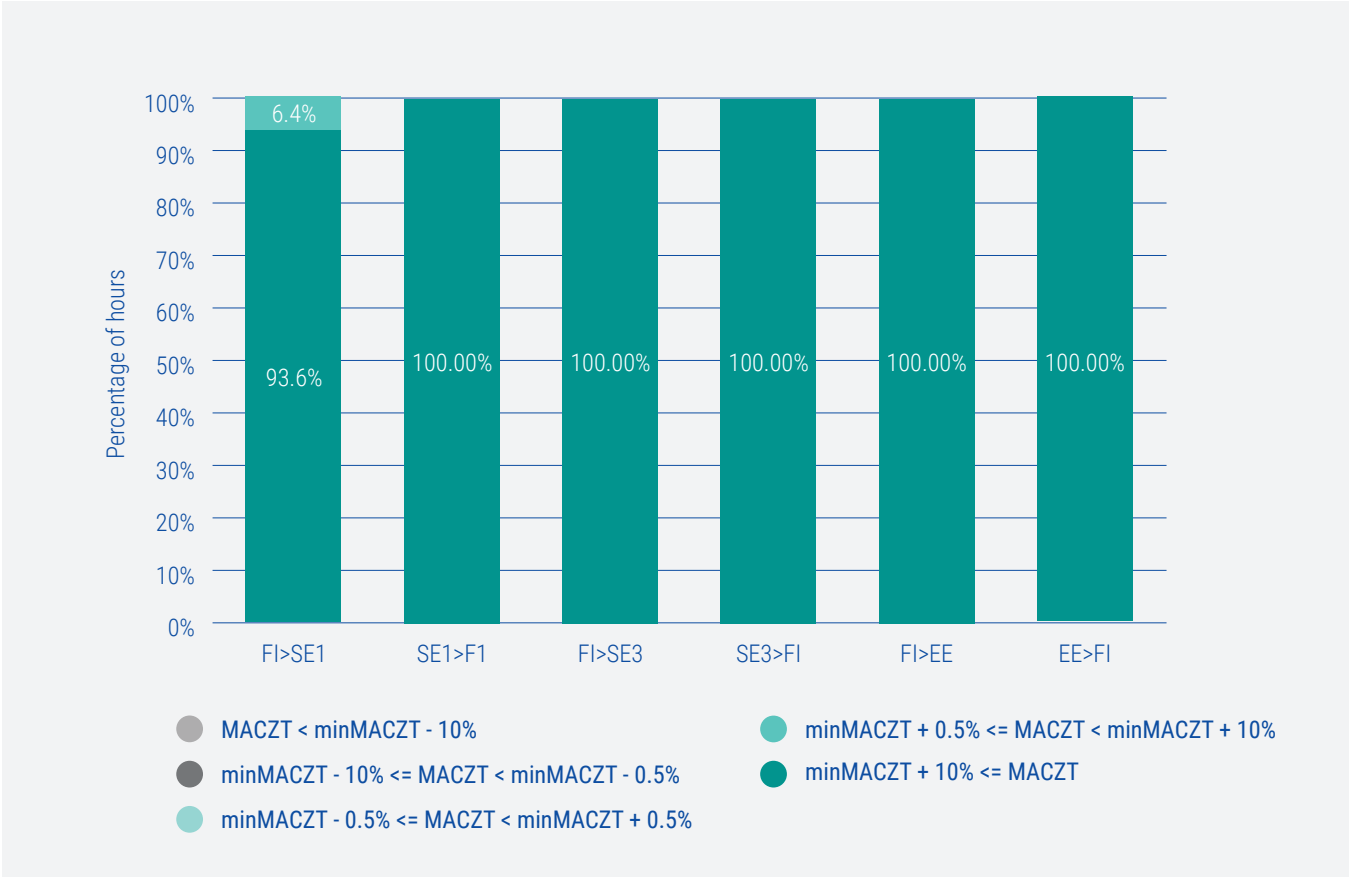


Figure A19 – Percentage of time when the relative MACZT of the least-performing Finnish CNEC per MTU is above its minimum MACZT or within a certain range below its minimum MACZT. For each MTU, the CNEC with the lowest MACZT was selected and categorised into one of the ranges.

4. Additional information

Dynamic angle and voltage stability limits are considered to the border FI–SE1. Export capacity from Sweden to Finland is limited by dynamic angle stability due to long-distance transmission path between southern Finland and southern Sweden. This is done in order to limit undamped oscillation between large production units (e.g. nuclear power plants) in southern Finland and southern Sweden via the AC network.

This phenomenon limits the transfer capacity below the thermal limit of the cross-border line

Import capacity from Finland to Sweden is limited due to voltage stability. After major production contingency, voltage has to remain on a predefined level (>370kV). This is quite close to the thermal limit of the cross-border lines.

1.2.9. France

1. Current status of the implementation of the CEP70 provisions

There was no derogation for Réseau de Transport d'Électricité (RTE) in CWE and in Italy North for 2021.

For RTE, CEP implementation took place in February 2021 in CWE.

In Italy North, CEP implementation took place in late October 2021, but since the results on the French element regarding the CEP70 provisions were almost always systematically above the 70% threshold, there was no reason to request a derogation.

However, there was a derogation for RTE in the SWE CCR in 2021. The CEP implementation was planned at the end of 2021, and results for SWE on the French elements were slightly lower than in Italy North. There is no longer a derogation for RTE in the SWE CCR for 2022. The go-live of CEP implementation finally took place at the beginning of February 2022. In the event that a CNEC is not respecting the CEP70 provisions, RTE provides some costly remedial action to improve the MACZT (and consequently capacity).

2. Assessment methodology

RTE applies ACER's recommendation to determine MACZT by taking into account non-EU countries. Regarding compliance with the CEP70 provisions, all French non-limiting CNECs and MTUs with price convergence are deemed compliant.

Please note that the overview on the underlying assumptions of the assessment methodology of France is provided in Table 2 in Chapter 2.

3. Assessment results

Based on the assessment methodology, the results for France are as follows.

Figure A20 – Relative cross-zonal trading margin of France for SWE with a minimum capacity of 70% for 80% of the time

Figure A21 – Relative cross-zonal trading margin of France for CWE and IN

Figure A22 provides an overview of the time monitored in 2021 for CWE. Please note that for CWE, the category "application of fallback procedure" considers the application of fallback capacities (default flow-based parameters) or spanning.

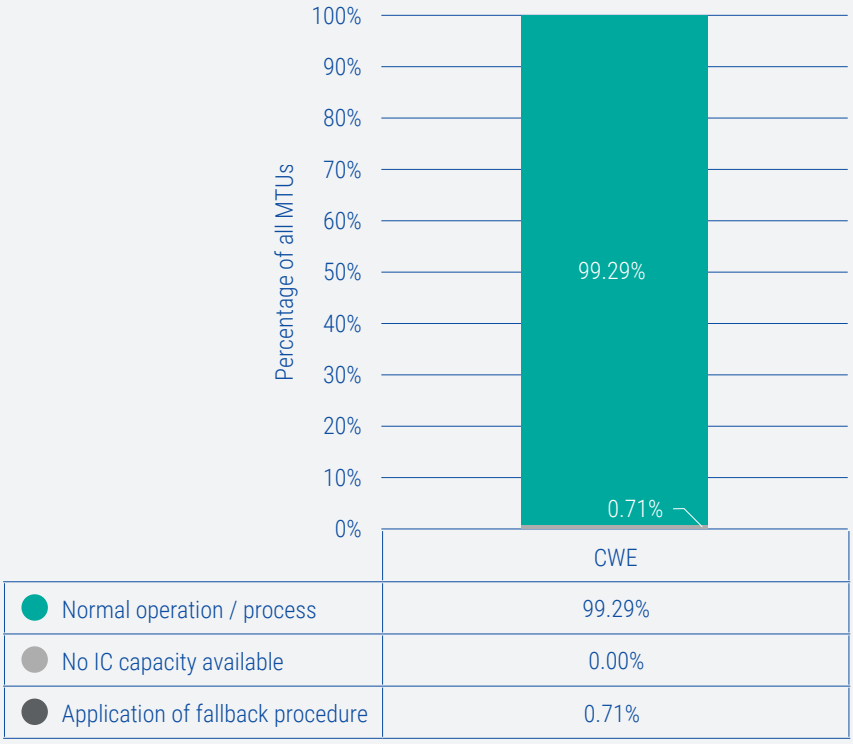


Figure A22 – Overview of time monitored in 2021 for France

1.2.10. Germany

1. Current status of the implementation of the CEP70 provisions

Pursuant to Article 15(1) of the EU Electricity Regulation, EU Member States with identified structural grid congestion can submit an action plan to reduce this congestion. This leads to a situation where the minimum capacity of 70% must be achieved via a linear trajectory by 31 December 2025 (Article 15, para. 2). In this context, the Federal Republic of Germany – after prior consultation with stakeholders and Member States – submitted the Action Plan Bidding Zone to the European Commission and ACER on 28 December 2019. The Action Plan Bidding Zone contains concrete measures through which Germany will counteract the previously identified structural bottlenecks and gradually achieve the minimum capacity for cross-bidding zone electricity trading of 70% by 31 December 2025.

In 2021, the action plan's minimum target was reached. All undercuts of the minimum target were justified by risks for operational security.

2. Assessment methodology

The applied methodology for monitoring compliance regarding the available margin for cross-zonal electricity trade is based on the EU Electricity Regulation and the specifications of the German NRA Bundesnetzagentur (BNetzA).

Accordingly, for borders using a flow-based approach, the available margin is determined per critical network element with the respective contingency (CNEC) and must respect the applicable minimum value (in line with the German action plan) per market time unit (MTU), i.e. in each hour and in both directions. For borders using a cNTC approach, the available margin is determined per border (for borders with AC network elements on the limiting CNEC) and must respect the applicable minimum value per MTU and in both directions. This minimum value defines the minimum capacity that should be made available/offered to the market.

The available margin offered to the market consists of two components. The first is the coordinated margin, which represents the offered capacity on the analysed CNE or border with the respective CCR. In practical terms, for CWE, the coordinated margin is at least equal to the RAM offered in the day-ahead capacity calculation for cross-zonal trade. The second component reflects the uncoordinated margin, which depicts the impact of capacity offered on borders that do not participate in the CCR. In practical terms, the uncoordinated margin is calculated by multiplying the corresponding burdening power transfer distribution factors (PTDFs) with the respective NTCs to determine the impact of these NTCs on the respective CNEC. The total uncoordinated margin of a specific CNEC equals the sum of the individual uncoordinated margins of the different NTC borders.

In November 2020, Amprion and the Belgian TSO Elia put into operation the first direct electricity interconnection between Germany and Belgium, ALEGrO. Against this background, for the first time this report provides an assessment for a complete year. ALEGrO is integrated as a DC interconnection into the CWE capacity calculation and allocation via the evolved flow-based methodology, and is thus subject to a special monitoring methodology. The relevant metric for monitoring compliance is the maximum transmission capacity provided in the FBMC process on ALEGrO. This is modelled within the framework of evolved flow-based via virtual hubs of the converter stations Lixhe and Oberzier. These form their own hubs with their own PTDFs in the capacity calculation and allocation. The maximum or minimum net positions of the virtual hubs are generally limited to the available thermal capacity of ALEGrO and thus also form the basis for the assessment for the present compliance monitoring. This metric must be at least equal to the minimum percentage value according to the action plan multiplied by the available thermal capacity of ALEGrO. In the event of an outage or reduced thermal capacity of ALEGrO, the minimum value for cross-zonal trading capacity of ALEGrO will be reduced as well. Since congestions may occur in the AC grid, the actual trading capacity via ALEGrO may differ from the capacity offered directly on ALEGrO. However, this does not affect the monitoring results of ALEGrO.

More detailed information about the methodology applied and the compliance monitoring can be found in the national monitoring report.

Please note that an overview on the underlying assumptions of the assessment methodology of Germany (all TSOs) is provided in Table 2 in Chapter 2.

3. Assessment results

(a) 50Hertz

Based on the assessment methodology, the results for 50Hertz are as follows.

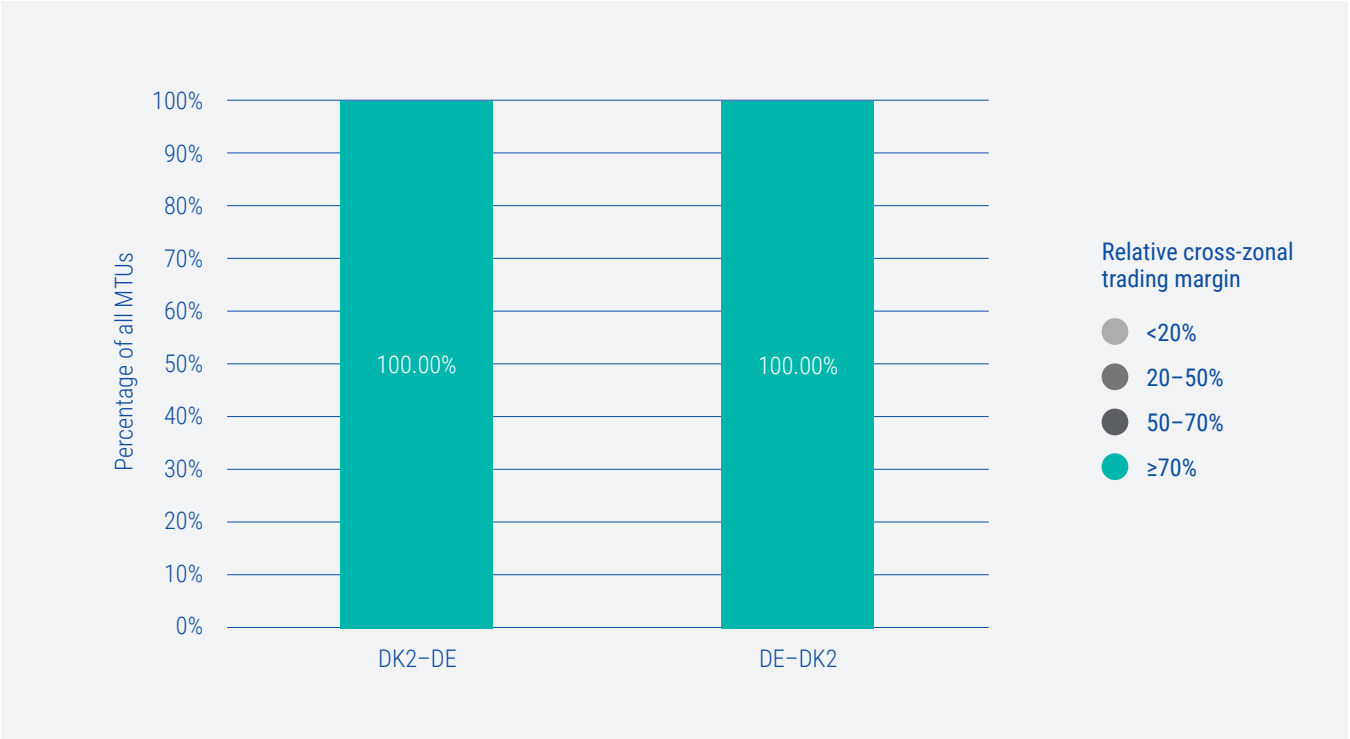


Figure A23 – Relative cross-zonal trading margin of 50Hertz for DK2->DE and DE->DK2 with a minimum capacity of 70%

(b) 50Hertz/TenneT Germany

Based on the assessment methodology, the results for 50Hertz and TenneT Germany for the border to Poland/Czechia are as follows.

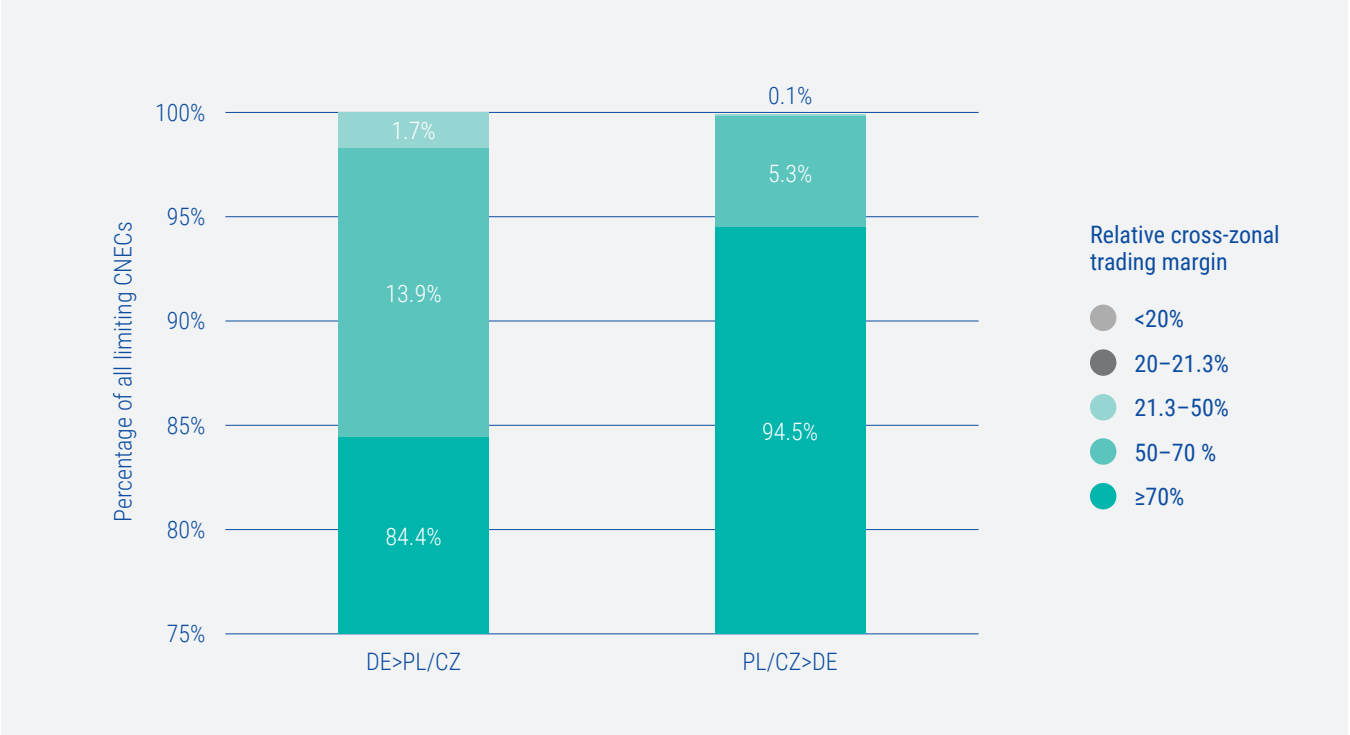


Figure A24 – Relative cross-zonal trading margin of 50Hertz/TenneT Germany for DE->PL/CZ and PL/CZ->DE with a minimum capacity of 21.3%

(c) Amprion

Based on the assessment methodology, the results for Amprion are as follows.

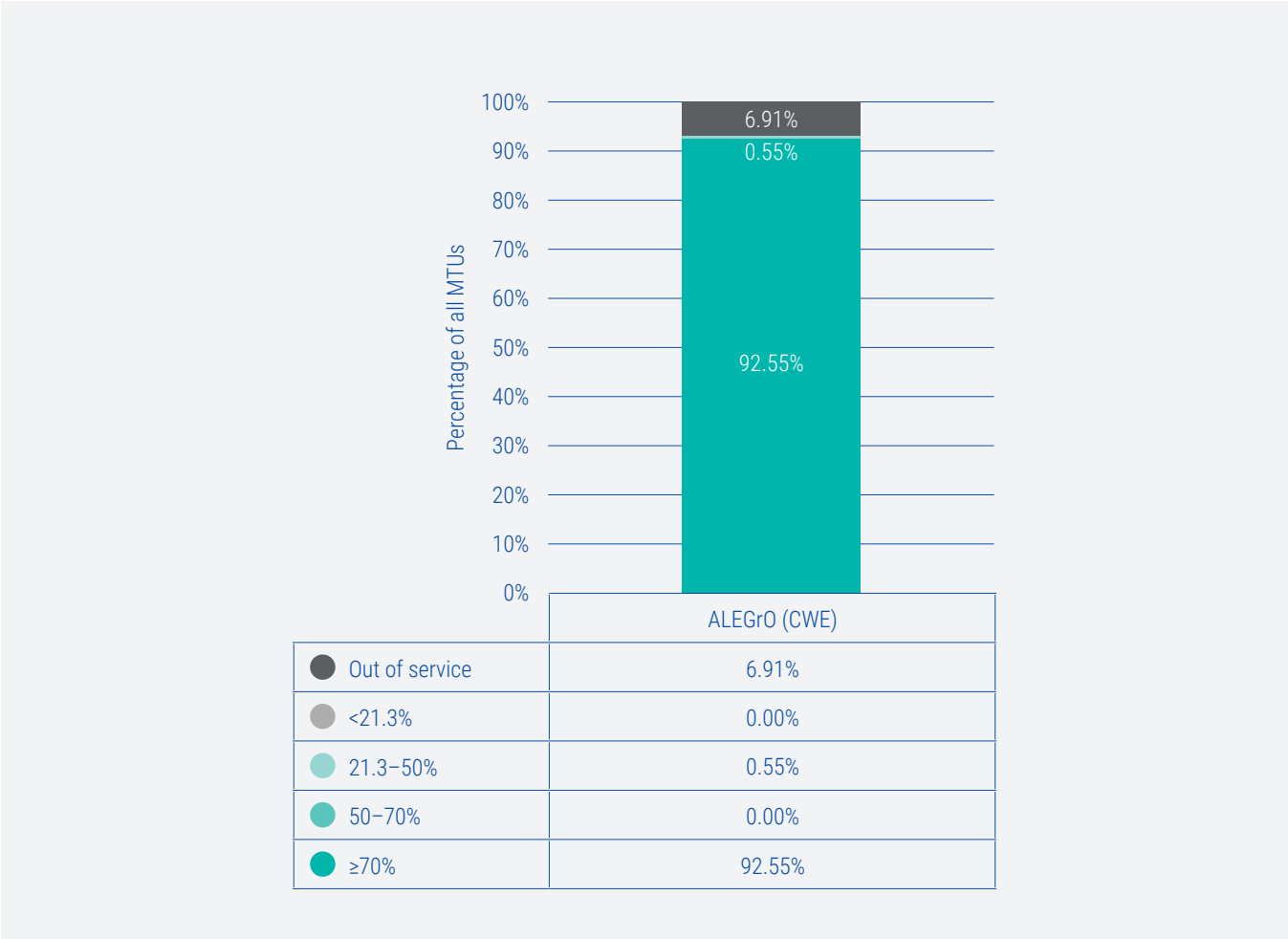


Figure A25 – Relative cross-zonal trading margin of Amprion for ALEGrO (CWE)

Amprion was able to offer 100% of the available thermal transmission capacity of 1 000 MW for cross-zonal electricity trading in 92.55% of the hours in 2021.

During the following periods, ALEGrO was not available due to maintenance work:

- 11 March 2021 7 a.m. to 12 March 2021 3 p.m.: planned outage (maintenance of critical functions: measurement of electromagnetic coupling, replacement of defective components in the converter);
- 16 May 2021 12 a.m. to 22 May 2021 10 p.m. as well as 25 May 2021 5 a.m. until 26 May 2021 3 p.m.: planned outage (annual maintenance of ALEGrO);
- 19 August 2021 6 a.m. until 3 September 2021 10 p.m.: planned outage (repair of the roof of the converter station in Lixhe on the Belgian side).

During these periods, the available thermal capacity dropped to 0 MW, so that no capacity had to be offered for cross-zonal electricity trading on ALEGrO.

On 18 and 19 January 2021, Elia and Amprion had to lower the capacity offered on ALEGrO to 250 MW for 48 hours, which corresponds to 0.55% of the hours in 2021. The cause was a technical error in the allocation algorithm of the CWE FBMC and thus outside Amprion's sphere of influence. With the reduction to 250 MW, Elia and Amprion helped to prevent a decoupling, which would have resulted in much higher economic losses than a capacity reduction on ALEGrO. Nevertheless, 25% of the available thermal capacity of ALEGrO could be offered during these hours, meaning that the minimum value of 21.3% could also be reached during these hours.

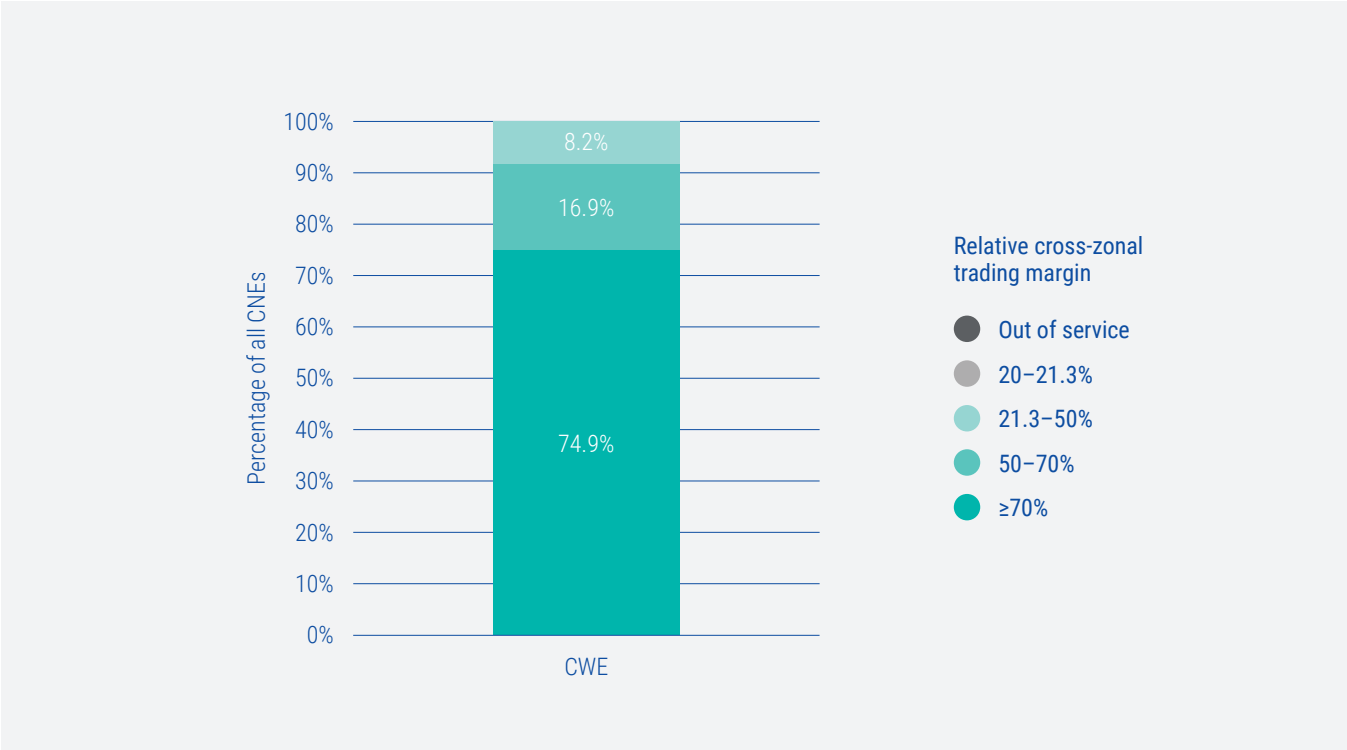


Figure A26 – Relative cross-zonal trading margin of Amprion for CWE with a minimum capacity of 21.3%

(d) TenneT Germany

Based on the assessment methodology, the results for TenneT Germany are as follows.

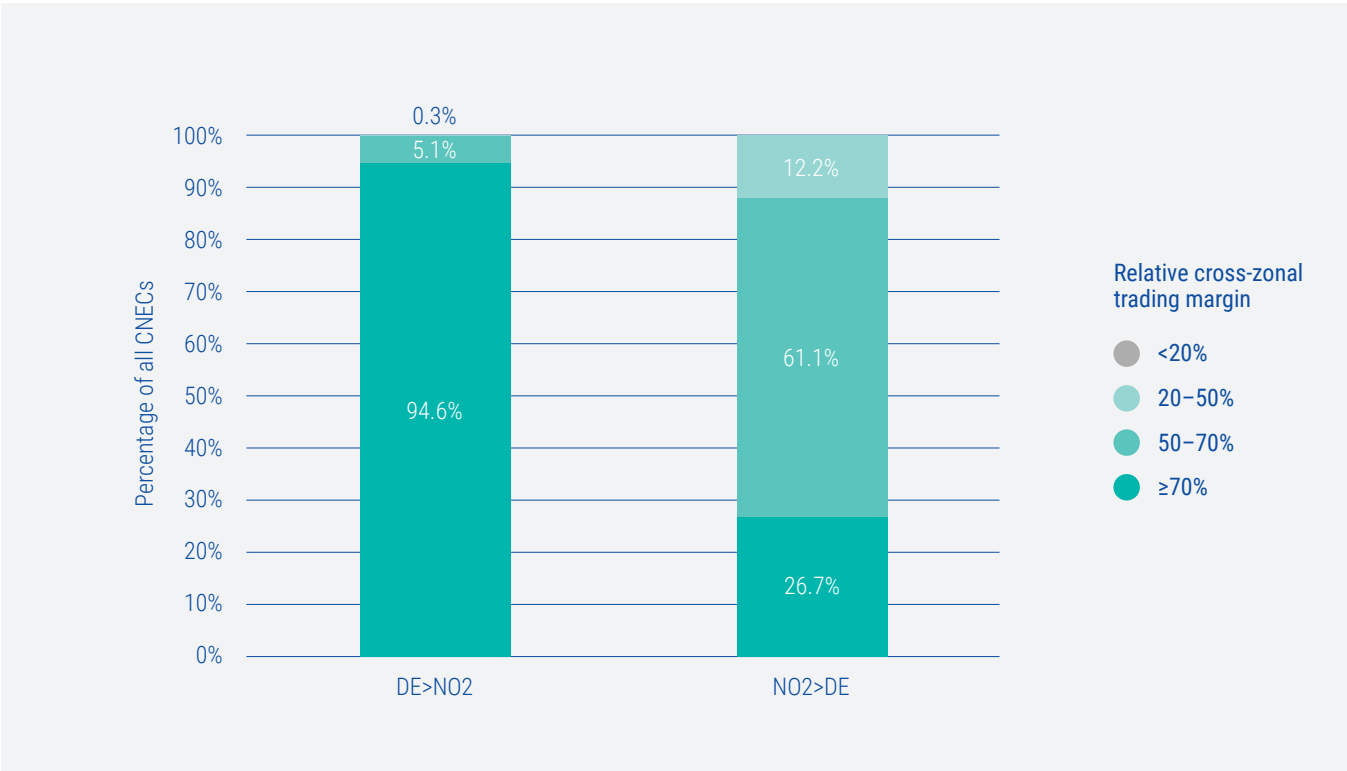


Figure A27 – Relative cross-zonal trading margin of TenneT Germany for DE->NO2 and NO2->DE with a minimum capacity of 11.7%

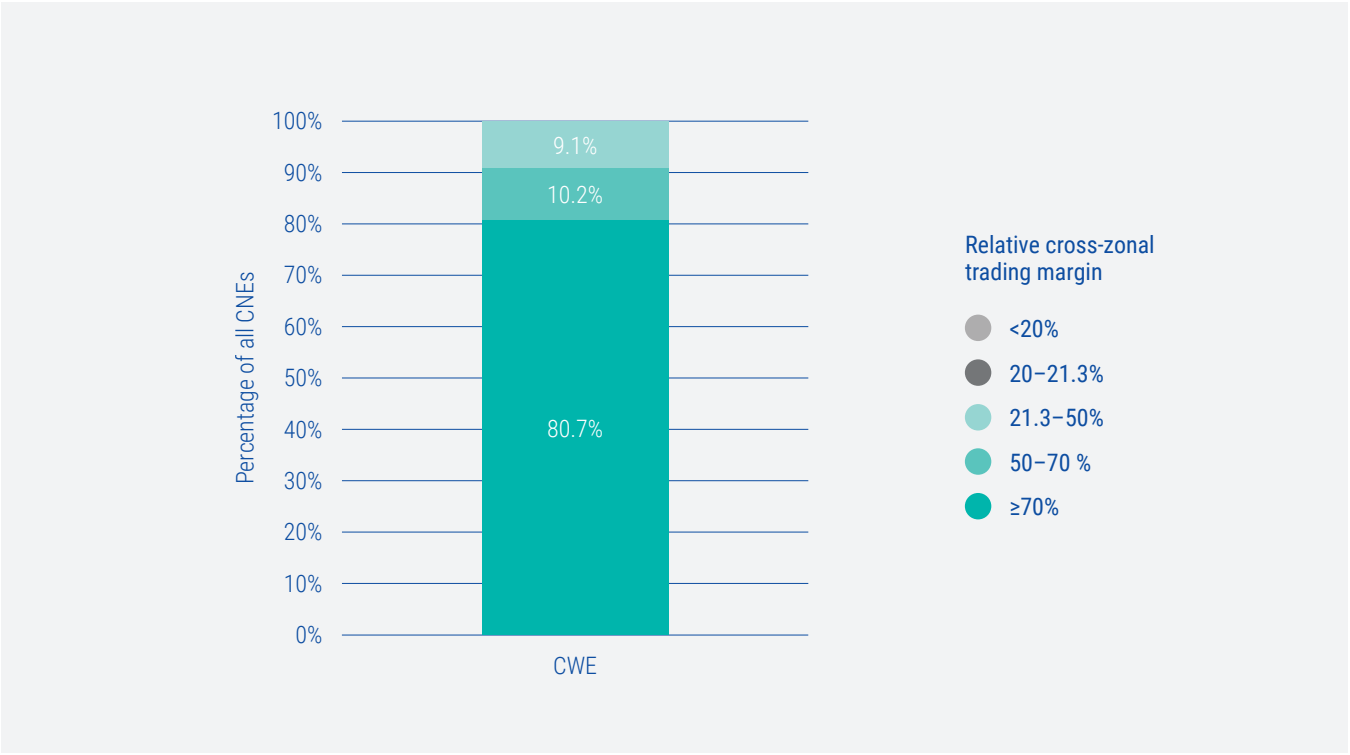


Figure A28 – Relative cross-zonal trading margin of TenneT Germany for CWE with a minimum capacity of 21.3%

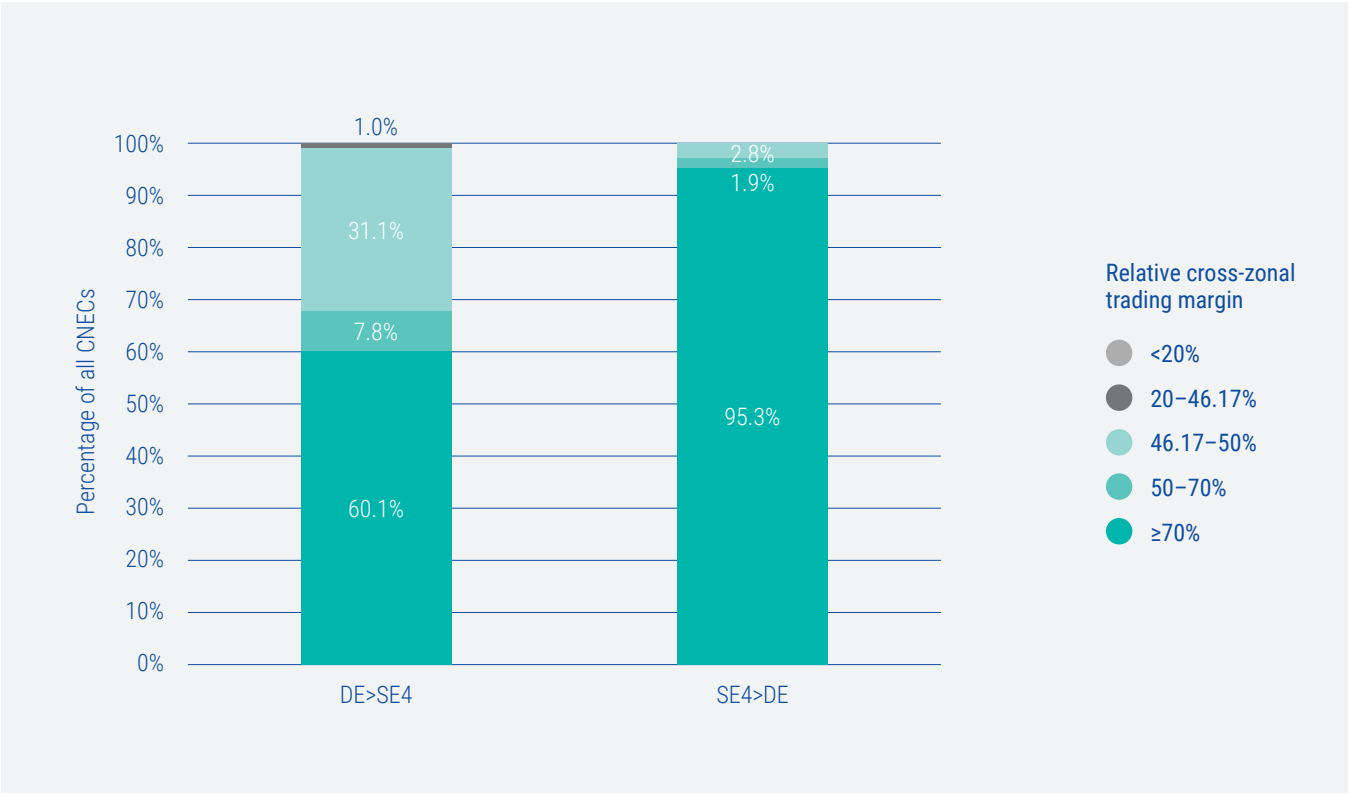


Figure A29 – Relative cross-zonal trading margin of TenneT Germany for DE>SE4 and SE4>DE with a minimum capacity of 46.17%

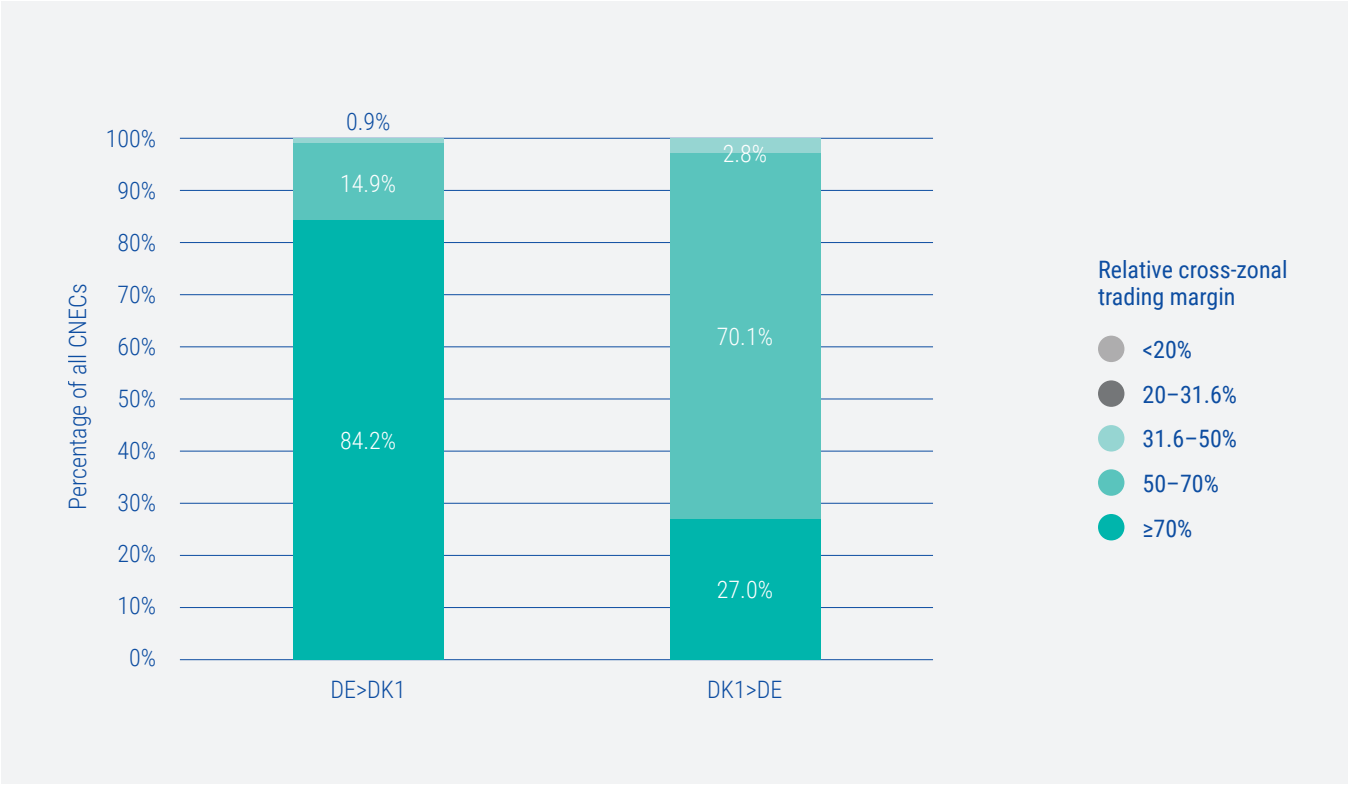


Figure A30 – Relative cross-zonal trading margin of TenneT Germany DE->DK1 and DK1->DE with a minimum capacity of 31.6%

(e) TransnetBW

Based on the assessment methodology, the results for TransnetBW are as follows.

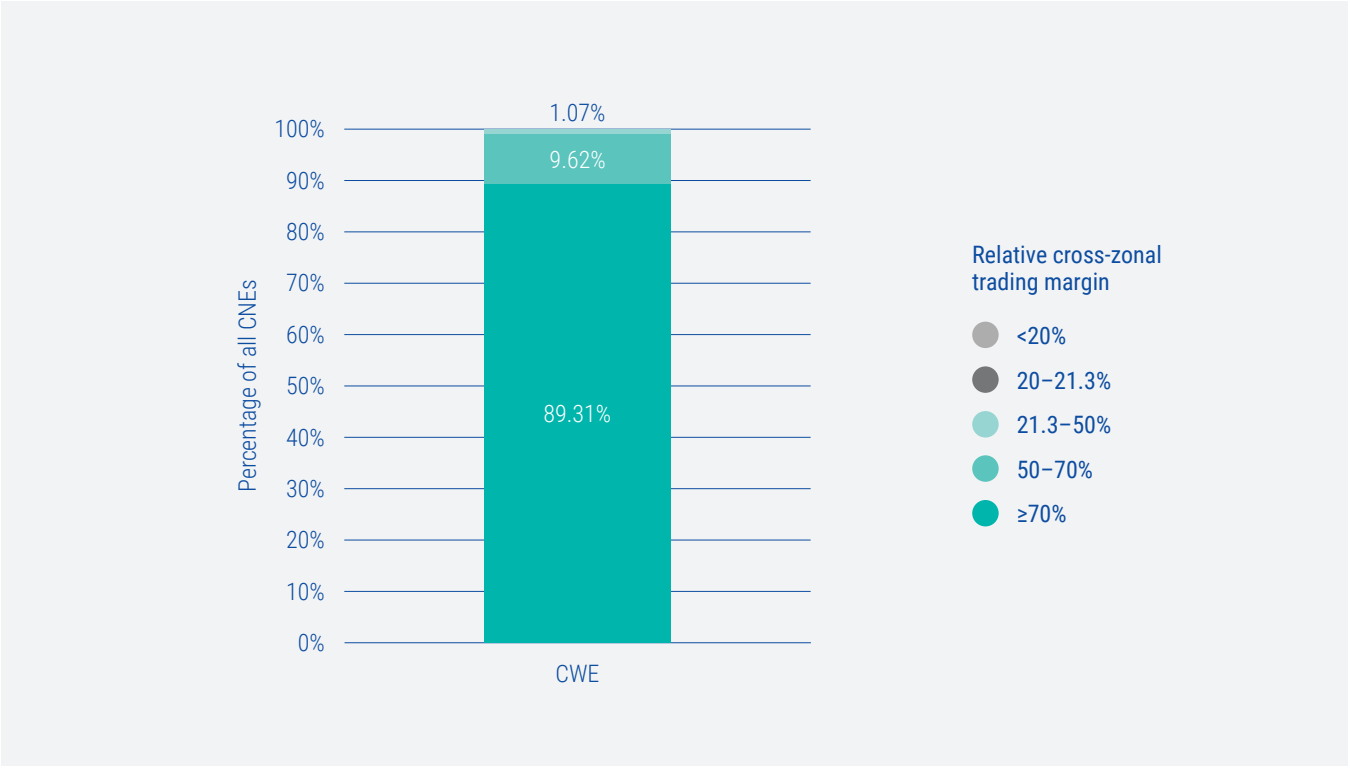


Figure A31 – Relative cross-zonal trading margin of TransnetBW for CWE with a minimum capacity of 21.3%

4. Additional information

Figure A32 provides an overview of the time monitored in 2021 for Germany. The category "Normal operation/process" represents all MTUs of 2021 that have been monitored. The category "No IC capacity available" indicates the amount of MTUs during which no interconnector capacity has been available in 2021. Yet, it has to be noted that for flow-based borders, this category will be empty always as it cannot happen that no IC capacity in the entire flow-based system is available. However, the category is kept for the sake of comparability to other borders. The category "application of fallback procedure" represents the amount of MTUs during which MTUs have not been monitored due to problems in the capacity calculation.

Please note that for CWE, the category "Application of fallback procedure" considers the application of fallback capacities (default flow-based parameters) or spanning.

	CWE	DK2–DE	DE–DK2	DE>PL/CZ	PL/CZ>DE	DE>SE4	SE4>DE	DE>DK1	DK1>DE	DE>NO2	NO2>DE
Normal operation / process	99.29%	100.00%	100.00%	100.00%	99.73%	98.79%	98.79%	99.73%	99.73%	92.98%	92.98%
No IC capacity available	0.00%	0.00%	0.00%	0.00%	0.00%	1.21%	1.21%	0.00%	0.00%	6.75%	6.75%
Application of fallback procedure	0.71%	0.00%	0.00%	0.00%	0.27%	0.00%	0.00%	0.27%	0.27%	0.27%	0.27%

Figure A32 – Overview of time monitored in 2021 for Germany

1.2.11. Greece

1. Current status of the implementation of the CEP70 provisions

As in 2021, IPTO has been granted a derogation for commercial flows from non-EU countries, insufficient potential for remedial actions and development of new processes and tools in 2022.

2. Assessment methodology

The methodology according to ACER's Recommendation No. 01/2019 is applied.

To estimate compliance with the 70% rule, the results from ACER were considered. For the SEE CCR, derogation is present for 2020 for the GR–BG border.

Please note that an overview on the underlying assumptions of the assessment methodology of Greece is provided in Table 2 in Chapter 2.

3. Assessment results

Based on the assessment methodology, the results for Greece are as follows. Please note that **Figure A33** and A34 do not include the number of cases where the line BG–GR was out of operation and where there is a failure in the process of obtaining results.

GRIT = Greece and Italy.

Figure A33 – Relative cross-zonal trading margin of Greece

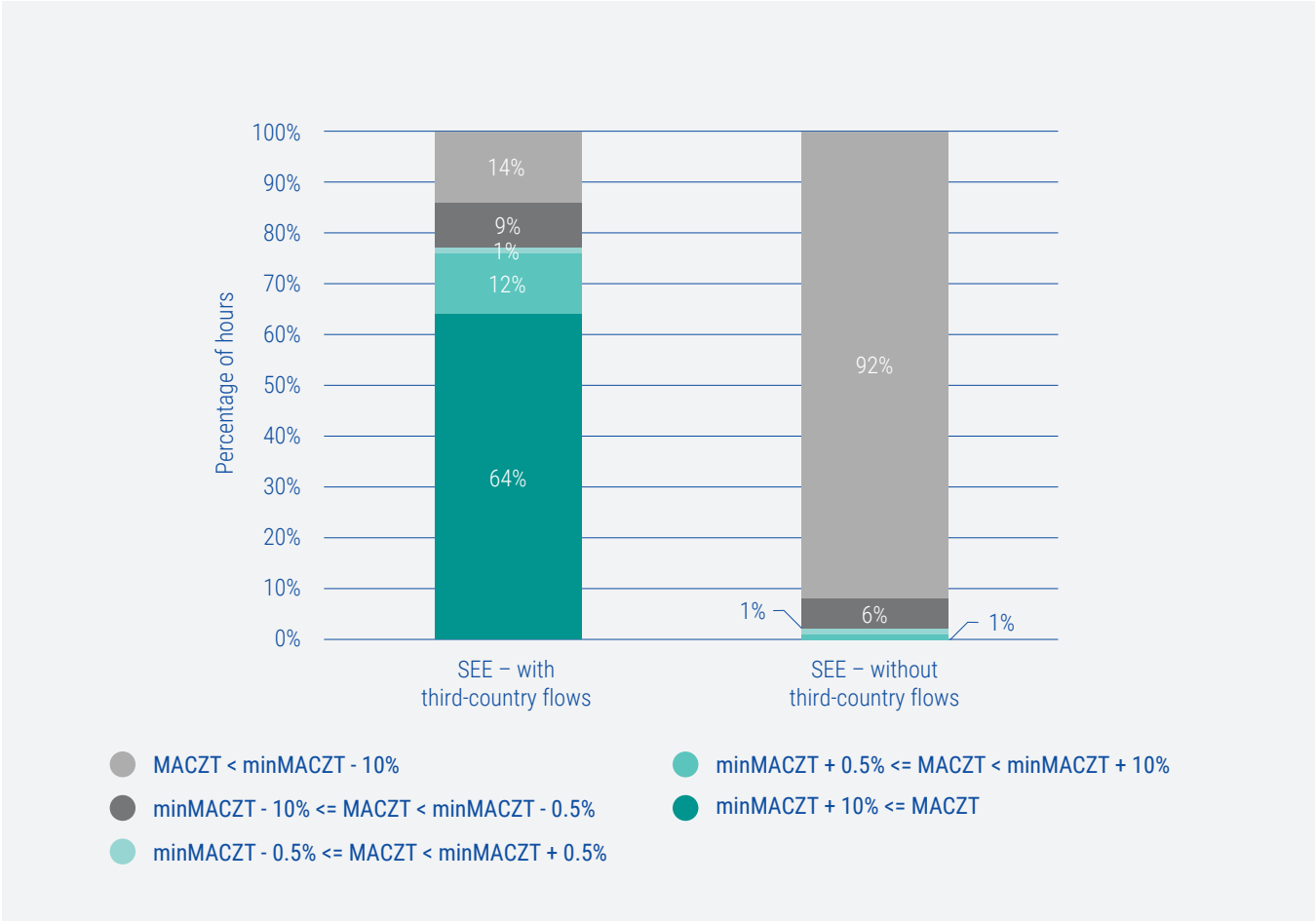


Figure A34 – Percentage of time when the relative MACZT of the least-performing Greek CNEC per MTU is above its minimum MACZT or within a certain range below its minimum MACZT. For each MTU, the CNEC with the lowest MACZT margin was selected and categorised into one of the ranges.

1.2.12. Hungary

1. Current status of the implementation of the CEP70 provisions

In 2021, a derogation with respect to all EU bidding zone borders (HU–HR, HU–AT, HU–RO, HU–SK, future HU–SI) is applied, until the introduction of a coordinated flow-based CCM in accordance with the CACM regulation. According to the derogation, Magyar Villamosenergia-ipari Átviteli Rendszerirányító Zártkörűen Működő Részvénytársaság (MAVIR) is expected to make available for cross-border trade at least the following capacities for the limiting CNECs relevant for the interfaces and exchange directions specified as follows, as a minimum value for the 75% of MTUs including non-EU country flows during the derogation period:

- SK–HU border/import direction: 10%
- AT–HU border/import direction: 25%
- HR–HU border/import direction: 10%.

2. Assessment methodology

We perform our assessment by calculating PTDFs on the merged day-ahead congestion forecast (DACF) models, simulating the potential flows for the case when all available capacities offered to the market was scheduled. This is the worst-case scenario from the perspective of the security of supply, and shall be considered by a TSO.

Please note that an overview of the underlying assumptions of the assessment methodology of Hungary is provided in Table 2 in Chapter 2.

3. Assessment results

Based on the assessment methodology, the results for Hungary are as follows.

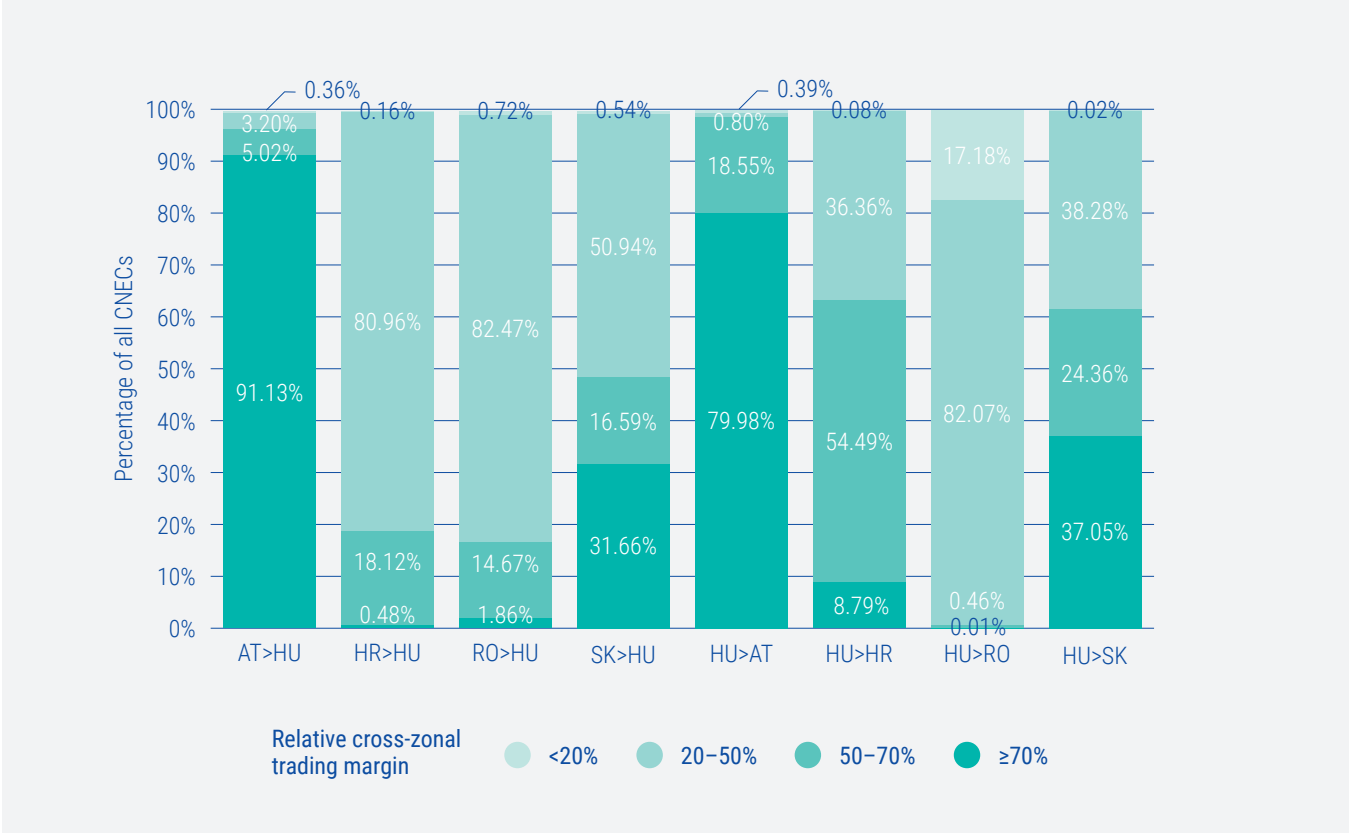


Figure A35 – Relative cross-zonal trading margin of Hungary

1.2.13. Italy

1. Current status of the implementation of the CEP70 provisions

For Italy North, a derogation was in place for 2021 for all MTUs where allocation constraints are applied and for all MTUs until the entry into operation of the 'coordinated adjustment for minimum capacity' process. No minimum capacity target was defined.

The process entered into force at the end of October 2021.

2. Assessment methodology

Terna applies ACER's recommendation to determine MACZT by taking into account non-EU countries. Regarding compliance with the 70% rule, in the presence of a coordinated capacity calculation for the CCR, the MACZT target is assessed only on the limiting CNEC(s).

Please note that an overview of the underlying assumptions of the assessment methodology of Italy is provided in Table 2 in Chapter 2.

3. Assessment results

Based on the assessment methodology, the results for Italy are as follows.

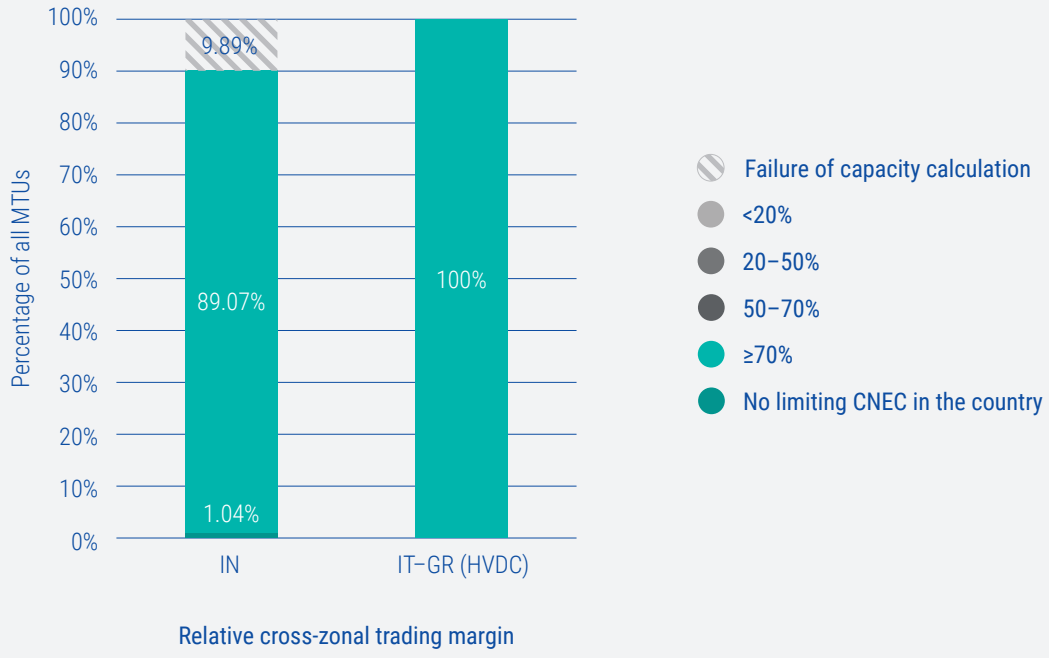
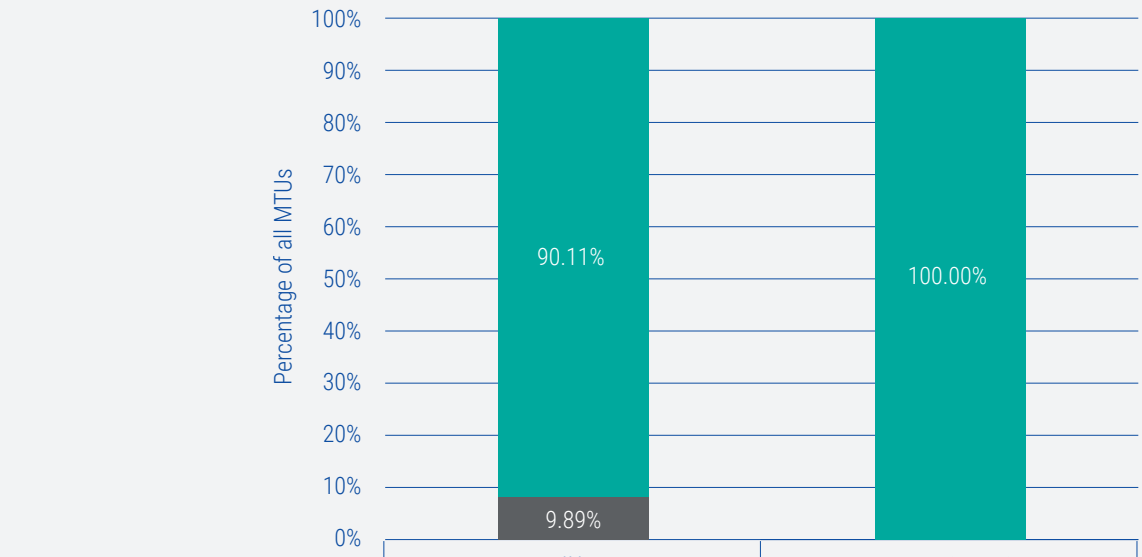


Figure A36 – Relative cross-zonal trading margin of Italy



	IN	IT–GR (HVDC)
Normal operation / process	90.11%	100.00%
No IC capacity available	0.00%	0.00%
Application of fallback procedure	9.89%	0.00%

Figure A37 – Overview of time monitored in 2021 for Italy

4. Additional information

Italy North is a CCR where the cNTC approach is used, according to the approved methodology. The calculation is performed in a coordinated manner, considering all the involved borders simultaneously, so that a single CNEC of one TSO can limit the capacity for all the borders, unlike the flow-based approach.

1.2.14. Latvia

1. Current status of the implementation of the CEP70 provisions

The 70% rule is applied in 2021.

2. Assessment methodology

The 70% rule according to Article 16(8) of the EU Electricity Regulation and the ACER Recommendation.

Please note that an overview of the underlying assumptions of the assessment methodology of Latvia is provided in Table 2 in Chapter 2.

3. Assessment results

Based on the assessment methodology, the results for Latvia are as follows.

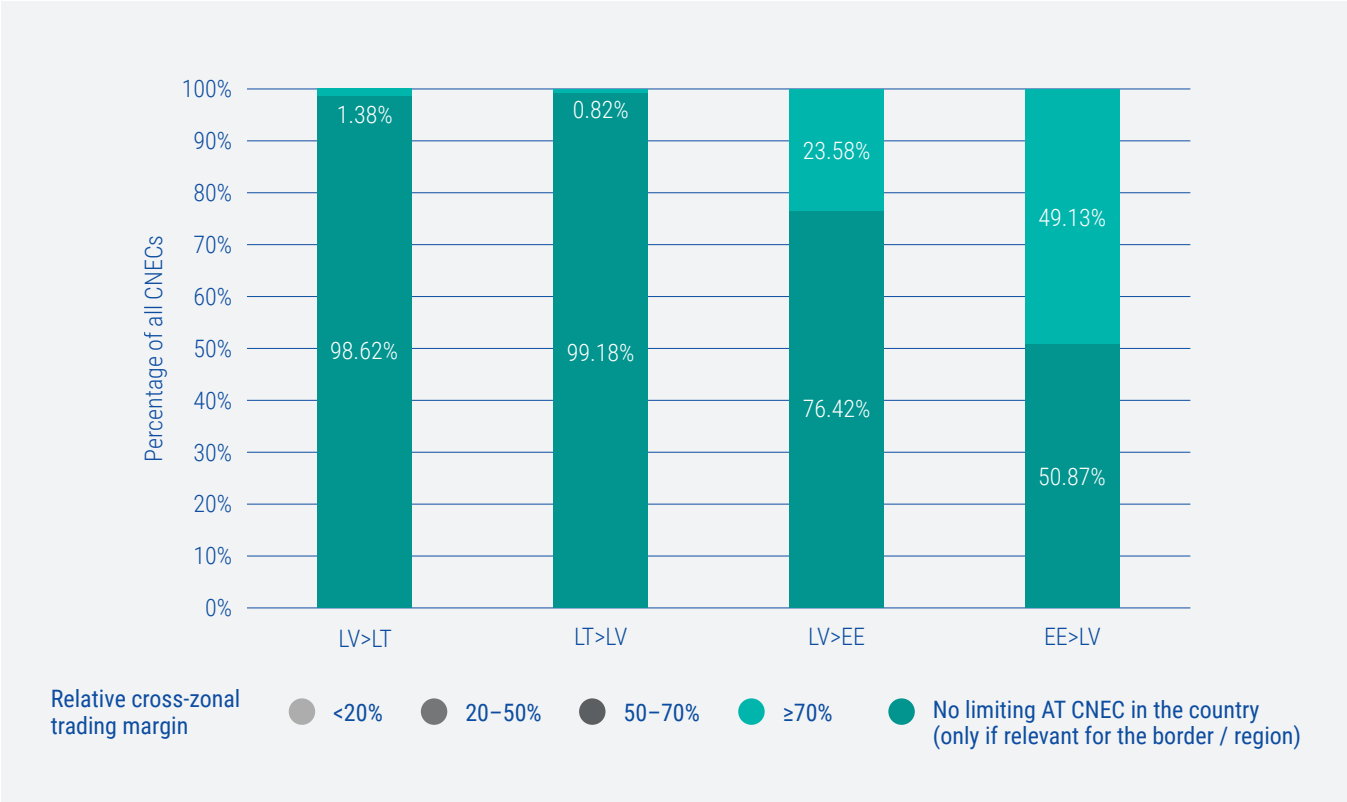
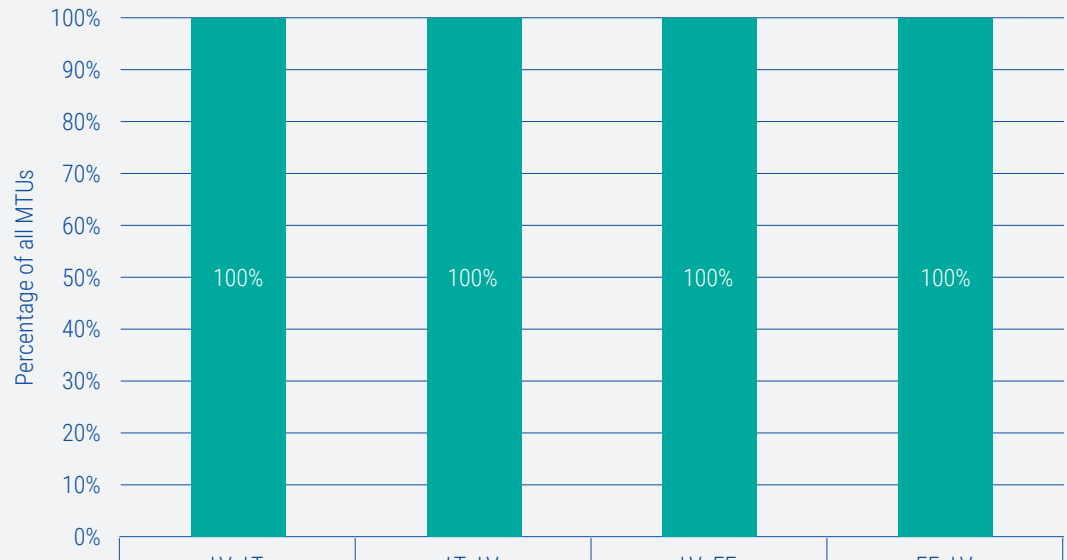


Figure A38 – Relative cross-zonal trading margin of Latvia



	LV>LT	LT>LV	LV>EE	EE>LV
Normal operation / process	100%	100%	100%	100%
No IC capacity available	0%	0%	0%	0%
Application of fallback procedure	0%	0%	0%	0%

Figure A39 – Overview of time monitored in 2021 for Latvia

1.2.15. Lithuania

1. Current status of the implementation of the CEP70 provisions

The 70% rule is applied in 2021.

2. Assessment methodology

The 70% rule according to Article 16(8) of the EU Electricity Regulation and the ACER recommendation.

Please note that an overview of the underlying assumptions of the assessment methodology of Lithuania is provided in Table 2 in Chapter 2.

3. Assessment results

Based on the assessment methodology, the results for Lithuania are as follows.

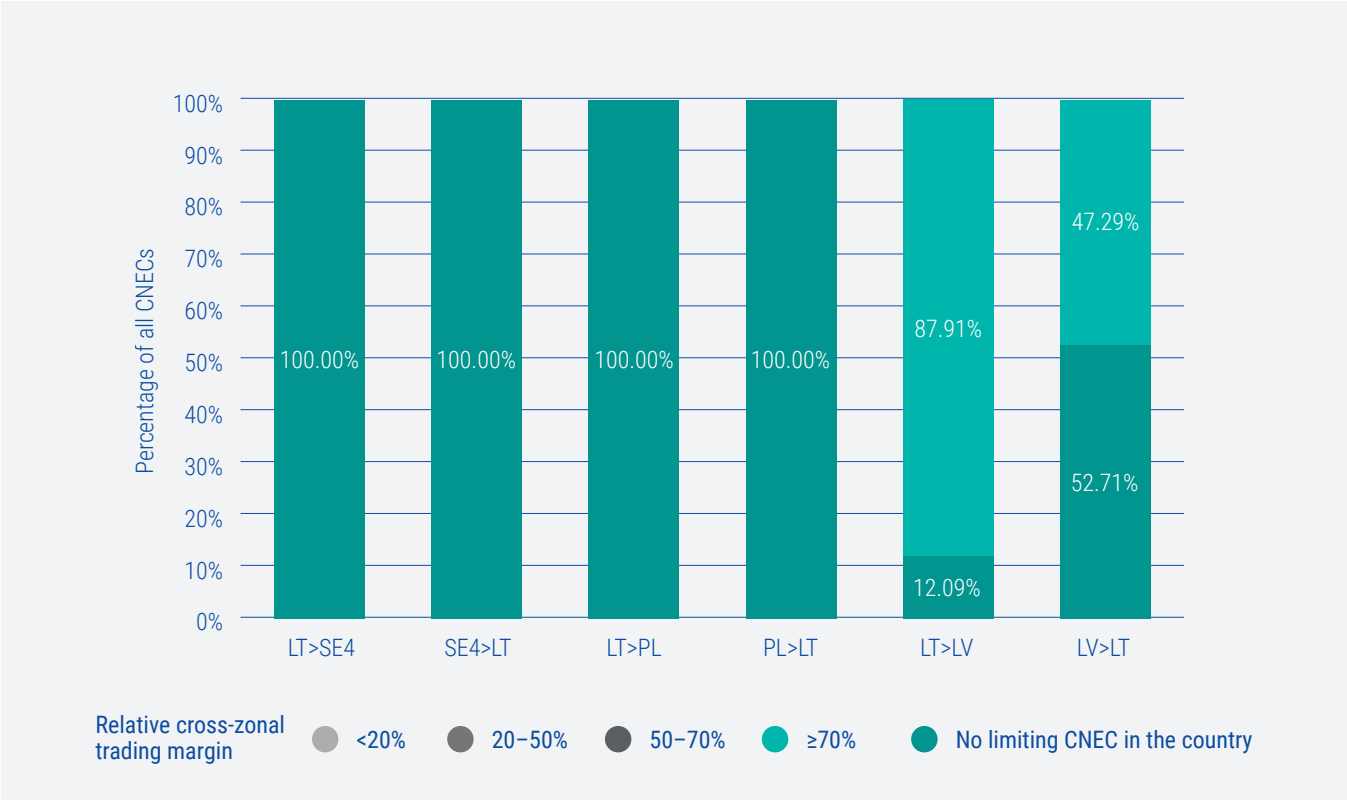
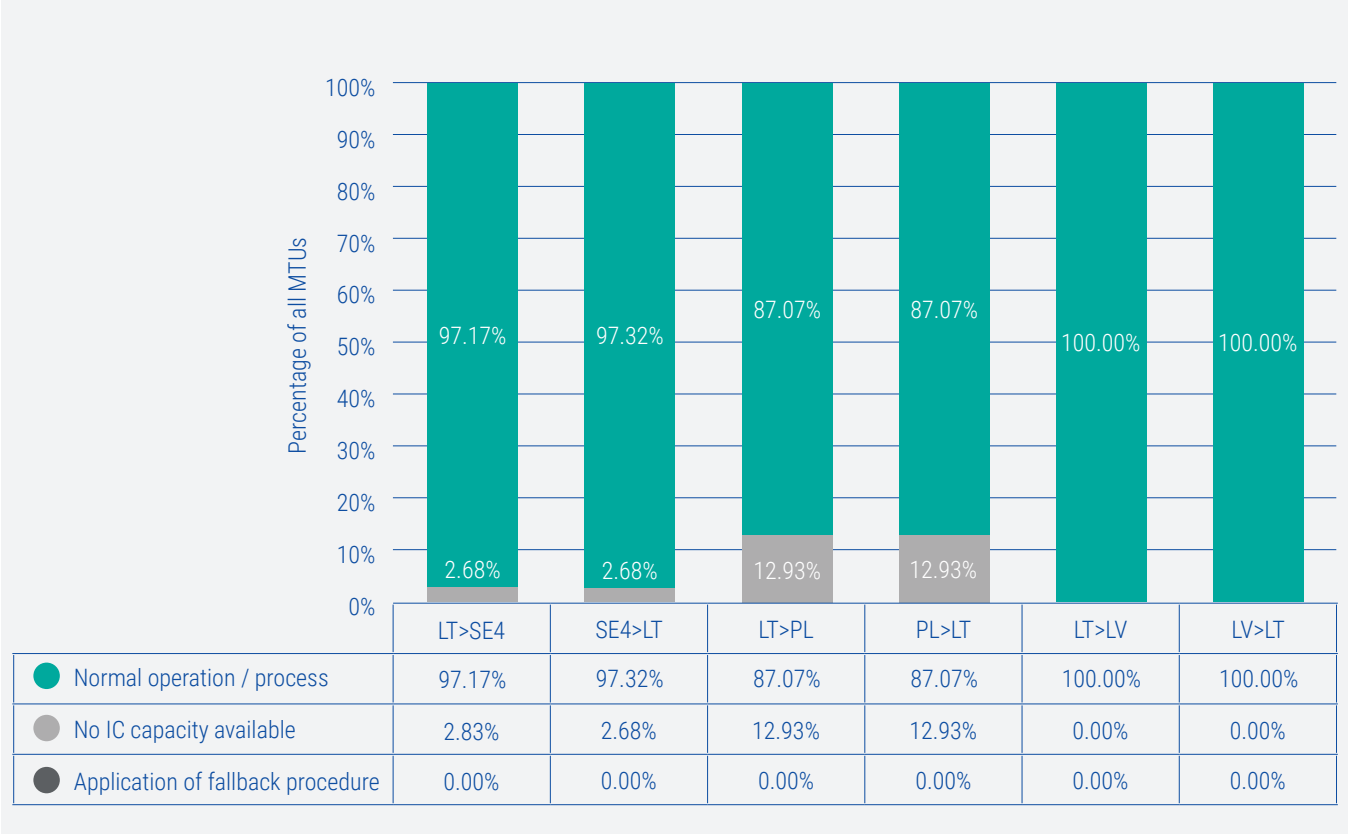


Figure A40 – Relative cross-zonal trading margin of Lithuania

4. Additional information



	LT>SE4	SE4>LT	LT>PL	PL>LT	LT>LV	LV>LT
Normal operation / process	97.17%	97.32%	87.07%	87.07%	100.00%	100.00%
No IC capacity available	2.83%	2.68%	12.93%	12.93%	0.00%	0.00%
Application of fallback procedure	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Figure A41 – Overview of time monitored in 2021 for Lithuania

1.2.16. Poland

1. Current status of the implementation of the CEP70 provisions

Poland adopted an action plan in December 2019, pursuant to Article 15(1) of the EU Electricity Regulation. The Polish action plan foresees several transmission investments that will be carried out to ensure that the 70% obligation is fulfilled by 31 December 2025. The action plan foresees that the level of CZC available for trade between bidding zones shall be gradually increased from 2020 to 2025 by means of a linear trajectory, until it reaches the level foreseen by Article 16(8) of the EU Electricity Regulation.

Additionally, Poland has obtained a derogation for 2021 based on foreseeable grounds affecting the security of system operation in accordance with Article 16(9) of the EU Electricity Regulation. The derogation granted covers two different reasons to deviate from the CEP70 provisions: (i) excessive loop flows through the Polish grid and lack of coordinated redispatching and countertrading (until the end of 2021) and (ii) uncertainties in uncoordinated transits (until the end of 2021). The derogation obtained concerns the borders belonging to the Core CCR (synchronous AC borders: DE–PL, CZ–PL and SK–PL).

Finally, both planned and unplanned outages in transmission elements affect the level of CZC that can be safely offered to the market. Prolonged outages of transmission elements impacting the ability to meet the CEP70 provisions, especially when they are required to perform necessary grid reinforcements or modernisation works, are not treated as non-compliance with Article 16(8) of the EU Electricity Regulation.

2. Assessment methodology

Polskie Sieci Elektroenergetyczne (PSE) calculates CZC according to the NTC methodology approved by the Polish NRA. Capacity calculations are based on the two-days-ahead congestion forecast (D2CF) file prepared by PSE using the latest available intraday models within the CEE CCR. When calculating capacities to be made available for the day-ahead market, PSE carefully monitors the calculated NTC and transit flows against the required minimum capacities from the linear trajectory obligations. When the CZC (including transits through the Polish grid) does not fulfil the criterion of minMACZT, the day-ahead capacities offered are increased to the required minimum threshold, upon assessing the availability of remedial actions. Please note that an overview of the underlying assumptions of the assessment methodology

of Poland is provided in Table 2 in Chapter 2.

3. Assessment results

CEP70 reporting is split into two parts: first and second semester. The following section presents the monitoring results obtained for Poland. Hours in which the minimal required MACZT levels were fulfilled are marked as fulfilled. Similarly, hours in which the minimal MACZT levels were considered as conditionally fulfilled due to legitimate reasons (outages, derogations, lack of redispatching potential) are also marked as fulfilled.

It is worth highlighting that in its assessment, PSE considered the applicable market design in Poland, and in particular the application of capacity allocation constraints. Detailed information on the usage and application of capacity allocation constraints is available in the regional CCMs for the Core, Hansa and Baltic CCRs. For borders belonging to the Core CCR, where uncoordinated NTC is applied and the allocation mechanism is based on explicit auctions, the capacities offered for the market are verified to account for allocation constraints. However, for the purpose of CEP70 monitoring, PSE checks the linear trajectory based on calculated NTC that is not verified for allocation constraints. In light of the EU Electricity Regulation and the CACM regulation, allocation constraints serve to maintain the system within operational security limits, while minimal capacity obligations consider the percentage of capacity that respects operational security limits. Therefore, application of allocation constraints cannot be considered to cause a reduction in the capacities offered by PSE to below the trajectory thresholds.

Assessment results for the first semester of 2021 with derogations

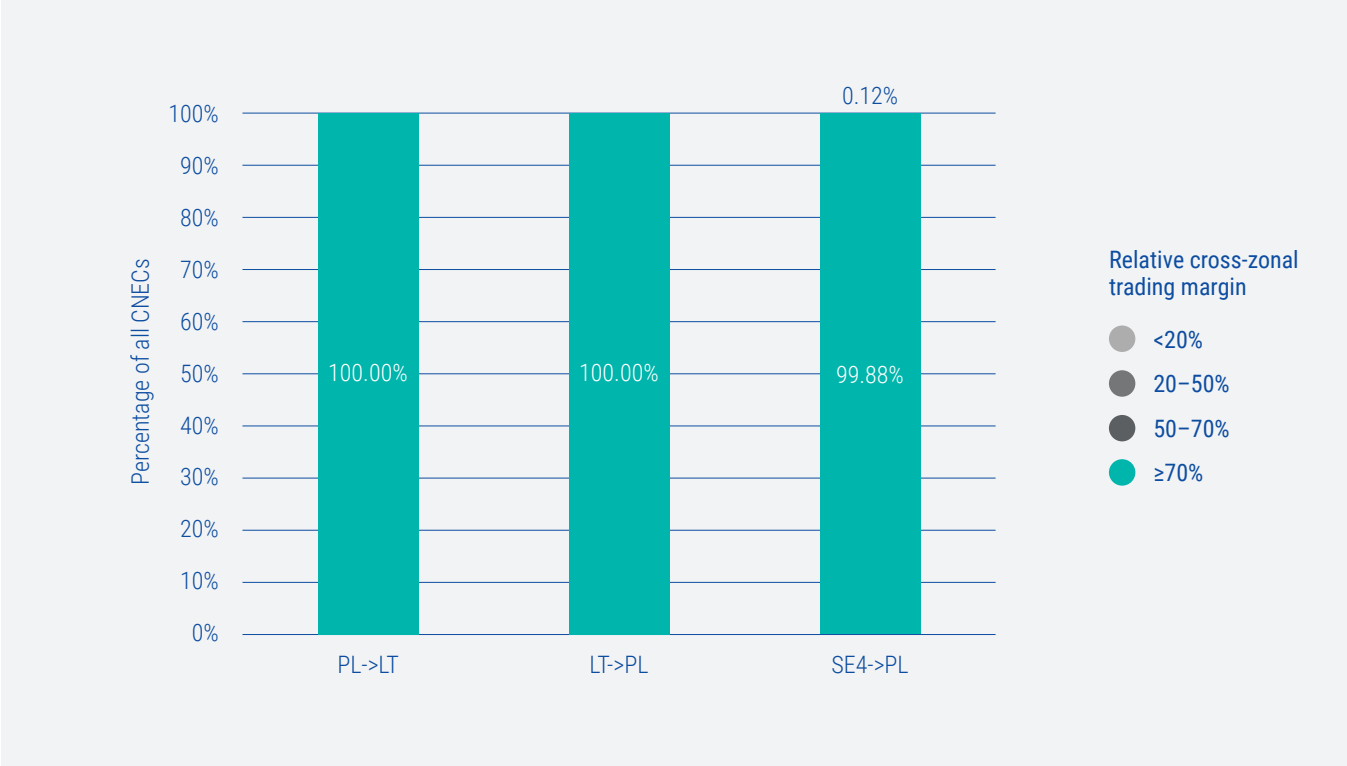


Figure A42 – Relative cross-zonal trading margin of Poland for PL->LT, LT->PL and SE->PL in the first semester

Figure A43 – Relative cross-zonal trading margin of Poland for PL->SE with a minimum capacity of 45% in the first semester

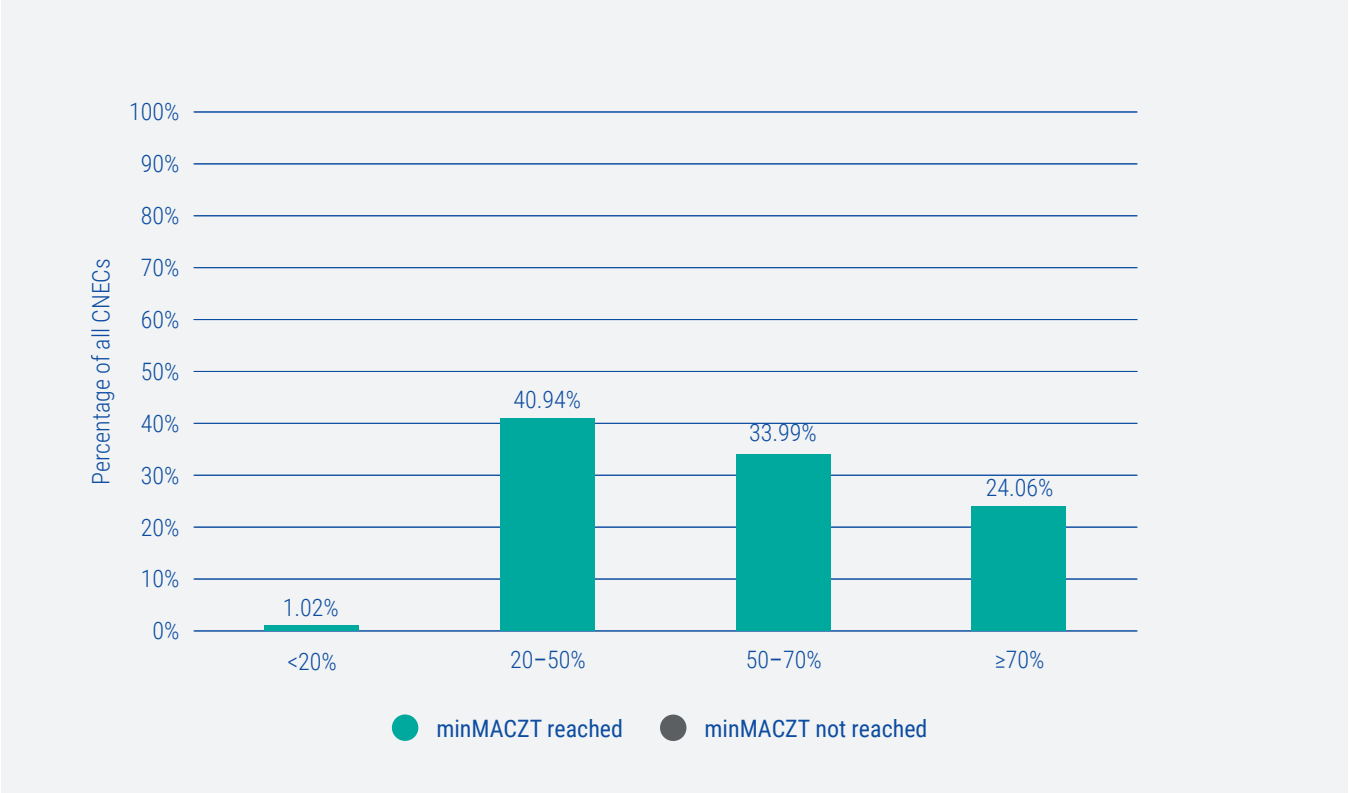


Figure A44 – Relative cross-zonal trading margin of Poland for CZ–DE–SK->PL in the first semester

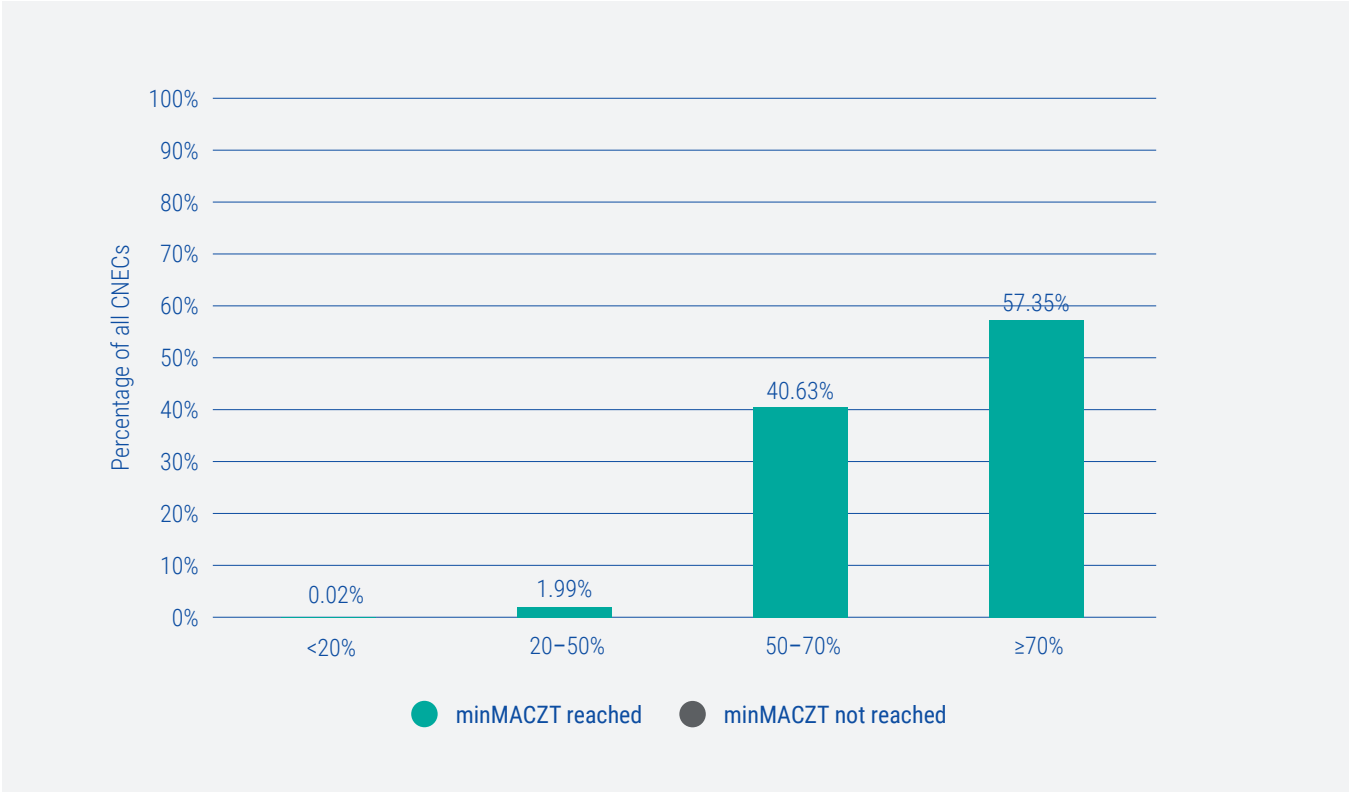


Figure A45 – Relative cross-zonal trading margin of Poland for PL->CZ–DE–SK in the first semester

Assessment results for the second semester of 2021

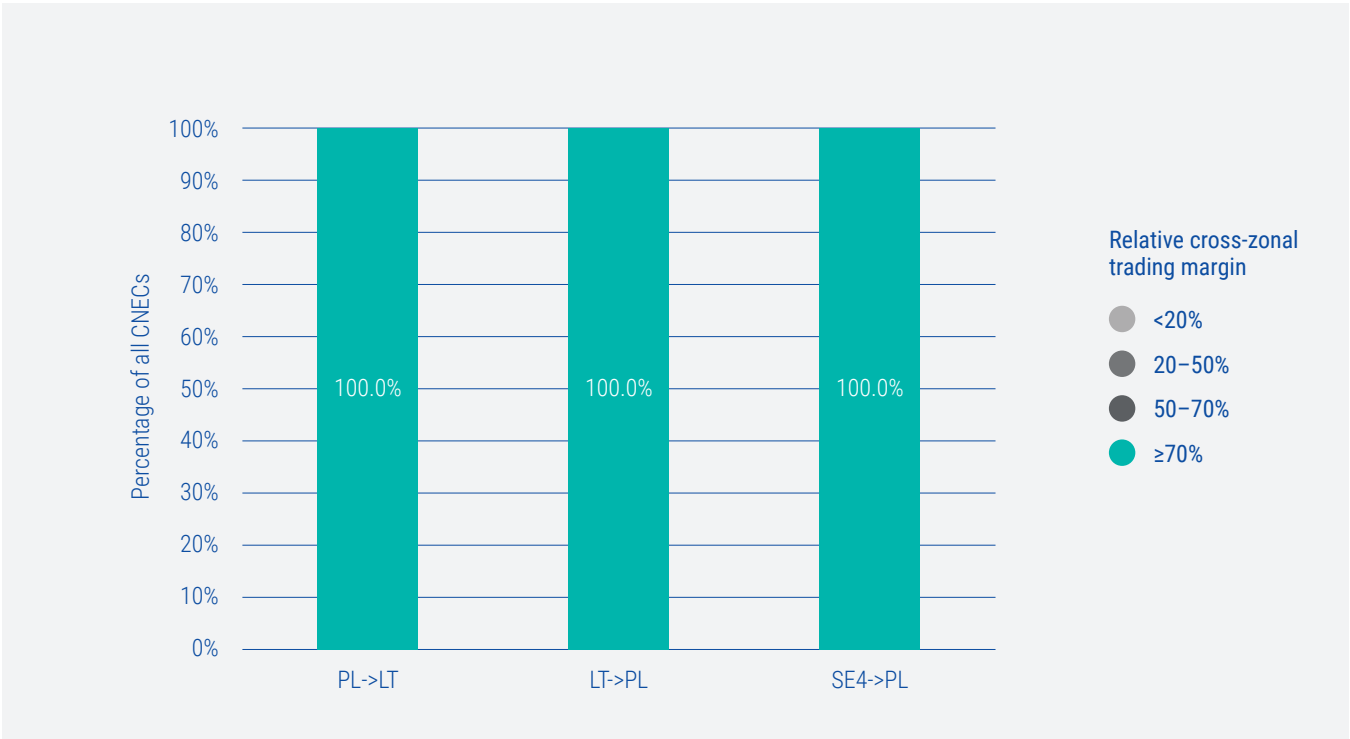


Figure A46 – Relative cross-zonal trading margin of Poland for PL->LT, LT->PL and SE->PL in the second semester

Figure A47 – Relative cross-zonal trading margin of Poland for PL->SE with a minimum capacity of 45% in the second semester

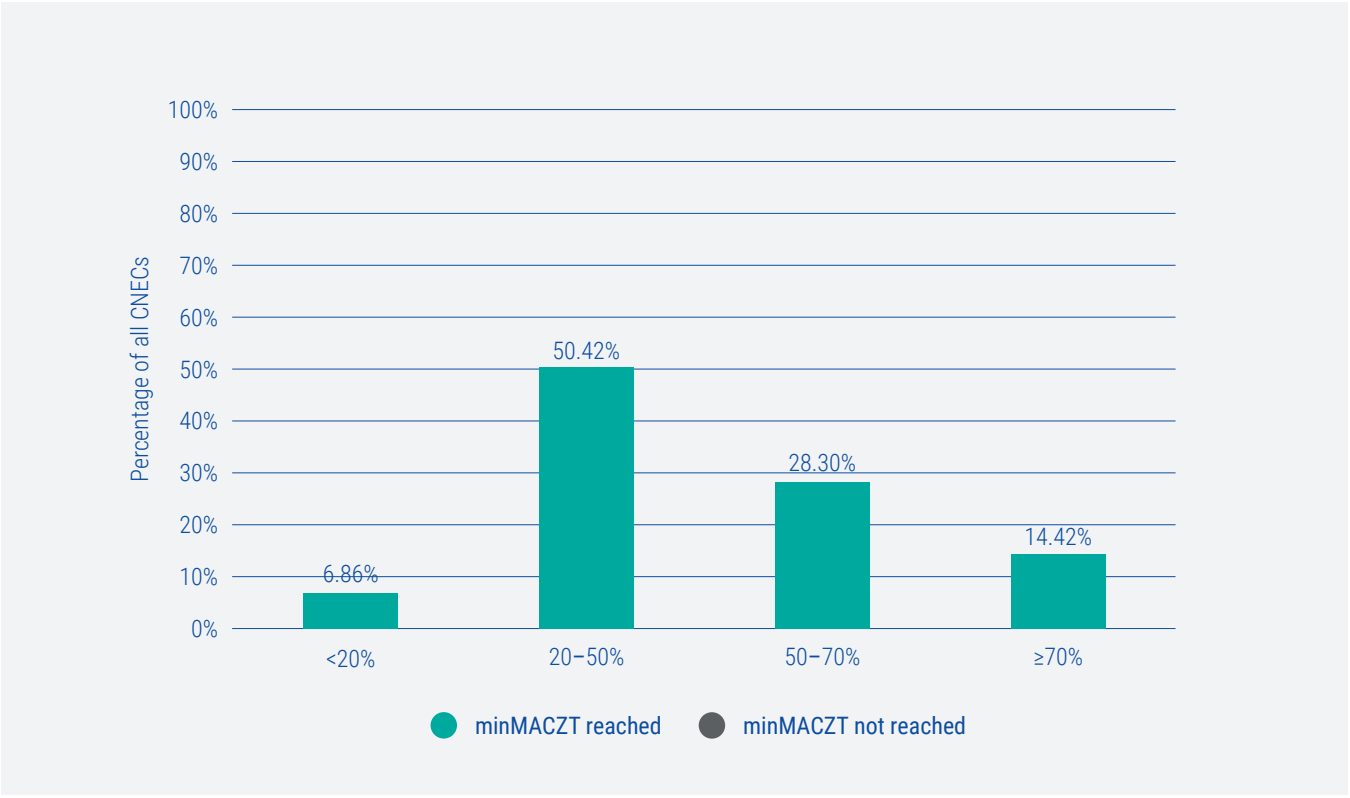


Figure A48 – Relative cross-zonal trading margin of Poland for CZ–DE–SK->PL in the second semester

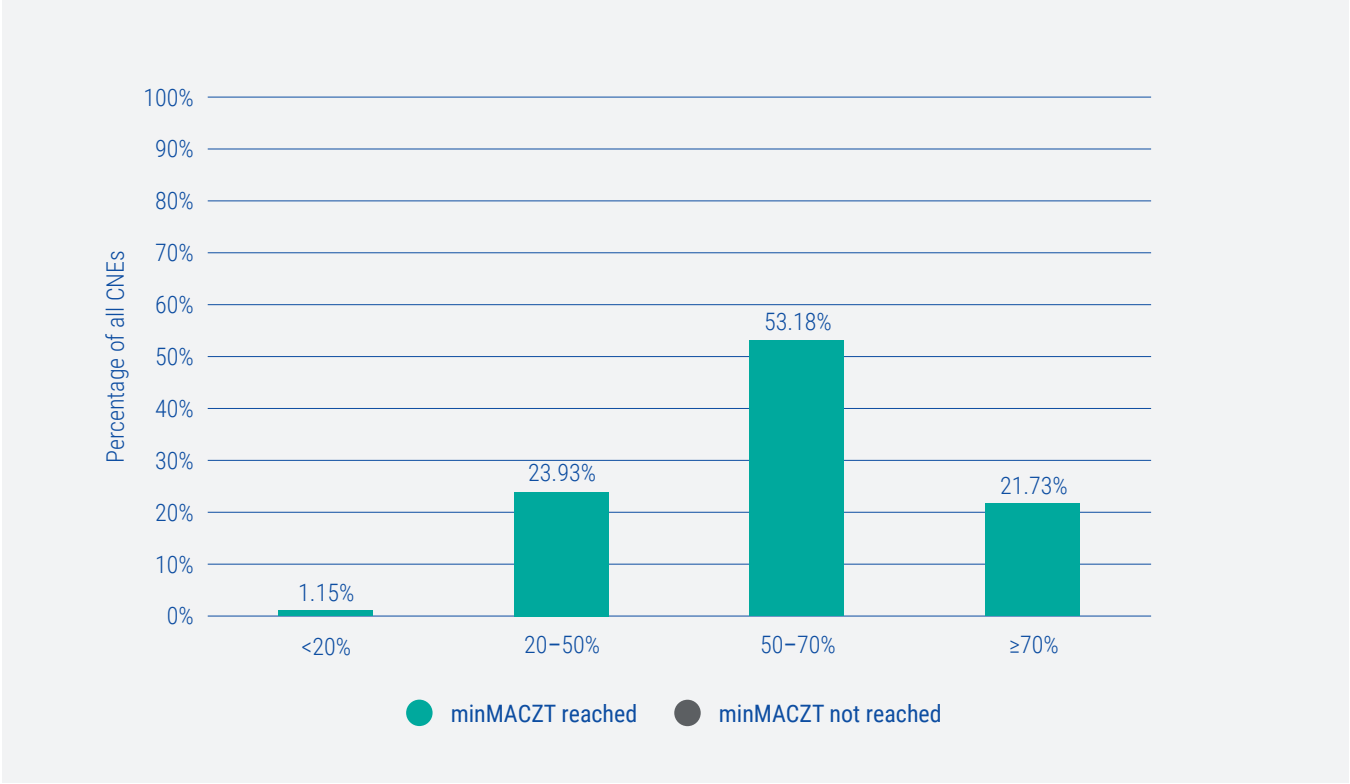


Figure A49 – Relative cross-zonal trading margin of Poland for PL->CZ–DE–SK in the second semester

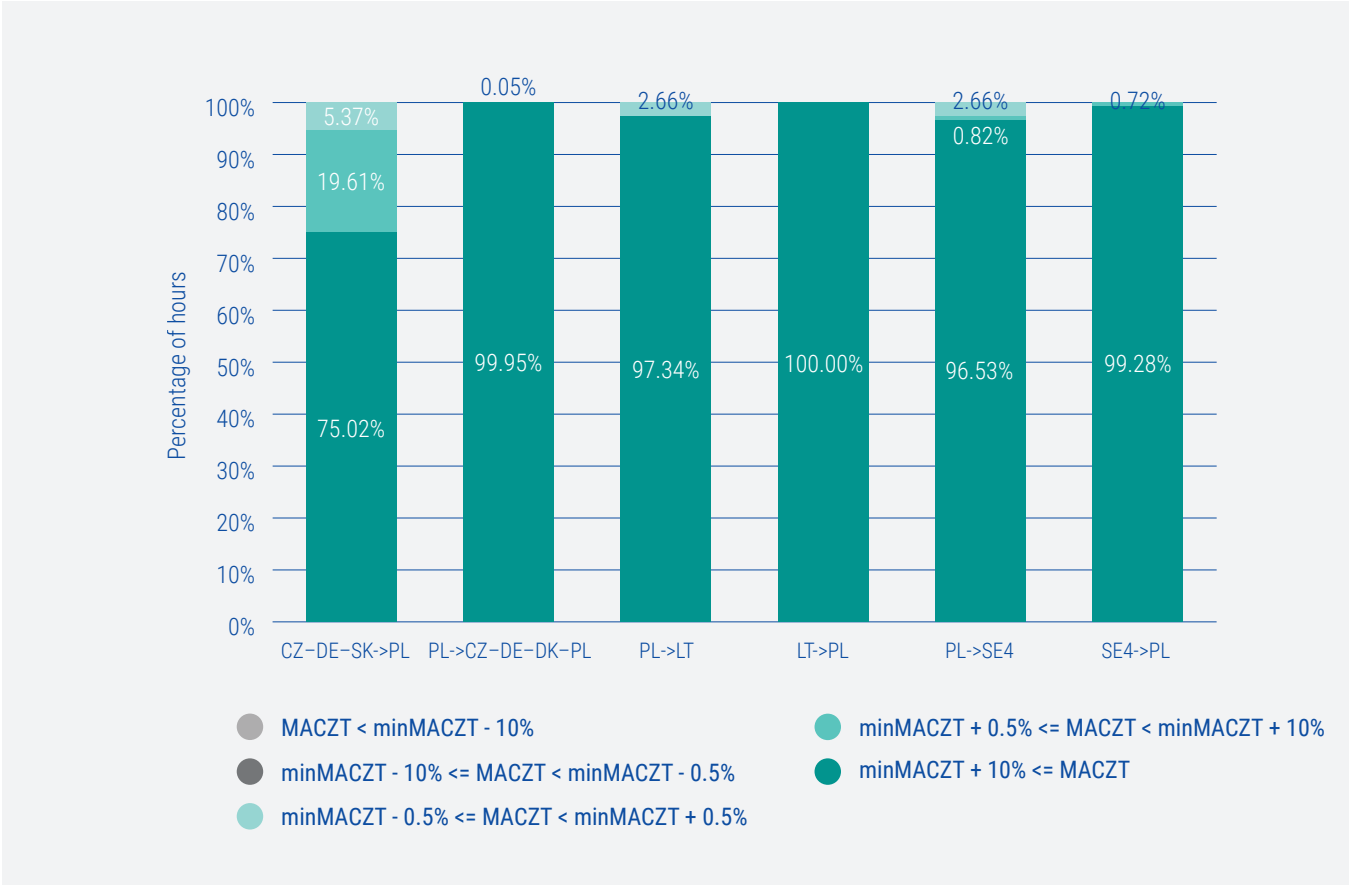


Figure A50 – Percentage of time when the relative MACZT of the least-performing CNEC in the coordination area is above its minimum MACZT or within a certain range below its minimum MACZT, in the first semester of 2021. For each MTU, the CNEC with the lowest MACZT was selected and categorised into one of the ranges.

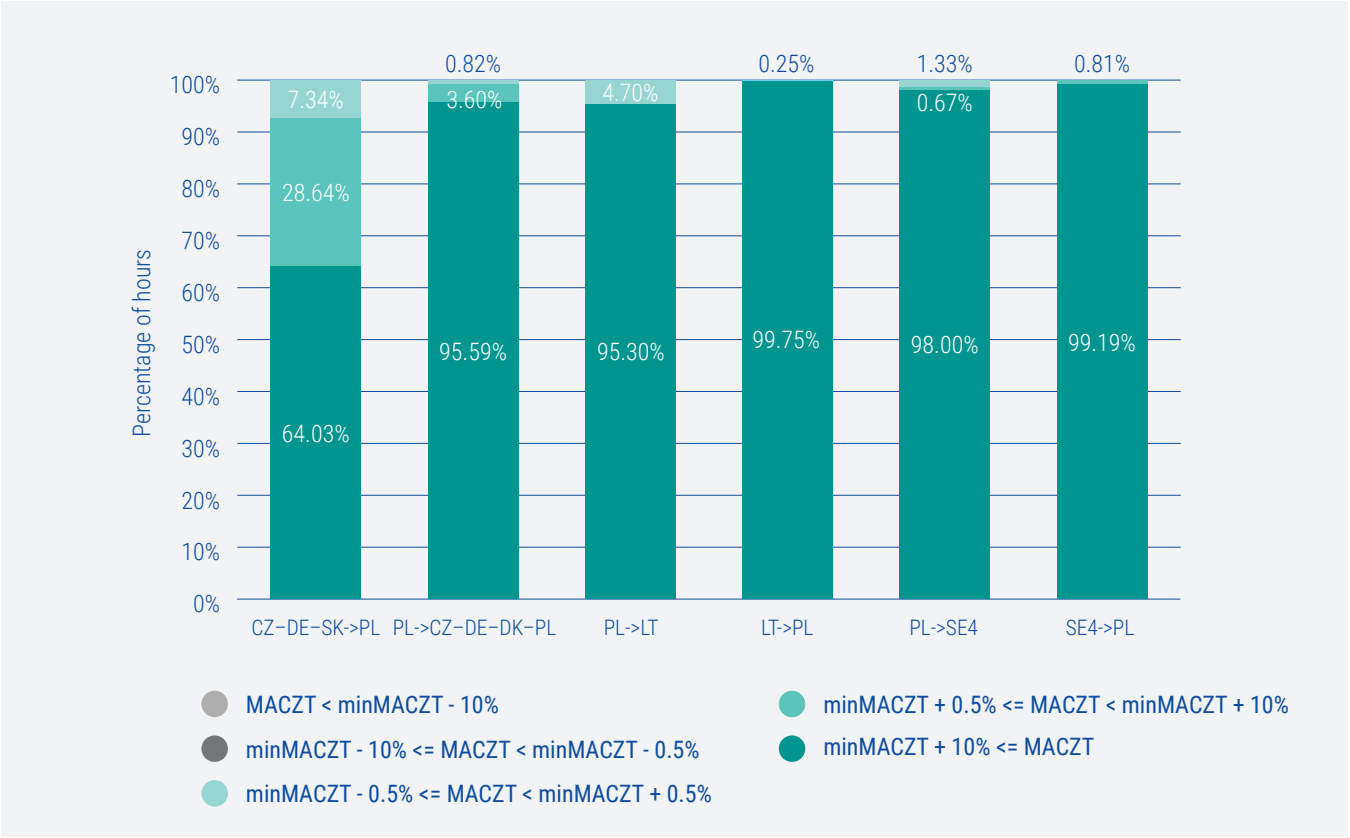
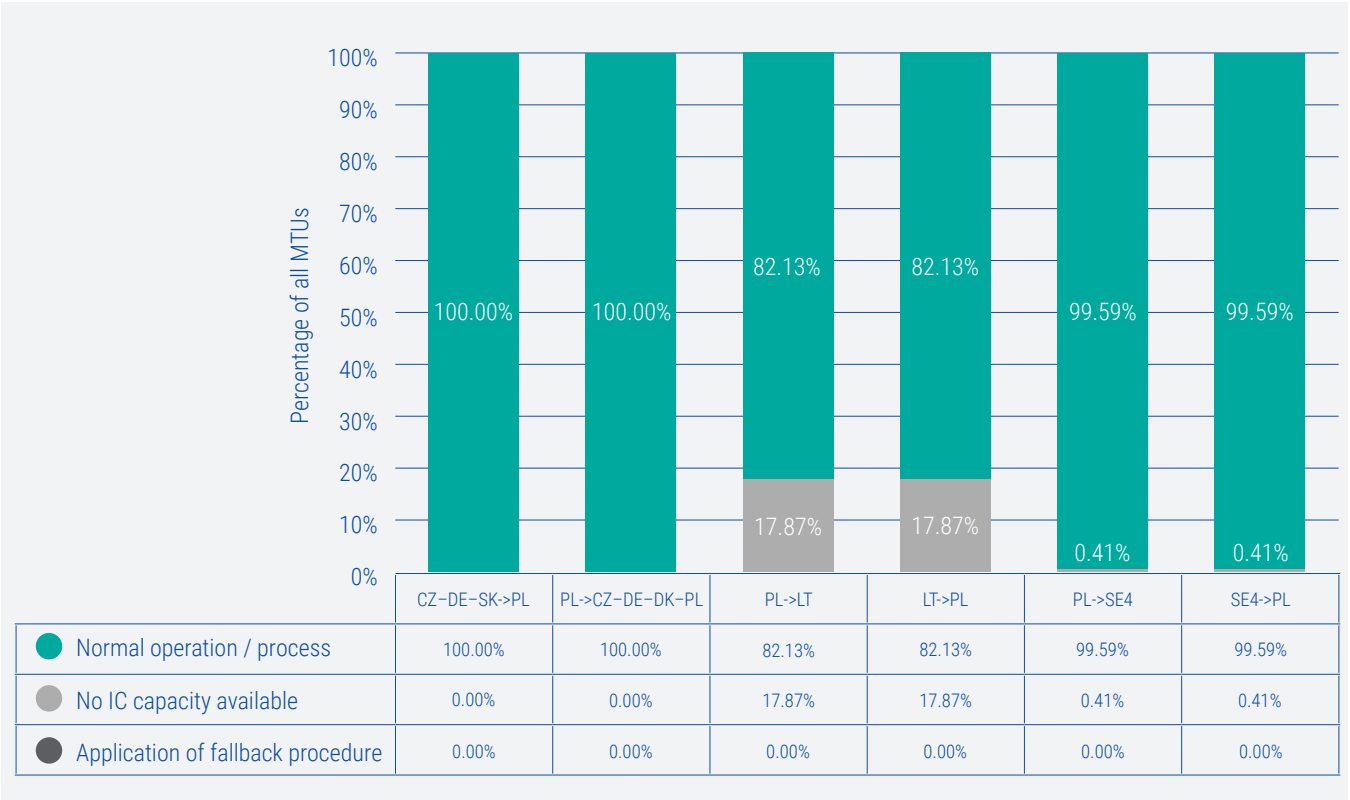


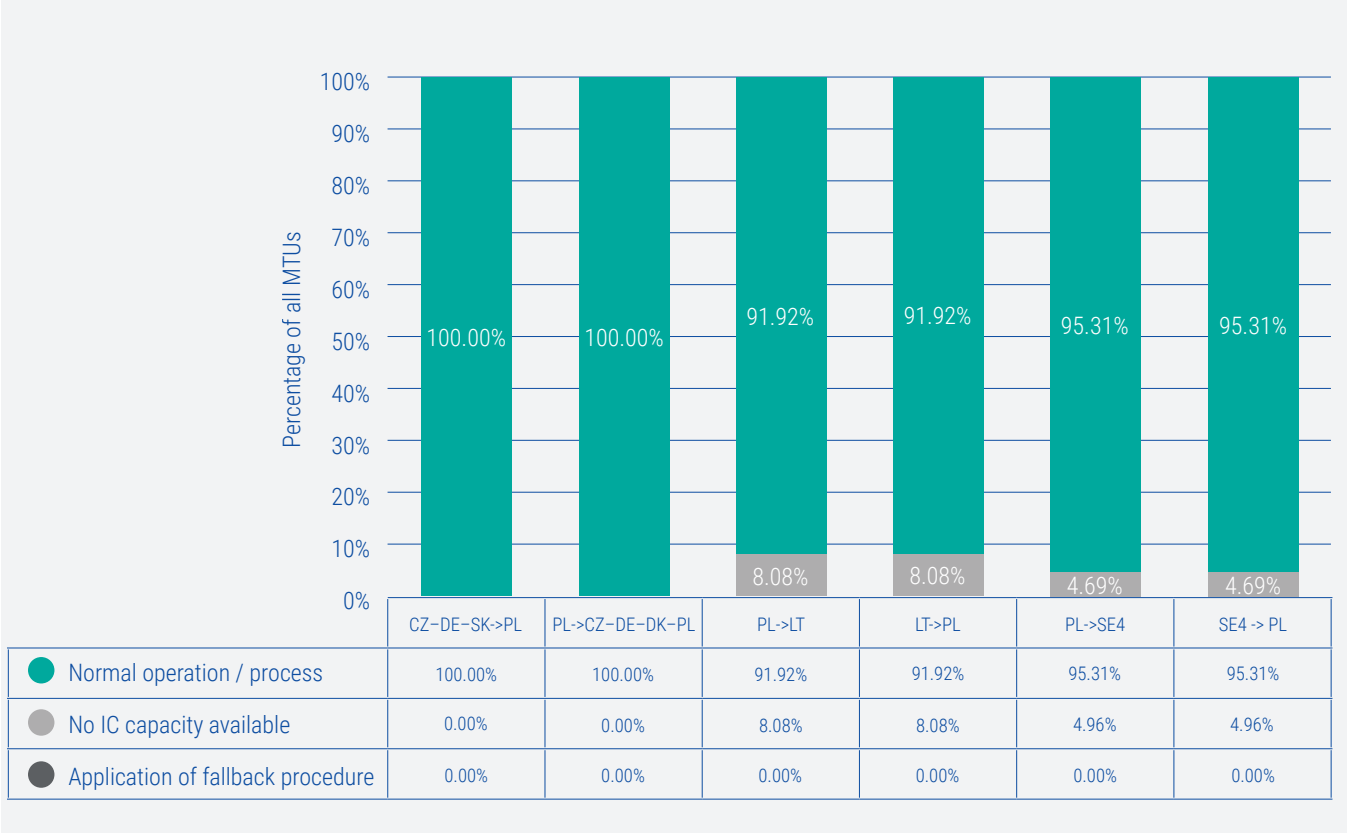
Figure A51 – Percentage of time when the relative MACZT of the least-performing CNEC in the coordination area is above its minimum MACZT or within a certain range below its minimum MACZT – S2 2021. For each MTU, the CNEC with the lowest MACZT was selected and categorised into one of the ranges.

4. Additional information



	CZ–DE–SK->PL	PL->CZ–DE–DK–PL	PL->LT	LT->PL	PL->SE4	SE4->PL
Normal operation / process	100.00%	100.00%	82.13%	82.13%	99.59%	99.59%
No IC capacity available	0.00%	0.00%	17.87%	17.87%	0.41%	0.41%
Application of fallback procedure	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Figure A52 – Overview of time monitored for Poland in the first semester



	CZ–DE–SK->PL	PL->CZ–DE–DK–PL	PL->LT	LT->PL	PL->SE4	SE4 -> PL
Normal operation / process	100.00%	100.00%	91.92%	91.92%	95.31%	95.31%
No IC capacity available	0.00%	0.00%	8.08%	8.08%	4.96%	4.96%
Application of fallback procedure	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Figure A53 – Overview of time monitored for Poland in the second semester

When ensuring fulfilment of the CEP70 provisions, PSE was guided by the methodology adopted by ACER. However, some minor details of the monitoring calculations might differ from the ACER approach due to differences between the *ex ante* operational process as applied by PSE when calculating capacities and ensuring trajectories on limiting CNECs, and the *ex post* monitoring process as applied by ACER.

However, one important difference from the ACER approach is the treatment of allocation constraints, which are defined in Article 2(6) of the CACM regulation as 'constraints to be respected during capacity allocation to maintain the transmission system within operational security limits and have not been translated into cross-zonal capacity or that are needed to increase the efficiency of capacity allocation'. Since minimal capacity obligations consider the percentage of capacity that respects operational security limits, the application of allocation constraints cannot be considered to reduce capacities below the trajectory thresholds. However, in its monitoring report, ACER has recalculated the CZC figures for Poland by reducing the capacities made available on the Polish DC borders, even though the full capacity of the link was usually offered (or the minimal threshold or derogation was respected, at least). The basis for assuming such an interpretation is not clear, since the applicable legal framework undoubtedly allows for the application of allocation constraints. Apart from keeping the system within operational security limits, allocation constraints are not listed in the EU Electricity Regulation as factors to be included within the 30% margin foreseen for inter alia loop flows. It is worth emphasising that for hours marked by ACER as not fulfilled, the respective DC borders were used for transits though Poland (often to the full capacity of the links), thus contributing to European social welfare. To conclude, these are the reasons for differences between the PSE assessment and the ACER assessment.

1.2.17. Portugal

1. Current status of the implementation of the CEP70 provisions

Improvements implemented in the SWE CCR regarding CEP70 include:

(a) regional monitoring process carried out by the SWE Regional Coordination Centre since April 2021;

(b) CZC recalculation using countertrading since February 2022.

There was still a derogation for Redes Energéticas Nacionais (REN) in 2021. The CEP implementation was planned at the end of 2021.

For 2022, there is a derogation for REN. During this period, REN will apply the amended CCM proposal in the SWE CCR for the operational day-ahead coordinated capacity calculation process, thus ensuring the maintenance of operational security in the SWE CCR. REN will offer this process at least the minimum levels of capacity in accordance with Article 16(8)(a) of the EU Electricity Regulation during 75% of the hours in which the one-year derogation applies. The minimum levels will be provided in accordance with Article 16(8)(a) of the EU Electricity Regulation and with paragraphs 4.2 and 5.1 of ACER Recommendation No. 01/2019 on the limiting CNECs. The go-live of CEP implementation finally took place at the beginning of February 2022.

2. Assessment methodology

The methodology according to the ACER Recommendation No. 01/2019 is applied.

Please note that an overview of the underlying assumptions of the assessment methodology of Portugal is provided in Table 2 in Chapter 2.

For the first quarter of 2021, the assessment was performed by ACER.

3. Assessment results

Based on the assessment methodology, the results for Portugal are as follows.

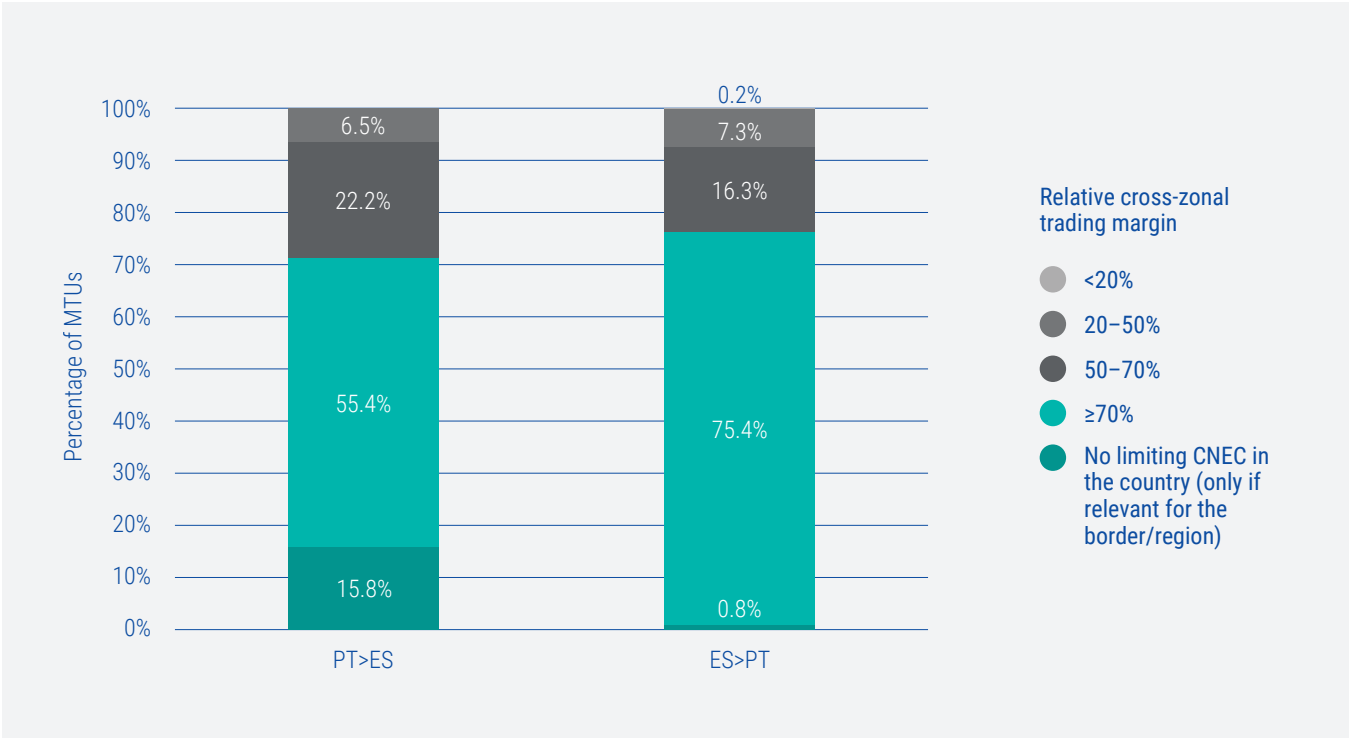


Figure A54 – Relative cross-zonal trading margin of Portugal

Figure A55 – Overview of time monitored for Portugal

4. Additional information

For the assessment of the 70% rule in the previous chapter, the following criteria have been applied:

- MTUs with limiting CNEC outside Portugal are deemed compliant.
- For all quarters except the first quarter, MTUs in which the SWE capacity calculation process did not provide a limiting CNEC due to application of the back-up procedure have not been considered in this assessment.

1.2.18. Romania

1. Current status of the implementation of the CEP70 provisions

In 2021, Transelectrica had an action plan to reach 70% capacity. For this year, there is a minimum capacity of 33% on the RO–HU border and 25% on the RO–BG border.

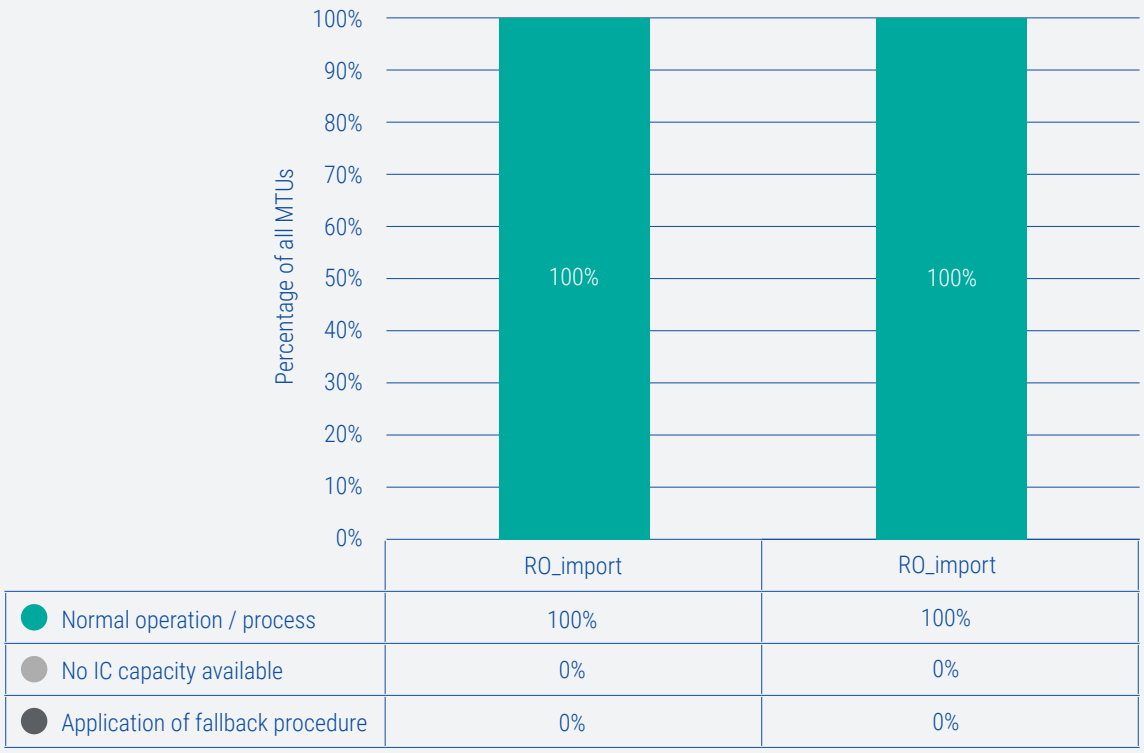
2. Assessment methodology

Transelectrica applies the ACER recommendation. Non-EU countries are included and values are given as a percentage of time for all limiting CNECs that have a positive MACZT.

Please note that an overview of the underlying assumptions of the assessment methodology of Romania is provided in Table 2 in Chapter 2.

3. Assessment results

Figure A56 – Relative cross-zonal trading margin of Romania with a minimum capacity of 33%



	RO_import	RO_import
Normal operation / process	100%	100%
No IC capacity available	0%	0%
Application of fallback procedure	0%	0%

Figure A57 – Overview of time monitored for Romania

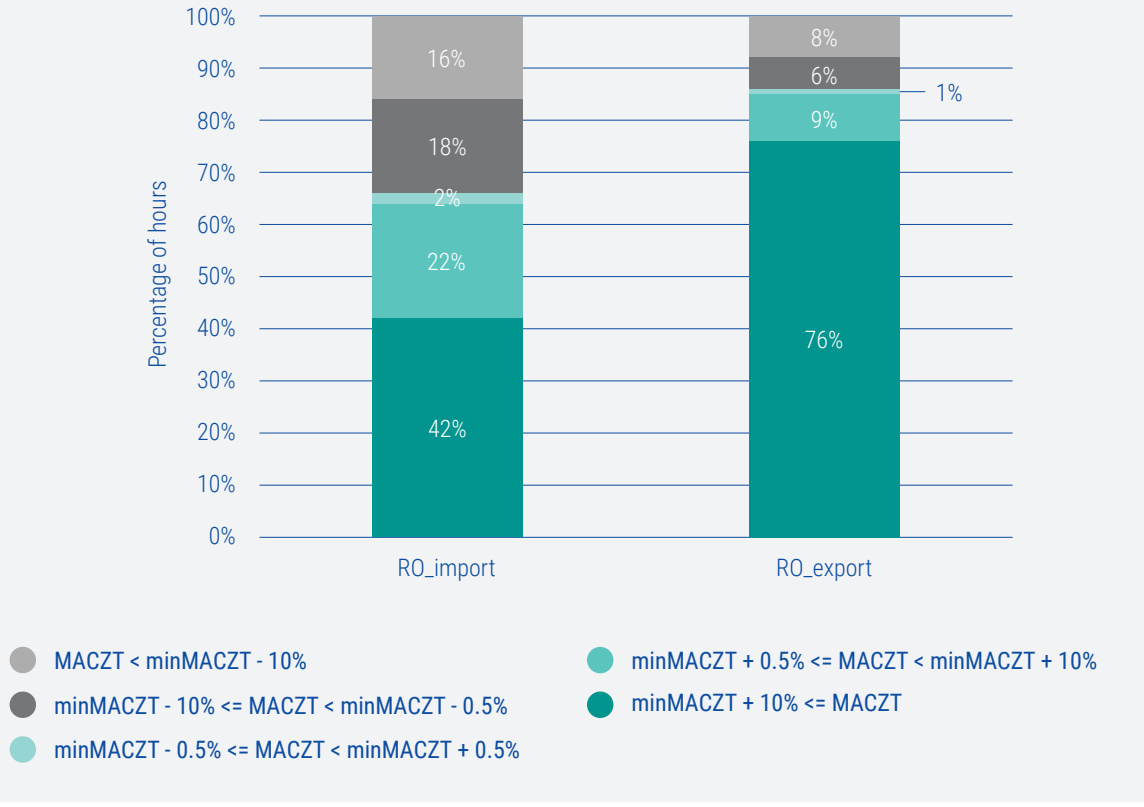


Figure A58 – Percentage of time when the relative MACZT of the least-performing CNEC in the coordination area is above its minimum MACZT or within a certain range below its minimum MACZT. For each MTU, the CNEC with the lowest MACZT was selected and categorised into one of the ranges.

4. Additional information

In 2021, Transelectrica had an action plan to reach 70% capacity. For this year, there is a minimum capacity of 33% on the RO–HU border and 25% on the RO–BG border. For the values provided, the 33% minimum capacity was chosen as a reference.

1.2.19. Slovakia

1. Current status of the implementation of the CEP70 provisions

As in 2020, Slovakia was granted a derogation for the year 2021. In accordance with this derogation, SEPS is committed to provide at least 30% MACZT for both import and export on the SK–CZ, SK–HU and SK–PL borders in at least 80% of MTUs if the security of the power system is secured.

2. Assessment methodology

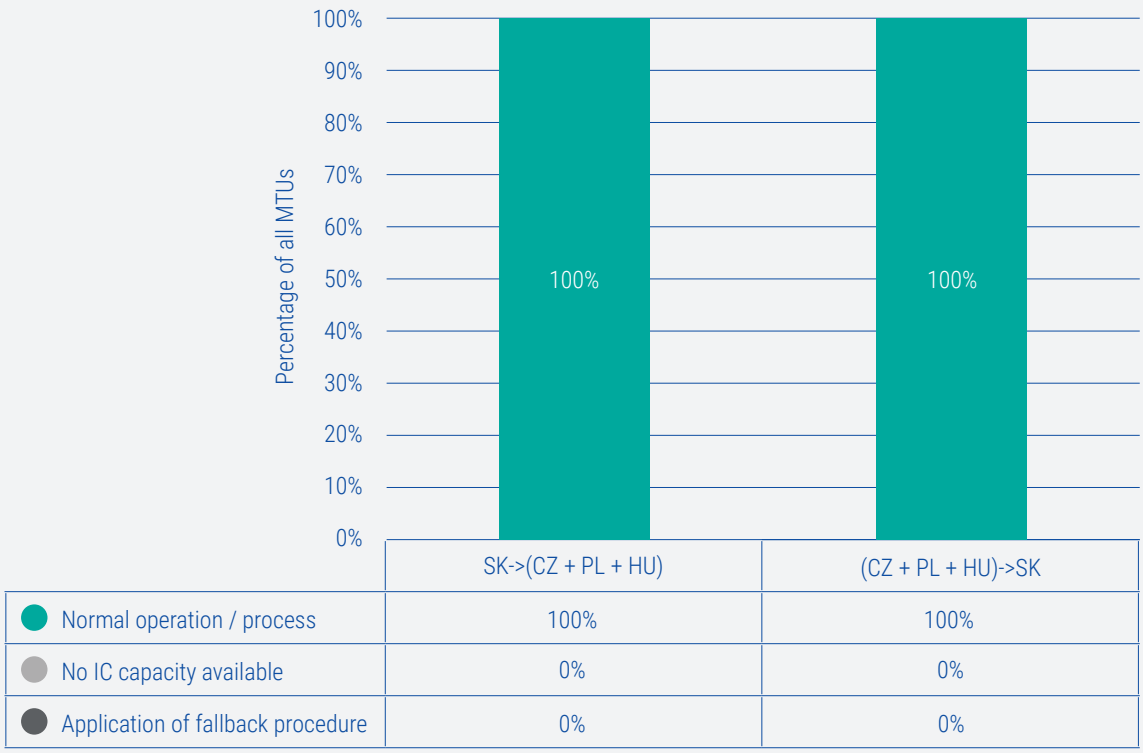
The methodology according to ACER Recommendation No. 01/2019 is applied.

Please note that an overview of the underlying assumptions of the assessment methodology of Slovakia is provided in Table 2 in Chapter 2.

3. Assessment results

Based on the assessment methodology, the results for Slovakia are as follows.

Figure A59 – Relative cross-zonal trading margin of Slovakia



	SK->(CZ + PL + HU)	(CZ + PL + HU)->SK
Normal operation / process	100%	100%
No IC capacity available	0%	0%
Application of fallback procedure	0%	0%

Figure A60 – Overview of time monitored for Slovakia

1.2.20. Slovenia

1. Current status of the implementation of the CEP70 provisions

For the borders SI–AT and SI–HR, we did not perform detailed calculations due to the fact that we have no limiting elements (e.g. NTC is limited by another party).

2. Assessment methodology

For the borders SI–AT and SI–HR, we followed ACER Recommendation No. 01/2019.

For the region CEE, we followed ACER Recommendation No. 01/2019, the limiting elements were determined by the joint day-ahead and intraday CCM of the region, which led to no limiting elements on our side.

Please note that an overview of the underlying assumptions of the assessment methodology of Slovenia is provided in Table 2 in Chapter 2.

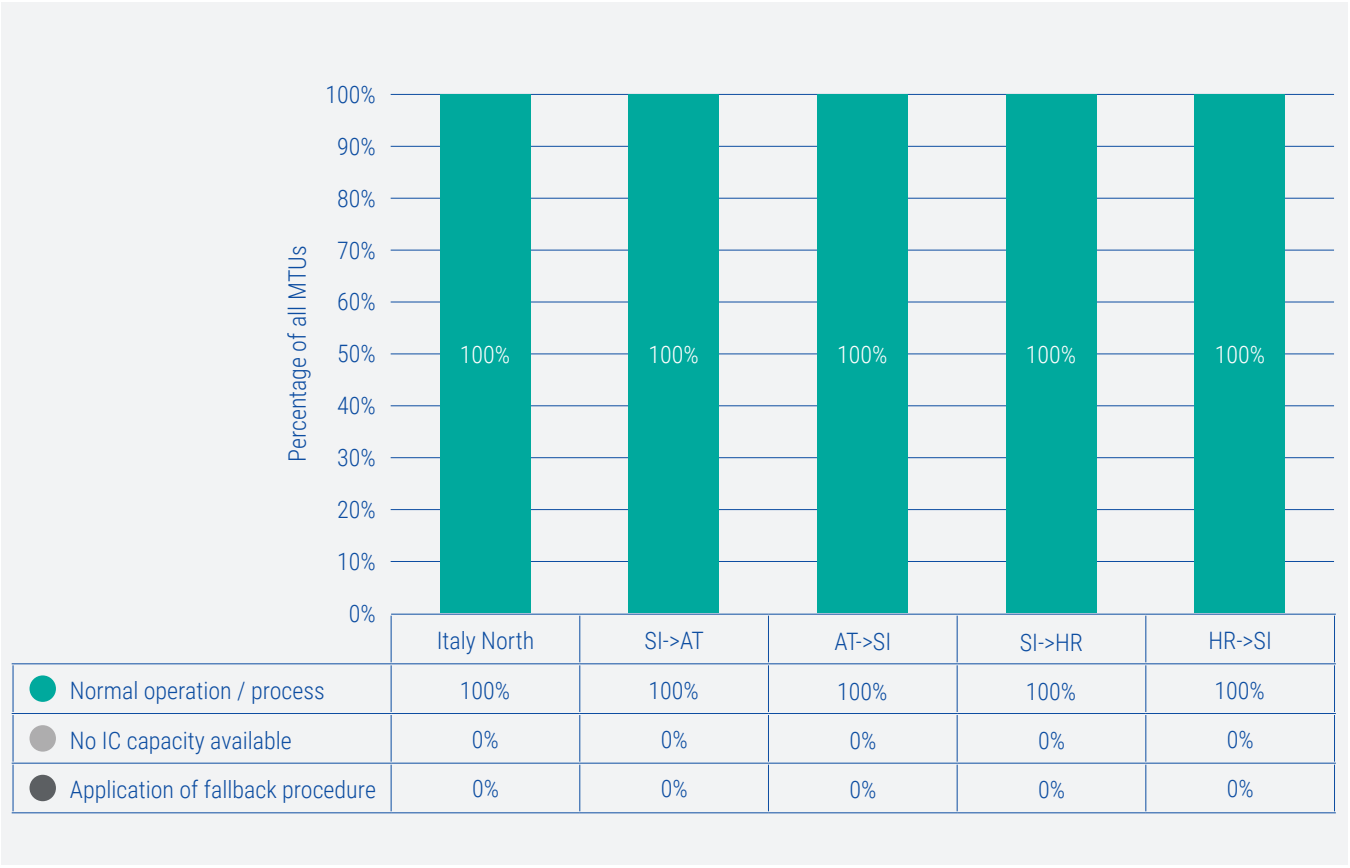
3. Assessment results

Based on the assessment methodology, the results for Slovenia are as follows.

Figure A61 – Relative cross-zonal trading margin of Slovenia

4. Additional information

Since the PSTs are used to increase overall capacities, PST flows can be considered as market flows. However, ACER does not consider them as such in the MACZT monitoring.



	Italy North	SI->AT	AT->SI	SI->HR	HR->SI
Normal operation / process	100%	100%	100%	100%	100%
No IC capacity available	0%	0%	0%	0%	0%
Application of fallback procedure	0%	0%	0%	0%	0%

Figure A62 – Overview of time monitored in 2021 for Slovenia

1.2.21. Spain

1. Current status of the implementation of the CEP70 provisions

Some improvements implemented in the SWE CCR regarding the CEP70 provisions:

(a) regional monitoring process carried out by the SWE CCR since April 2021;

(b) CZC recalculation using countertrading since February 2022.

2. Assessment methodology

The methodology according to the ACER Recommendation No. 01/2019 is applied.

Please note that an overview of the underlying assumptions of the assessment methodology of Spain is provided in Table 2 in Chapter 2.

3. Assessment results

Based on the assessment methodology, the results for Spain are as follows.

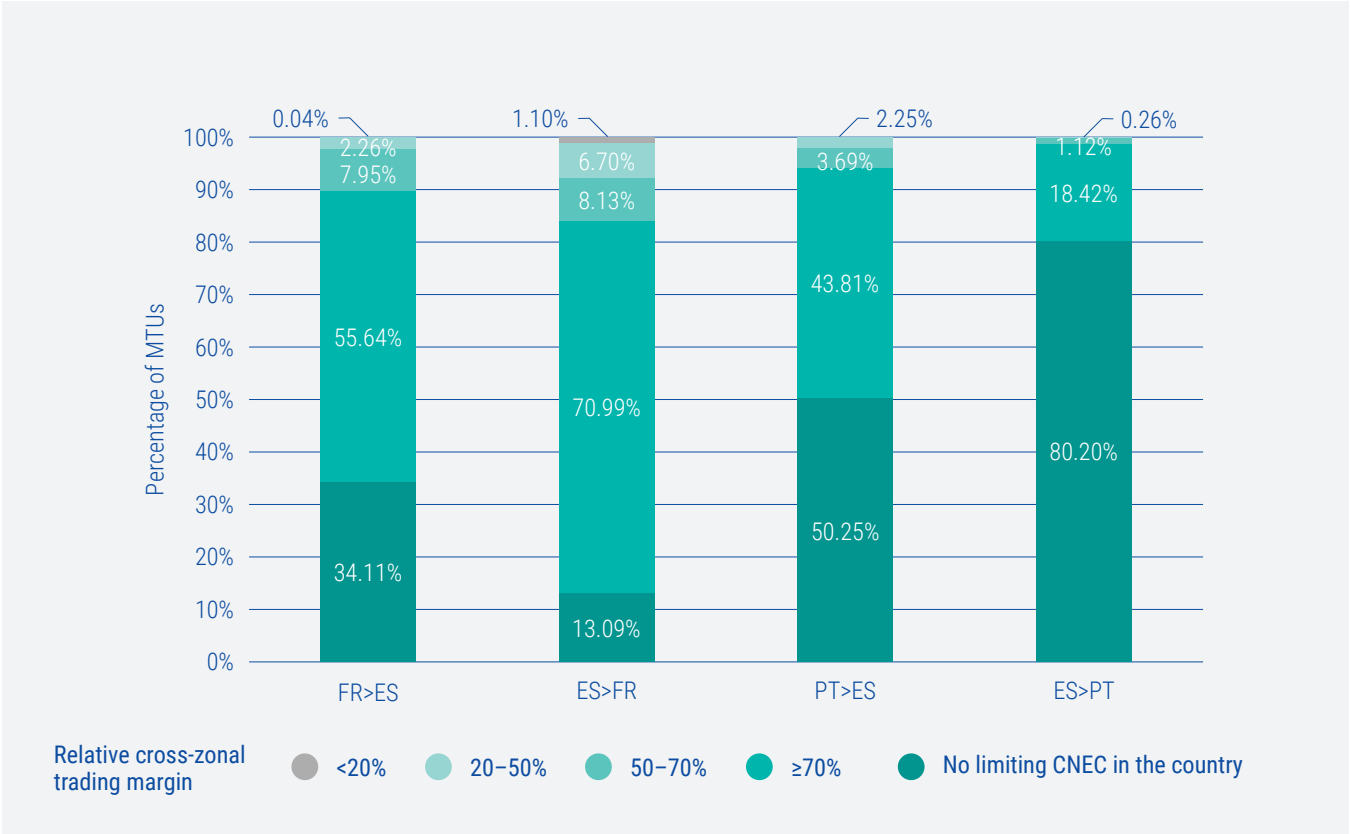


Figure A63 – Relative cross-zonal trading margin of Spain

4. Additional information

For the assessment of the 70% rule in the previous chapter, the following criteria have been applied:

- MTUs with limiting CNEC outside Spain are deemed compliant.
- MTUs where the SWE capacity calculation process did not provide a limiting CNEC due to application of back-up procedure have not been considered in this assessment.

1.2.22. Sweden

1. Current status of the implementation of the CEP70 provisions

For 2021, a derogation was granted by Energimarknadsinspektionen, the Swedish NRA, after consulting with its counterparts in relevant countries. The derogation is related to the lack of remedial actions, both costly and non-costly, to resolve overloads. The derogation encompasses the following bidding zone borders:

- DK1–SE3
- DK2–SE4
- DE/LU–SE4
- PL–SE4
- LT–SE4.

Svenska kraftnät published a methodology to minimise the need for a derogation in March 2021. The methodology includes both grid investments and measures to increase the availability of remedial actions.

The current NTC capacity calculation process at Svenska krafnät was not established with the CEP70 provisions in mind. Svenska kraftnät developed this process in 2021 but before the implementation of flow-based in the Nordic CCR, Svenska kraftnät will not be able to fully follow ACER Recommendation No. 01/2019. The current assessment of the CEP70 provisions is carried out as closely as possible to this recommendation.

2. Assessment methodology

The methodology according to ACER Recommendation No. 01/2019 is applied with some caveats as all required information to perform the assessment will not be available until the flow-based capacity calculation is implemented in the Nordic CCR.

3. Assessment results

For the bidding zone borders with derogation, the CEP70 provisions are met 100% of the time.

An assessment within Svenska kraftnät is ongoing to determine the level of compliance. Svenska kraftnät is currently discussing the legal prerequisite for sharing certain network information with ACER. This has impacted the implementation of the assessment process. Assessment requires the implementation of the Nordic CCR day-ahead/intraday CCM (i.e. flow-based) to provide an accurate picture of the situation.

1.2.23. The Netherlands

1. Current status of the implementation of the CEP70 provisions

For the Netherlands, an action plan and a derogation were adopted as transitory measures to gradually reach the 70% minimum capacity margin on the CNEs included in CWE flow-based day-ahead capacity calculation.

TenneT Netherlands submitted an assessment of available CZC for the Netherlands in 2021[144], in accordance with Article 15(4) of the EU Electricity Regulation. The report contains an assessment of the transmission capacity made available within the CWE CCR, as well as on the transmission capacity made available on the bidding zone borders with Norway and Denmark, which are not part of the action plan and on which the target capacity margin of 70% already applies.

In the assessment report, TenneT clarifies which specific provisions related to minimum capacities apply for the Netherlands, how it implemented those specific provisions in operations, and how it has monitored its compliance with those provisions. The report also contains various analyses and additional insights obtained from the assessment of capacity calculation data.

2. Assessment methodology

For the CWE CCR:

For each MTU, the CNEC with the lowest MACZT (difference between the provided MACZT and required minimum MACZT) is selected. The MTU is deemed compliant when this margin is equal to or above 0%.

For the borders DK1->NL, NL->DK1, NO2->NL and NL->NO2:

For each MTU, the relative capacity in a certain direction on the high-voltage direct current (HVDC) cable is calculated (capacity made available by TenneT / total capacity).

Please note that an overview of the underlying assumptions of the assessment methodology of the Netherlands is provided in Table 2 in Chapter 2.

3. Assessment results

Based on the assessment methodology, the results for the Netherlands are as follows.

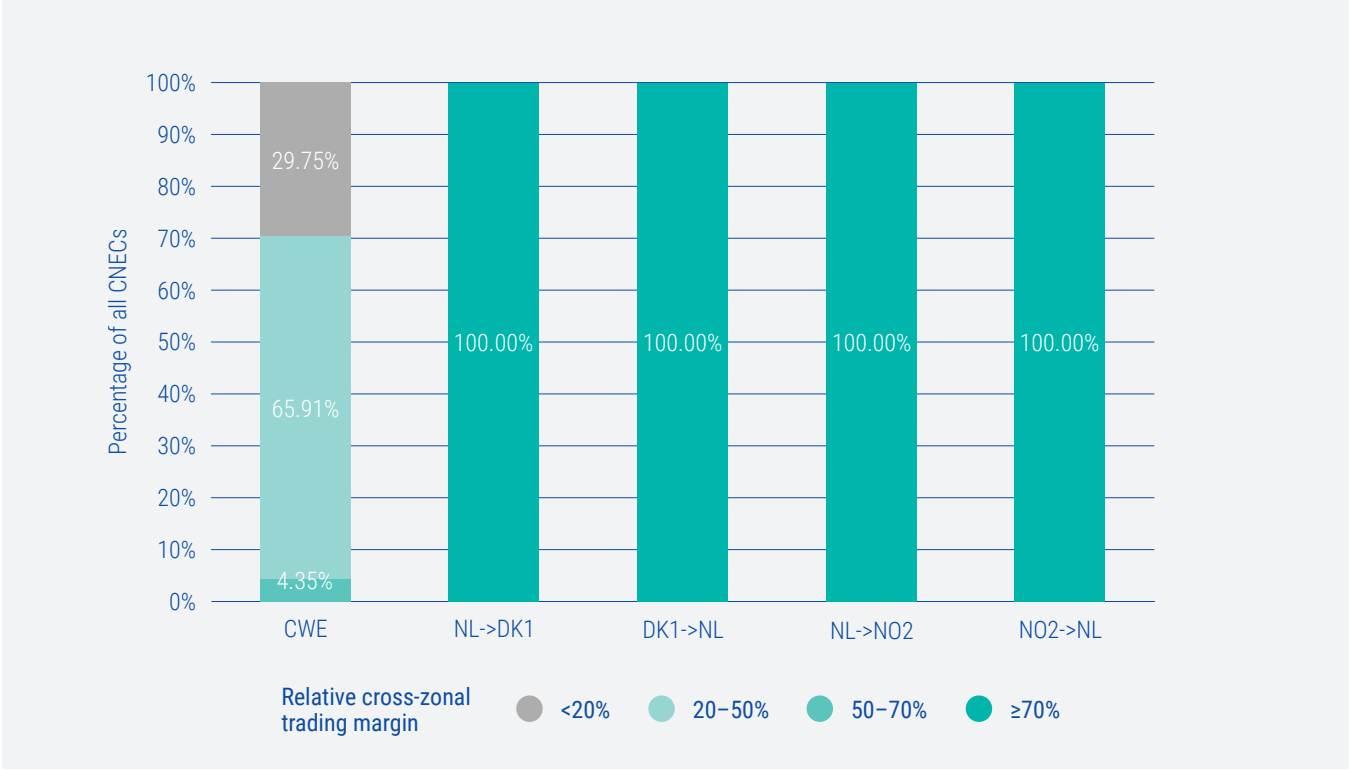


Figure A64 – Relative cross-zonal trading margin for the Netherlands

144 Available from www.acm.nl/sites/default/files/documents/verzoek-tennet-goedkeuring-beoordelingsverslag-actieplan.pdf.

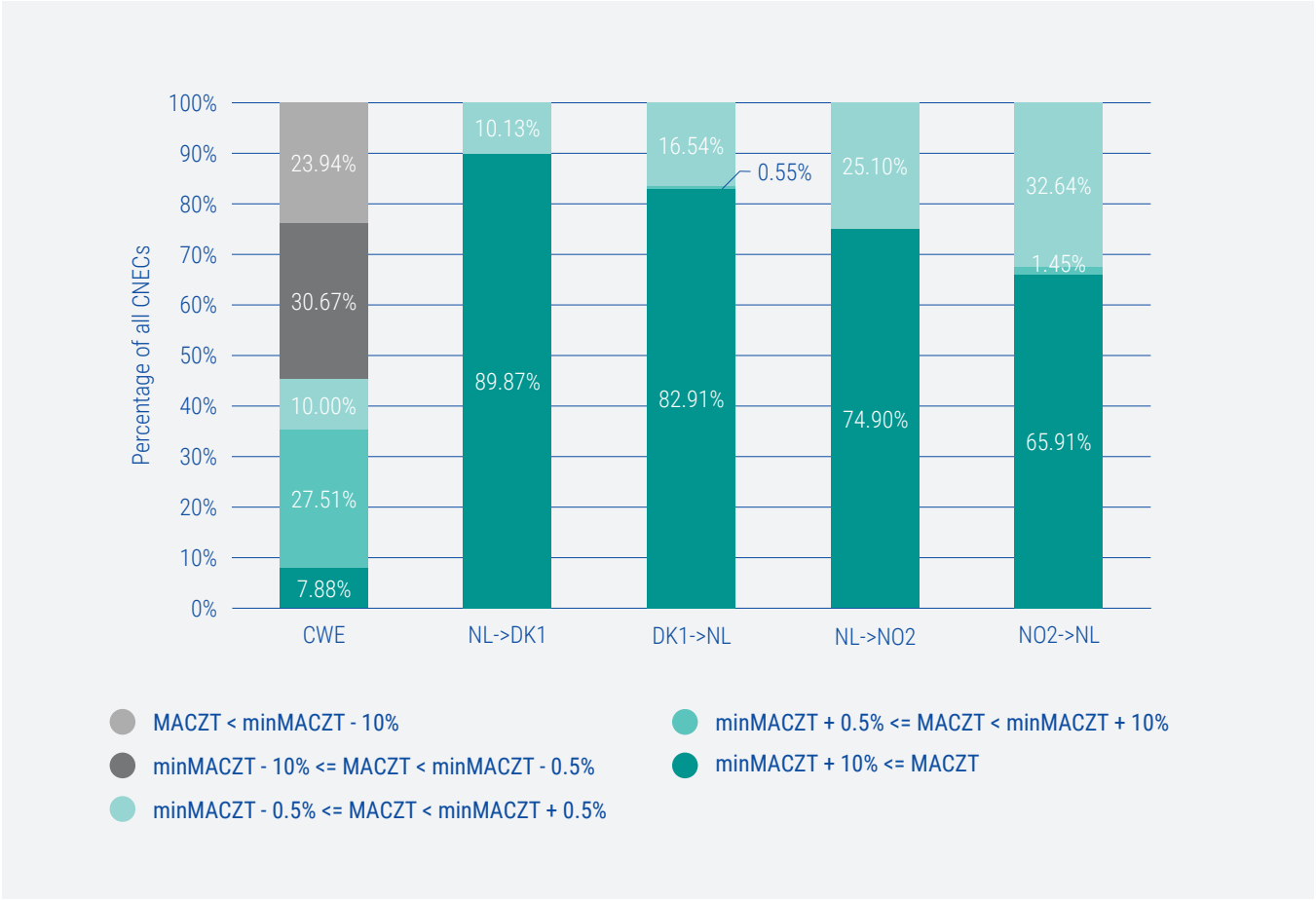


Figure A65 – Percentage of time when the minimum capacity margins have been met, and how much capacity was provided above or below the minimum MACZT, for the Netherlands. For each MTU, the CNEC with the lowest MACZT was selected and categorised into one of the ranges.

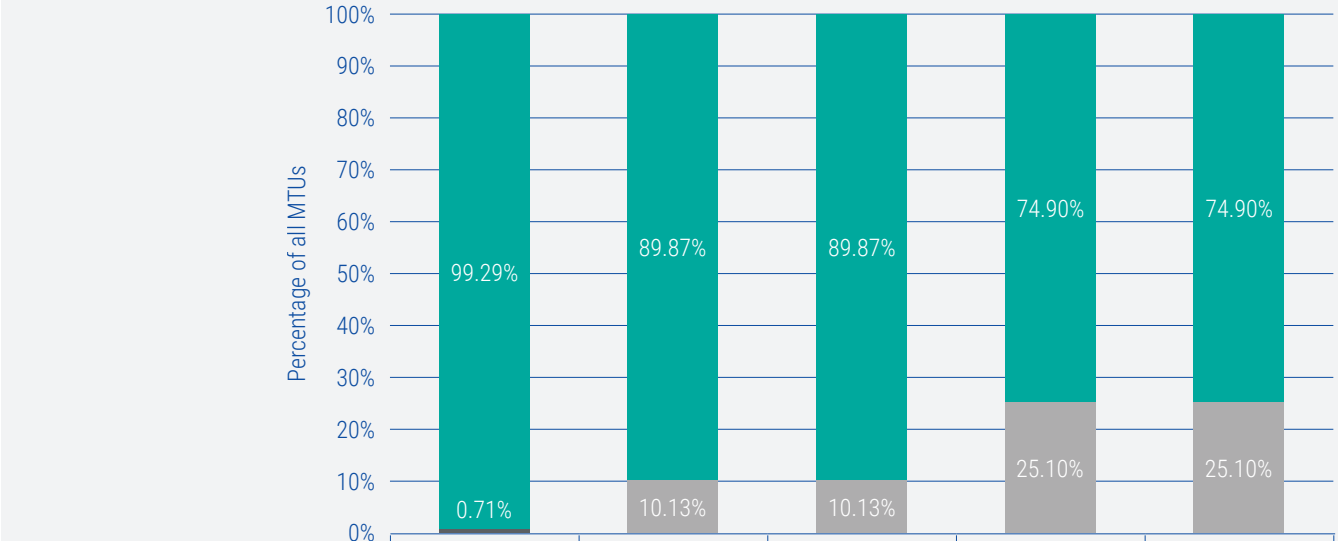
4. Additional information

For a detailed assessment and further information, see the *2021 Assessment of available cross-zonal capacity for the Netherlands*[145].

Figure A66 provides an overview of the time monitored in 2021 for the Netherlands. The category "Normal operation/ process" represents to all MTUs of 2021 that have been monitored. The category "No IC capacity available" indicates the amount of MTUs during which no interconnector capacity has been available in 2021. Yet, it has to be noted that for flow-based borders, this category will be empty always as it cannot happen that no interconnector capacity in the entire flow-based system is available. However, the category is kept for the sake of comparability to other borders. The category "Fallback or failure of CC" represents the amount of MTUs during which MTUs have not been monitored due to problems in the capacity calculation.

Please note that for CWE, the category "Application of fallback procedure" considers the application of fallback capacities (default flow-based parameters) or spanning.

145 Available from www.acm.nl/sites/default/files/documents/verzoek-tennet-goedkeuring-beoordelingsverslag-actieplan.pdf.



	CWE	NL->DK1	DK1->NL	NL->NO2	NO2->NL
Normal operation / process	99.29%	89.87%	89.87%	74.90%	74.90%
No IC capacity available	0.0%	10.13%	10.13%	25.10%	25.10%
Application of fallback procedure	0.71%	0.00%	0.00%	0.00%	0.00%

Figure A66 – Overview of time monitored in the Netherlands

Glossary

4M MC	4M market coupling between Czechia, Hungary, Romania and Slovakia
50Hertz	50Hertz Transmission GmbH (one of four German TSOs)
AC	alternating current
ACER	Agency for the Cooperation of Energy Regulators
aFRR	frequency restoration reserves with automatic activation
ANCA	All NEMO Cooperation Agreement
AOF	activation optimisation function
AL	Albania
ANIDOA	All NEMO Intraday Operational Agreement
ANDOA	All NEMO Day Ahead Operational Agreement
APG	Austrian Power Grid AG
Amprion	Amprion GmbH (one of four German TSOs)
AST	AS Augstsprieguma tikls (Latvian TSO)
AT	Austria
ATC	available transfer capacity
BA	Bosnia and Herzegovina
BE	Belgium
BEPP	balancing energy pricing period
BG	Bulgaria
BRP	balance responsible party
BSP	balancing service provider
CACM	capacity allocation and congestion management
CCM	capacity calculation methodology
CCR	capacity calculation region
CGES	Crnogorski Elektroprenosni Sistem AD
CGM	Common Grid Model
CGMM	Common Grid Model methodology
CH	Switzerland
CID	congestion income distribution
CEE	Central East Europe
CMM	capacity management module
CMOL	Common Merit Order List
CNE	critical network element

CNEC	critical network element and contingency
CNTC	coordinated net transfer capacity
CROPEX	Croatian Power Exchange Ltd
CWE	Central West Europe
CZ	Czechia
CZC	cross-zonal capacity
D2CF	two-days-ahead congestion forecast
DACF	day-ahead congestion forecast
DAOA	Day-ahead Operational Agreement
DC	direct current
DE	Germany
DK	Denmark
EE	Estonia
EB Regulation	Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing
ELIA	Elia System Operator SA
ESO	Electroenergien Sistemen Operator EAD
EMS	Akcionarsko društvo Elektromreža Srbije
ENTSO-E	European Network of Transmission System Operators for Electricity
ES	Spain
EU	European Union
EUPHEMIA	Pan-European Hybrid Electricity Market Integration Algorithm
FAT	full activation time
FBMC	flow-based market coupling
FCA	forward capacity allocation
FCR	frequency containment reserve
FI	Finland
FTR	financial transmission rights
FR	France
FRC	firmness and remuneration of LTTRs
FRR	frequency restoration reserves
GB	Great Britain
GCT	gate closure time
GOT	gate opening time
GR	Greece
HAR	Harmonised Allocation Rules
HEnEx	Hellenic Energy Exchange SA
HOPS	Croatian Transmission System Operator Ltd
HR	Croatia

HU	Hungary
HVDC	high-voltage direct current
IBEX	Independent Bulgarian Energy Exchange
IBWT	Italian Borders Working Table
IDOA	Intraday Operational Agreement
IDSC	Intraday Steering Committee
IFA	Interconnexion France-Angleterre
IGCC	International Grid Control Cooperation
IE	Ireland
IGM	Individual Grid Model
IN	imbalance netting process
IPTO	Independent Power Transmission Operator S.A.
ISP	imbalance settlement period
IT	Italy
JAO	Joint Allocation Office
KPI	key performance indicator
LIP	Local Implementation Project
LFC	load frequency control
LU	Luxembourg
MACZT	margin available for cross-zonal trade
MC	market coupling
MARI	Manually Activated Reserves Initiative
MAVIR	Magyar Villamosenergia-ipari Átviteli Rendszerirányító Zártkörűen MűködőRészvénytársaság
MCO	market coupling operation
MCSC	Market Coupling Steering Committee
ME	Montenegro
MEMO	Electricity Market Operator of North Macedonia
MEPSO	Macedonian Transmission System Operator AD
mFRR	frequency restoration reserves with manual activation
MNA	multi-NEMO arrangement
MRC	multi-region coupling
MTU	market time unit
NEMO	nominated electricity market operator
NDA	non-disclosure agreement
NL	Netherlands
NO	Norway
Nord Pool EMCO	Nord Pool European Market Coupling Operator AS
NOS BiH	Nezavisni Operator Sustava u Bosni i Hercegovini

NRA	national regulatory authority
NTC	net transfer capacity
OMIE	OMI, Polo Español S.A.
OPCOM	Operatorul Pieței de Energie Electrică și de Gaze Naturale
OPSCOM	operational steering committee
OST	OST sh.a – Albanian Transmission System Operator
PCR	price coupling of regions
PICASSO	Platform for the International Coordination of Automated Frequency Restoration and Stable System Operation
PL	Poland
PMB	PCR Matcher and Broker IT system
PSE	Polskie Sieci Elektroenergetyczne
PST	phase shifting transformer
PT	Portugal
PTR	physical transmission rights
RA	regulatory authorities
R&D	research and development
REE	Red Eléctrica de España S.A.U.
REN	Rede Eléctrica Nacional, S.A.
RO	Romania
RS	Serbia
RR	replacement reserves
RRIF	implementation framework for the exchange of balancing energy from replacement reserves
RTE	Réseau de Transport d'Electricité
SAFA	Synchronous Area Framework Agreement
SA	synchronous area
SAP	single allocation platform
SAP CA	Single Allocation Platform Cooperation Agreement
SDAC	single day-ahead coupling
SE	Sweden
SEPS	Slovenská elektrizačná prenosová sústava, a.s. (Slovakian TSO)
SI	Slovenia
SIDC	single intraday coupling
SEE	South East Europe
SK	Slovakia
Statnett	Statnett SF (Norway TSO)
SM	shipping module
SOB	shared order book
SONI	System Operator for Northern Ireland Ltd

Svenska	Svenska kraftnät (Swedish TSO)
SWE	South West Europe
Swissgrid	Swissgrid ag (Swiss TSO)
TCDA	TSO Cooperation Agreement for Single Day-ahead Coupling
TCID	TSO Cooperation Agreement for Single Intraday Coupling
TCOA	TSO Cooperation Operational Agreement
TenneT NL	TenneT TSO NV (Dutch TSO)
TenneT DE	TenneT TSO GmbH (one of four German TSOs)
Terna	Rete Elettrica Nazionale SpA (Italian TSO)
Transelectrica	National Power Grid Company Transelectrica S.A. (Romanian TSO)
TransnetBW	TransnetBW GmbH (one of four German TSOs)
TERRE	Trans-European Restoration Reserves Exchange
TSO	transmission system operator
XBID	cross-border intraday project

The terms used in this document share the definitions included in Article 2 of the CACM and FCA regulations and the EB Regulation.

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