

Study

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Study on the compliance of ELIA TRANSMISSION BELGIUM with the requirements related to the transmission capacity made available for cross-zonal trade in 2022

Done in accordance with article 59, paragraph 1, h) of Directive (EU) 2019/944 of the European Parliament and the Council of 5 June 2019 on common rules for the internal market for electricity

Non-confidential

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EXECUTIVE SUMMARY

The Electricity Regulation (part of the *Clean Energy Package*) imposes a set of obligations on European transmission system operators with the aim to increase the transmission capacities made available for cross-zonal exchanges. These increases in capacities were identified as an efficient means to facilitate cross-zonal trade and to further integrate the electricity markets into the European Internal Energy Market.

This obligation is translated into a minimal margin to be offered to cross-zonal trade: this margin amounts to 70% of the transmission capacity, for all network elements. Regulatory authorities may grant a derogation from this obligation, when requested by transmission system operators in order to ensure operational security at all times.

In this study, the CREG investigates the extent to which Elia has complied, in 2022, with the provisions in article 16 of the Electricity Regulation. The CREG performs this analysis for all network elements in the considered period between 1 January and 31 December 2022. This analysis follows a stepwise approach: in a first step the compliance with the 70% threshold is assessed during the considered hours and across all observed network elements. Subsequently, the observed available margins are compared to the minimum margins in application of the derogation from the 70% threshold, granted to Elia. These results are compared, later on in this study, to the results for the period between 1 April 2020 and 31 December 2021, which were calculated according to the same methodology in the two previous compliance reports of the CREG. Finally, some additional considerations are identified, related to the circumstances under which the margins on the network elements have been observed, either in compliance or not with the legal obligations.

The analyses performed show that Elia has respected the legal requirement related to the minimum margins, between 1 January and 31 December 2022, during **78,3% of the considered period** and on **99,7% of all observed network elements**, taking into account the approved derogation from the 70% requirement. In terms of respecting the compliance per hour, this result marks a decrease compared to last year, when Elia met the legal requirements during 81,3% of all hours.

Notwithstanding the derogation, Elia has offered a margin equal to at least the 70% threshold on 95,8% of all observed network elements. The number of hours during which all network elements respect the 70% threshold, nevertheless, only amounts to 23,5% of the hours in the considered period.

This study demonstrates that the observed loop flows from neighbouring bidding zones have a significant impact on the ability of Elia to respect the 70% requirement at all times. Given the granted derogation, which contains a methodology for considering excessive loop flows above an acceptable threshold, the compliance of Elia with the legal requirements is ensured. The CREG observes that the level of loop flows and, hence, the impact of the derogation for excessive loop flows, has decreased slightly in 2022 compared to the two previous years, in line with expectations. The CREG expects this impact to reduce further, leading to higher capacities that may be offered to the cross-zonal markets.

INTRODUCTION

The COMMISSION FOR THE REGULATION OF THE ELECTRICITY AND THE GAS (hereafter “CREG”) investigates, via this study, the compliance by ELIA TRANSMISSION BELGIUM SA (hereafter “Elia”) with the legal obligations in article 16 of Regulation (EU) 2019/943 of the European Parliament and the council of 5 June 2019 on the internal market for electricity (hereafter “Electricity Regulation”).

In this study, the CREG investigates the extent to which the margins on transmission network elements which are offered by Elia comply with the minimum margins set by article 16 of the Electricity Regulation in 2022. These margins amount to 70% of the maximum capacity of these network elements, corrected – whenever relevant – for the acceptable reductions in application of the approved derogation request from Elia.

The monitoring of the compliance with this obligation is performed by the CREG for the third time since the entry into force of the Electricity Regulation. In previous versions of this study, the compliance for Elia in 2020 and 2021 has been investigated, according to the same methodology.

This study contains six chapters. In the first chapter, the legal basis which contains the competence of the CREG with regards to the monitoring of Elia’s compliance, is described. The second chapter describes the earlier proceedings and the context leading up to this study. The third chapter elaborates on the methodology used, the analysed data and the considered period while the fourth chapter presents the observed results. In the fifth chapter, these results are discussed in a general manner and the sixth chapter, finally, concludes this study.

This study has been approved by the CREG’s Board of Directors during its meeting of 18 October 2023.

LIST OF ABBREVIATIONS

CCR	Capacity Calculation Region
CWE FBMC	Central-West Europe Flow-Based Market Coupling
(c)NTC	Coordinated Net Transfer Capacity
CEP	Clean Energy Package
EIC	Energy Identification Code
F_{\max}	Maximum capacity
FRM	Flow Reliability Margin
IEM	Internal Energy Market
IF	Internal Flow
JAO	Joint Allocation Office
LTA	Long-Term Allocation
LF	Loop Flow
MACZT	Margin Available for Cross-Zonal Trade
MCCC	Margin for Coordinated Capacity Calculation
minMACZT	minimal Margin Available for Cross-Zonal Trade
MNCC	Margin for Non-Coordinated Capacity Calculation
MTU	Market Time Unit
PST	Phase Shift Transformer
PTDF	Power Transfer Distribution Factor

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1. LEGAL BASIS

1. This chapter summarizes the legal obligations which are applicable to Elia and the CREG with regards to the maximization of interconnection capacities offered for cross-zonal exchanges. These obligations are laid out in the European legislation (the Electricity Regulation and the Electricity Directive) on the one hand, and national legislation (the Electricity Law) on the other hand.

1.1. EUROPEAN LEGAL FRAMEWORK

1.1.1. Regulation (EU) 2019/943 of the European Parliament and the Council of 5 June 2019 on the internal market for electricity

2. Article 16 of the Electricity Regulation lays out the modalities with regards to the minimum margins which Elia needs to offer to the cross-zonal markets. In paragraph 8, it defines this minimum margin as 70% of the capacity. Upon the approval of the CREG and in compliance with paragraph 9, Elia may request a derogation from this obligation, to be applied under specific circumstances.

Article 16

General principles of capacity allocation and congestion management

(...)

4. The maximum level of capacity of the interconnections and the transmission networks affected by cross-border capacity shall be made available to market participants complying with the safety standards of secure network operation. Counter-trading and redispatch, including cross-border redispatch, shall be used to maximise available capacities to reach the minimum capacity provided for in paragraph 8. A coordinated and non-discriminatory process for cross-border remedial actions shall be applied to enable such maximisation, following the implementation of a redispatching and counter-trading cost-sharing methodology.

(...)

8. Transmission system operators shall not limit the volume of interconnection capacity to be made available to market participants as a means of solving congestion inside their own bidding zone or as a means of managing flows resulting from transactions internal to bidding zones. Without prejudice to the application of the derogations under paragraphs 3 and 9 of this Article and to the application of Article 15(2), this paragraph shall be considered to be complied with where the following minimum levels of available capacity for cross-zonal trade are reached:

(a) for borders using a coordinated net transmission capacity approach, the minimum capacity shall be 70 % of the transmission capacity respecting operational security limits after deduction of contingencies, as determined in accordance with the capacity allocation and congestion management guideline adopted on the basis of Article 18(5) of Regulation (EC) No 714/2009;

(b) for borders using a flow-based approach, the minimum capacity shall be a margin set in the capacity calculation process as available for flows induced by cross-zonal exchange. The margin shall be 70 % of the capacity respecting operational security limits of internal and cross-zonal critical network elements, taking into account contingencies, as determined in accordance with the capacity allocation and congestion management guideline adopted on the basis of Article 18(5) of Regulation (EC) No 714/2009.

The total amount of 30 % can be used for the reliability margins, loop flows and internal flows on each critical network element.

9. At the request of the transmission system operators in a capacity calculation region, the relevant regulatory authorities may grant a derogation from paragraph 8 on foreseeable grounds where necessary for maintaining operational security. Such derogations, which shall not relate to the curtailment of capacities already allocated pursuant to paragraph 2, shall be granted for no more than one-year at a time, or, provided that the extent of the derogation decreases significantly after the first year, up to a maximum of two years. The extent of such derogations shall be strictly limited to what is necessary to maintain operational security and they shall avoid discrimination between internal and cross-zonal exchanges.

Before granting a derogation, the relevant regulatory authority shall consult the regulatory authorities of other Member States forming part of the affected capacity calculation regions. Where a regulatory authority disagrees with the proposed derogation, ACER shall decide whether it should be granted pursuant to point (a) of Article 6(10) of Regulation (EU) 2019/942. The justification and reasons for the derogation shall be published.

Where a derogation is granted, the relevant transmission system operators shall develop and publish a methodology and projects that shall provide a long-term solution to the issue that the derogation seeks to address. The derogation shall expire when the time limit for the derogation is reached or when the solution is applied, whichever is earlier.

(...)

1.1.2. Directive (EU) 2019/944 of the European Parliament and the Council of 5 June 2019 on common rules for the internal market for electricity

3. In application of article 59, paragraph 1, b) and h) of the Electricity Directive (transposed in Belgium into the Electricity Law and the Federal Grid Code), the CREG is competent to monitor the compliance by Elia with the obligations in the Electricity Regulation in general, and article 16 of the latter in particular.

Article 59

Duties and powers of the regulatory authorities

1. The regulatory authority shall have the following duties:

(...)

(b) ensuring the compliance of transmission system operators and distribution system operators and, where relevant, system owners, as well as the compliance of any electricity undertakings and other market participants, with their obligations under this Directive, Regulation (EU) 2019/943, the network codes and the guidelines adopted pursuant to Articles 59, 60 and 61 of Regulation (EU) 2019/943, and other relevant Union law, including as regards cross-border issues, as well as with ACER's decisions;

(...)

(h) ensuring that transmission system operators make available interconnector capacities to the utmost extent pursuant to Article 16 of Regulation (EU) 2019/943;

(...)

1.2. NATIONAL LEGAL FRAMEWORK

1.2.1. Law of 29 april 1999 on the organisation of the electricity market

4. In application of article 59, paragraph 1, b) and h) of the Electricity Regulation (transposed in Belgium into the Electricity Law and the Federal Grid Code), the CREG is competent to monitor the compliance by Elia with the obligations in the Electricity Regulation in general, and article 16 of the latter in particular.

Art. 23. § 1. A commission for the regulation of the electricity and the gas, in German "Elektrizitäts- un Gasregulierungs-kommission" and abbreviated "CREG", is established. The commission is an autonomous organism with legal personality, having its registered offices in the administrative arrondissement of Brussels-Capital.

(...)

§ 2. The commission is charged with an advisory task towards the government in matters related to the organisation and functioning of the electricity markets, on the one hand, and with a general task of supervision and control of the application of the relevant laws and regulations, on the other hand.

To this end, the commission shall:

(...)

8° exercise supervision on the compliance by the network operator and the electricity undertakings with the obligations vested in them by this law and its implementing decrees, as well as all other legal and regulatory obligations relevant for the electricity market, in particular with regards to cross-border problems and matters as described in Regulation (EC) No. 714/2009;

(translation by the CREG)

2. CONTEXT

5. The obligations with respect to the margins to be offered to cross-zonal trade are the direct result of the entry into force of the Electricity Regulation. Since the entry into force in June 2019, European regulatory authorities have, in cooperation with ACER on the one hand and with TSOs' on the other hand, discussed, defined, and formalised the application of article 16 into different processes, on the European and national levels.

6. This chapter describes the cooperation with ACER and the other regulatory authorities firstly, and with Elia secondly. The approved derogation for the year 2022 is highlighted and reference is made to the previous compliance reports, for the years 2020 and 2021.

2.1. COOPERATION WITH ACER AND REGULATORY AUTHORITIES

7. The minimum margins to be offered and the potential derogations from these obligations have been discussed, at several occasions, between regulatory authorities and ACER. The absence of a formal, legal obligation for coordination between regulatory authorities and ACER with regards to the monitoring of the TSOs' compliance did not prevent the general endorsement and approval of some general observations with regards to article 16:

- A non-binding recommendation by ACER with regards to the implementation of article 16, paragraph 8 of the Electricity Regulation. This recommendation described, in particular, the calculation method for the minimum margin for cross-zonal trade (hereafter: "MACZT" or *Margin Available for Cross-Zonal Trade*).¹
- A position paper by all regulatory authorities with regards to the criteria for granting a derogation to TSOs', as foreseen in article 16, paragraph 9 of the Electricity Regulation.²

Both documents describe the way in which TSOs should strive to comply with the obligations in article 16 and which the tasks of ACER and the regulatory authorities in this context are.

8. ACER has published several reports³ to monitor the available margins of all TSOs in Europe, in 2020 and 2021. These biannual reports are published in application of the task of ACER, described in article 15, first paragraph of the ACER Regulation,⁴ to monitor the electricity and gas wholesale and retail markets.

¹ Recommendation No 01/2019 of the European Union Agency for the Cooperation of Energy Regulators of 08 August 2019 on the implementation of the minimum margin available for cross-zonal trade pursuant to Article 16(8) of Regulation (EU) 2019/943

² Attached as [Annex 3](#) to Decision (B) 2136

³ The different reports of ACER are available via <https://www.acer.europa.eu/electricity/market-monitoring-report/cross-zonal-capacity-70-target>

⁴ Regulation (Eu) 2019/942 of the European Parliament and of the Council of 5 June 2019 establishing a European Union Agency for the Cooperation of Energy Regulators

9. The relevance of this report by ACER for this study may be illustrated in several ways.
- ACER focuses its analyses on the compliance with the 70% threshold in article 16, paragraph 8 of the Electricity Regulation. To the extent where a derogation from this threshold is approved and applied, temporarily or not, each regulatory authority (in casu the CREG) needs to supervise the compliance with the legal obligations in article 16, paragraph 8 and paragraph 9. The analyses of ACER and the CREG are therefore complementary.
 - The reporting by Elia of the offered margins is done according to the guidelines set out by ACER, among others in its non-binding recommendation (see also paragraph 7). The CREG uses the same MACZT-values, calculated as the sum of the MCCC and MNCC.
 - Elia has added to the reported datasets a number of other data that allows an efficient supervision of the application of the loop flow derogation (in ANNEX 1 and section 4.4). All other datasets are identical to those reported to ACER and have been made available by ACER to the CREG.
10. The chapter on the compliance with the legal obligations by Elia is, as described in chapter 1, a national competence attributed to the regulatory authority. This report is to be read from this angle.

2.2. DEROGATION REQUEST BY ELIA

11. In application of article 16, paragraph 9 of the Electricity Regulation Elia has submitted at the end of 2021 a request for a derogation from the obligation to offer in 2022, at all times, 70% of the F_{max} to cross-zonal trade, at least for network elements introduced in the CWE FBMC. The CREG has approved this derogation request.

12. This derogation prescribes that the minimum margin, when the observed loop flows are above a certain threshold, are calculated as follows:

$$\min MACZT = 70\% - \max [0; LF_{calc} - LF_{accept}]$$

In this equation, LF_{calc} represents the calculated, observed loop flows while LF_{accept} represents the acceptable threshold for loop flows. Two thresholds are defined: one for internal and one for cross-zonal network elements.

$$LF_{calc} \text{ on internal network elements} = \frac{[30\% - FRM]}{2}$$

$$LF_{calc} \text{ on cross - zonal network elements} = 30\% - FRM$$

On internal network elements, the available margins are divided arbitrarily between loop and internal flows, so that the acceptable threshold for loop flows on internal network elements is lower than on cross-border lines. Hence, the minMACZT is, when loop flows are equal, higher on internal network elements than on cross-zonal network elements.

2.3. PREVIOUS COMPLIANCE REPORTS

13. The CREG published a first report with regards to the compliance with article 16, for the year 2020, in early 2021.⁵ In this report, where this analysis has been performed for the first time, the CREG calculated that Elia complied with the legal obligation (with regards to the minMACZT) on 99,2% of all network elements or during 81,3% of the considered period.

14. A second compliance report was published by the CREG, for the year 2021, in early 2022.⁶ In this report, the CREG calculated that Elia complied with the legal obligation (with regards to minMACZT) on 99,2% of all network elements or during 62,2% of the considered period.

15. In these reports, the methodology, datasets and calculation methods (according to ACER's Recommendation) have been developed and elaborated. The current compliance report repeats this methodology, for the year 2022.

2.4. CORE FLOW-BASED MARKET COUPLING GO-LIVE

16. On 8 June 2022 the flow-based market coupling was implemented in the Core capacity calculation region. This means that, from 9 June 2022 (delivery date), transmission capacities are calculated and allocated according to a coordinated market coupling process between all transmission system operators and all nominated electricity market operators of the Core region. This region consists of the borders between 12 bidding zones: Austria, Belgium, Croatia, Czech Republic, France, Germany / Luxembourg, Hungary, Netherlands, Poland, Slovakia and Slovenia. This project succeeds the flow-based market coupling in the CWE region, where only Austria, Belgium, France, Germany / Luxembourg, France and the Netherlands participated.

17. Given the major impact of this important evolution, the CREG opted to present the results on the compliance of Elia with the minimum margin requirements in the capacity calculation process, for 2022, in two different periods: from 1 January until 8 June 2022 ("CWE") and from 9 June until 31 December 2022 ("Core").

⁵ Study (F) [2183](#) on the compliance of ELIA TRANSMISSION BELGIUM SA with the requirements related to the transmission capacity made available for cross-zonal trade in 2020

⁶ Study (F) [2350](#) on the compliance of ELIA TRANSMISSION BELGIUM SA with the requirements related to the transmission capacity made available for cross-zonal trade in 2021

3. METHODOLOGY

18. This chapter starts with an overview of the used datasets, followed by an explanation on the observed period and the methodology that was applied.

3.1. DATA

19. In the context of the monitoring of the available margins from TSOs, performed by ACER, Elia submits on a semi-annual basis a number of parameters to ACER. For this purpose and for each day of the considered period, a file is created including the following information for all CNECs:

- the MTU or Market Time Unit;
- the considered timeframe for capacity calculation (in casu only day-ahead);
- the codes of the observed CNEs and Cs and their considered direction;
- the coordination zone, the TSO and the Member State associated to the CNEC;
- the manner by which the F_{\max} is limited (in casu only thermal limitations);
- the F_{\max} (in MW);
- the minMACZT (in MW);
- an indication of any possible unspecified minMACZT as a result of a derogation (“yes/no”);
- the MCCC and MNCC, including and excluding 3rd country flows⁷ (in MW);
- whenever relevant, the shadow price (in € / MW);
- other remarks made by the TSO;
- the PTDF’s or Power Transfer Distribution Factors associated to the CNECs.

20. This dataset, however, lacks certain elements which should allow the CREG to correctly and efficiently monitor the compliance with article 16 of the Electricity Regulation. In particular, the CREG has asked Elia to add the following elements to the data provided to ACER for the considered period (cf. paragraph 17):

- the so-called minRAM Justification, where an overview is given of the calculation method for the minMACZT in function of the eventual application of the derogation for loop flows;
- the loop flows (in MW) and internal flows (only on internal CNE(C)s, in MW);
- the threshold for acceptable loop flows, as defined in the approved derogation request, being $\frac{1}{2} * [30\% - FRM]$ or $[30\% - FRM]$ (in MW).

⁷ Third countries are defined as countries not participating to the SDAC (in casu mainly non-EU Member States), such as the United Kingdom and Switzerland. Norway is, given its participation to the SDAC, not considered as a third country.

21. These characteristics are assigned to the unique combinations of a CNEC, the considered direction and the relevant MTU. In order to simplify the analyses, EIC-codes have been linked through JAOS' translation tables⁸ to the human readable names of the observed CNEs and Cs. This allows the distinction between internal and cross-border CNE(C)s. Finally, publicly available datasets from the *Entso-E Transparency Platform* on the observed prices on the CWE day-ahead markets (in €/MWh) are used.

22. Two remarks need to be made on the used datasets:

- The reported data encompass both absolute values with regards to the margins on CNECs (in MW) as well as values relative to the F_{\max} (in %). To avoid any rounding errors, either in this study or in the internal reporting tools of Elia, tolerance margins are applied. Concretely, a CNEC with an MACZT higher than or equal to 69,5% of its F_{\max} is considered to be compliant with the 70% threshold. Additionally, the minimum margin is considered to be respected when the MACZT on a CNEC is higher than or equal to 99,5% of its minMACZT. These tolerance margins are also applied in the analyses performed by ACER.
- The reported datasets only contain the unique CNEC combinations for each MTU. This implies that the CNECs on which LTA inclusion has been applied, have already been filtered out by Elia, as recommended by ACER (see section 2.1). Until halfway through December 2020, LTA inclusion was applied in the CWE region via a method based on "virtual branches", where each CNEC that fell outside of the LTA domain was replaced by a set of constraints with the same RAM value but different PTFDs. This method resulted in a multiplication of the number of CNECs as input to the market coupling algorithm *Euphemia* and was no longer tenable in light of the introduction of the new CWE bidding zone border DE/LU – AT via the ALEGrO interconnector. From December 2020 onwards, the LTA inclusion was applied via the *Extended LTA inclusion* method, yet the method based on (*Improved*) *Virtual Branches* was kept for reporting and transparency purposes.

3.2. OBSERVED PERIOD

23. The observed period spans the entire year 2022, from 1 January until 31 December. As mentioned in paragraph 17, a distinction is made between two periods where flow-based market coupling was organized on either CWE- or Core level (1 January until 8 June 2023, and 9 June until 31 December 2022 respectively).

24. During several hours however, problems have appeared in the operational processes of the CWE or Core FBMC, either on a local or regional level, that have had an impact on the results. As a consequence of these problems, since a number of timestamps are missing throughout the year, only **8.751 hours** (instead of 8.760) have been considered when calculating the results.

25. Per hour, about 3.000 unique combinations of critical network elements and contingences in a given direction are reported, leading to a total dataset encompassing **19.789.970 CNECs**.

⁸ <https://www.jao.eu/news/cwe-transparency-release-translation-table>

3.3. STEPSWISE ANALYSIS

26. The monitoring of the compliance by Elia with the obligations in article 16 of the Electricity Regulation is done through a stepwise approach. The analysis is performed on the level of the individual CNECs reported by Elia. During the different steps of the assessment, the most limiting CNEC (i.e. the lowest MACZT per MTU) is considered on the one hand, while all CNEC's across all MTUs are considered on the other hand. The advantages and disadvantages of considering – or not – the entire dataset have been described in Study (F) 2183, in section 3.4 (paragraph 24 and Table 1).

27. In a **first step**, the observed MACZT values are compared to a threshold equal to 70% of the CNECs' F_{max} . This lower threshold is set as a target in article 16, paragraph 8, and applies to network elements who are observed in a flow-based capacity calculation approach (FBMC) and in a capacity calculation approach based on coordinated net transfer capacities (NTC). This comparison provides a general impression with regards to the capacities offered to cross-border trade but fails to take into account the exception for excessive loop flows which applies in the context of the approved derogation request from Elia for 2022.

28. Because of this reason, in a second step, the observed MACZT values are compared to the CNECs' minMACZT value. These latter establish, for Elia, the legally binding lower threshold with regards to the margins for cross-zonal trade on all CNECs. The minMACZT is calculated by Elia and reported in line with the approved methodology, elaborated in section 2.2.

29. If, after the analyses in the first two steps, a network element shows a margin below these established thresholds, the non-compliance with the legal obligations in article 16 of the Electricity Regulation may be established.

30. In order to provide a complete picture of the circumstances under which such violations may occur, some additional considerations are identified with regards to the observed shadow prices, congestions in the CWE or Core region in a **third step**.

31. This process is shown schematically below, in Figure 1.

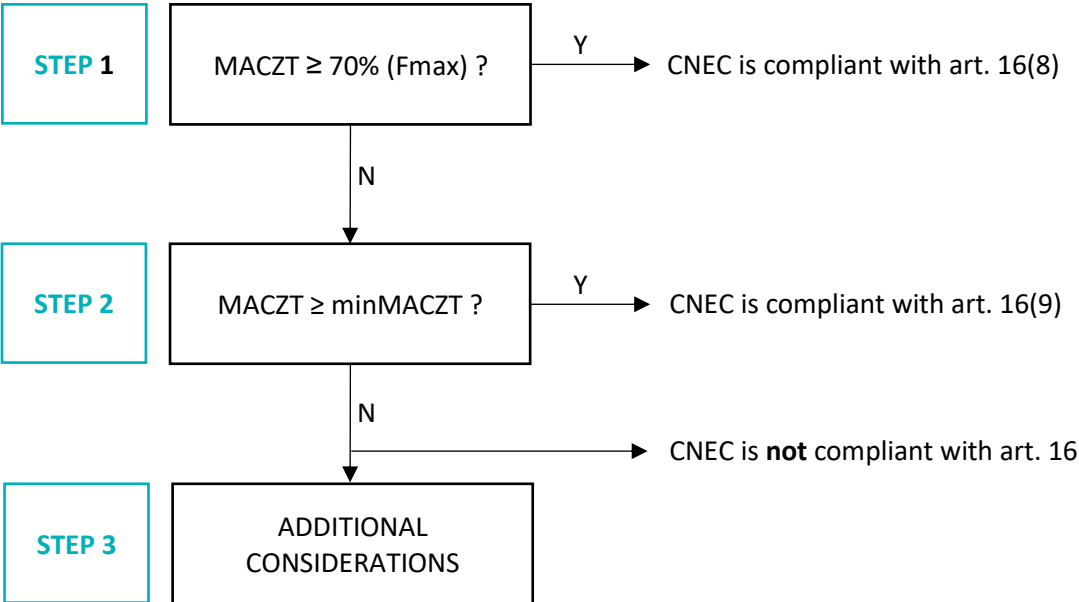


Figure 1 Overview of stepwise approach for the performed analyses

4. COMPLIANCE WITH ARTICLE 16

4.1. STEP 1: COMPLIANCE WITH THE 70% THRESHOLD

32. Figure 2 (CWE) and Figure 3 (Core)⁹ below shows the density curves of the margins each all network element, per type (internal, cross-border or PST) in function of its F_{\max} . The full lines show the values for the MNCC including third country flows, the dashed lines show the values excluding third country flows.

- The MNCC excluding third country flows relate to the transmission capacity that is used by commercial exchanges over EU bidding zone borders that are not part of the CWE region, for example between France and Italy.
- The MNCC including third country flows relate to the transmission capacity that is used both by commercial exchanges over EU bidding zone borders as on bidding zone borders with third countries, such as Switzerland and – since 1 January 2021 – also Great-Britain.

In contrast to 2020, the difference between the MCNC including third countries and the MNCC excluding third countries, and hence the resulting MACZT, is relatively large. This was already the case in 2021 and is mainly due to the relatively large share of the transmission capacity on Belgian CNECs that is used for exchanges with Great Britain, notably via Nemo Link, IFA and BritNed.

When assessing the compliance with the minMACZT requirements, the CREG considers the MCNC including third country flows. The CREG has, however, ensured that this MNCC is calculated based on the best available information on the expected market direction and the volume of these exchanges.

33. Figure 2 and Figure 3 show that, for the largest part of the observed CNECs, the MACZT values are observed around the 70% threshold, which seems to suggest that these margins are optimised by Elia in this direction. The outliers (both to the left as well as to the right) are remarkable, even though these latter are less relevant given the fact that they are observed mostly in the direction of the observed CNEC that is not relevant for the market.

⁹ Available data is shown, each time, for the CWE period (1 January until 8 June 2022) and the Core period (9 June until 31 December 2022)

Compliance with 70% threshold - STEP 1 (CWE)

Density curve of MACZTs compared to 70% of Fmax, for all CNECs (01.01 - 08.06.2022)

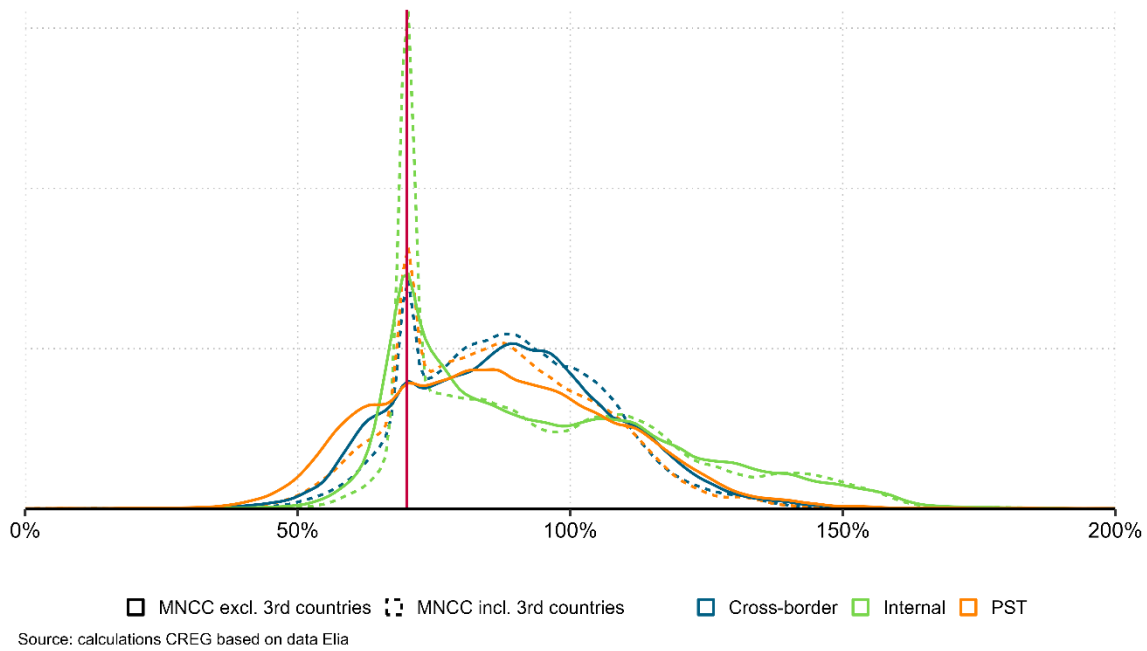


Figure 2 Compliance with 70% threshold – STEP 1 (CWE)

Compliance with 70% threshold - STEP 1 (Core)

Density curve of MACZTs compared to 70% of Fmax, for all CNECs (09.06 - 31.12.2022)

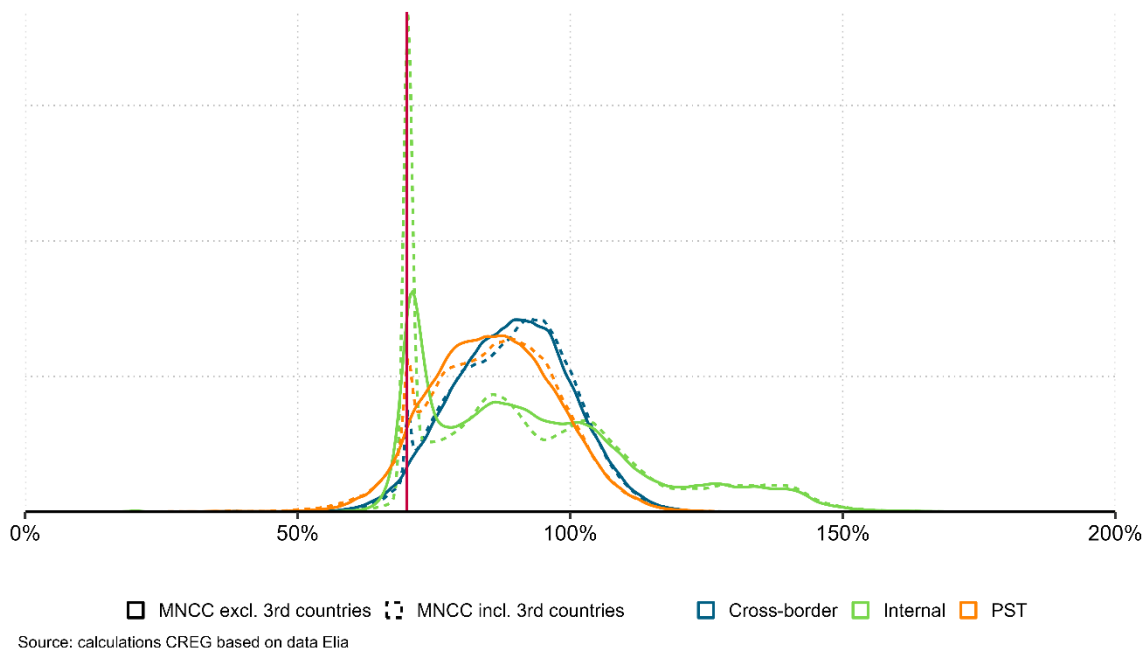


Figure 3 Compliance with 70% threshold – STEP 1 (Core)

34. The same analyses are repeated in Figure 4 and Figure 5, albeit by focusing the analyses on the CNEC with the lowest MACZT value per hour (MTU). It is clear that only in a very limited number of hours the lowest observed MACZT value exceeds the 70% threshold. The major share of the MTUs shows CNECs with a lowest value in the range of [40% - 70%] of the F_{max} . It is, however, worth noting that in the figure for the Core region (Figure 5), a larger number of observations is grouped around

70% of F_{max} , which suggests that Elia is more successful at optimizing the available margins towards the 70% threshold.

Compliance with 70% threshold - STEP 1 (CWE)

Density curve of MACZTs compared to 70% of F_{max} , for CNEC with lowest MACZT per MTU (01.01 - 08.06.2022)

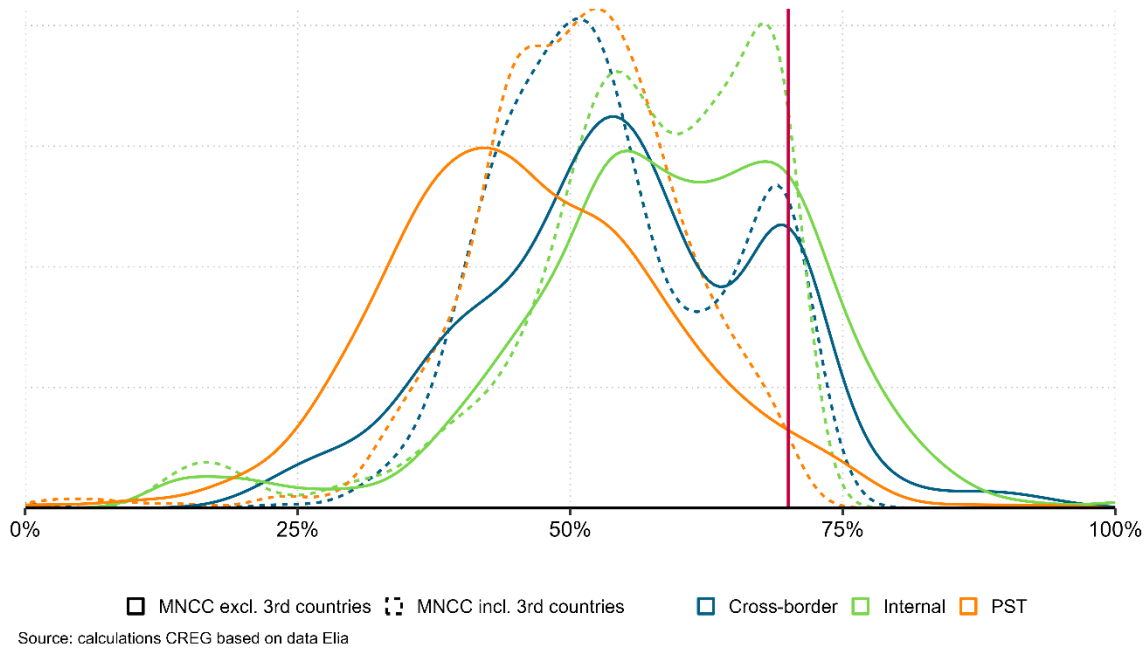


Figure 4 Compliance with 70% threshold - STEP 1 (CWE)

Compliance with 70% threshold - STEP 1 (Core)

Density curve of MACZTs compared to 70% of F_{max} , for CNEC with lowest MACZT per MTU (09.06 - 31.12.2022)

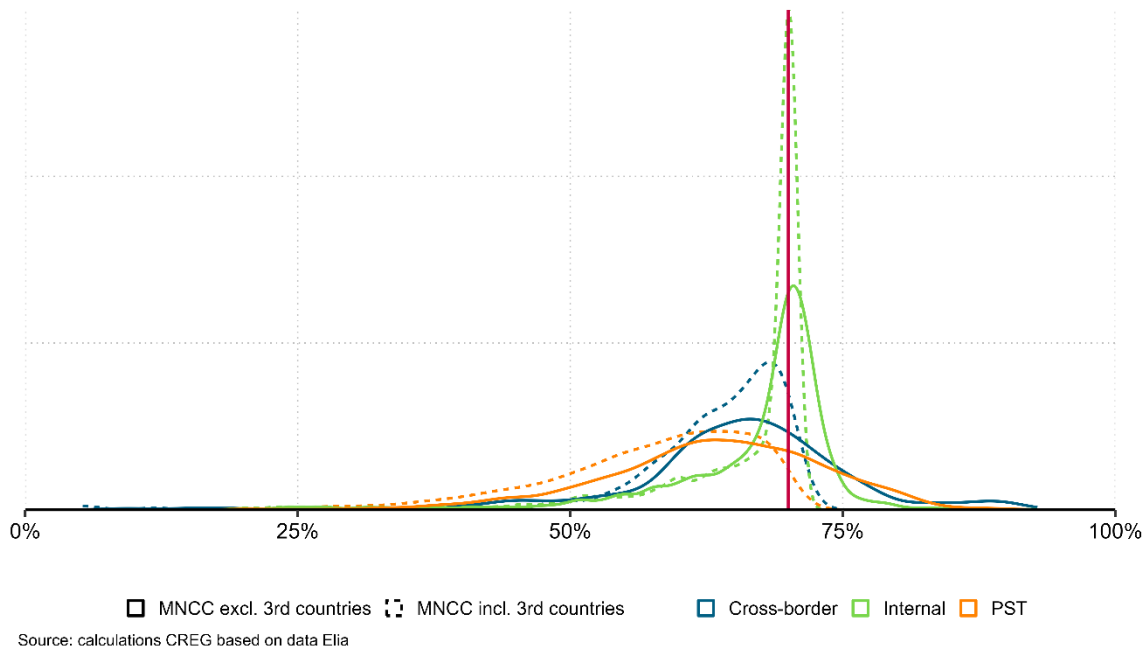


Figure 5 Compliance with 70% threshold - STEP 1 (Core)

35. The global results for both analyses are summarized in Table 1 where also, to serve as comparison, the results for 2020 are repeated.¹⁰ On average, the 70% rule was respected on more network elements and during more hours in 2022 than in 2021 (respectively **95,8% of all CNECs** compared to 93,5% on the one hand, or **23,5% of all MTUs** compared to 2,1% of MTUs on the other hand).

These improvements considering the number of CNECs is mostly the result of the increase in the number of internal network elements that respect the 70% threshold: these have – through their higher absolute count – a larger weight in the dataset compared to other categories. Also when this score is expressed per MTU, the increase is mostly due to the improvement during hours where the CNEC with the lowest margin is an internal one.

36. **Table 2** shows the scores for 2022, again, for both CWE FBMC and Core FBMC. It is striking to observe the increase when the score is expressed per MTU: especially on internal network elements, the lowest margins are observed far more often above 70% (from 3,9% of MTUs in CWE to 57,7% of MTUs in Core).

	2020		2021		2022	
	All CNECs	Per MTU	All CNECs	Per MTU	All CNECs	Per MTU
Cross-border	94,0%	0,5%	93,0%	2,4%	95,1%	13,4%
Internal	91,8%	2,2%	95,1%	2,2%	97,0%	40,5%
PST	87,4%	0,3%	85,8%	1,8%	90,5%	1,8%
GLOBAL	91,8%	1,5%	93,5%	2,1%	95,8%	23,5%

Table 1 Global results with respect to the compliance with the 70% threshold – STEP 1

	CWE (01.01 – 08.06.2023)		Core (09.06 – 31.12.2023)	
	All CNECs	Per MTU	All CNECs	Per MTU
Cross-border	89,7%	13,3%	97,4%	13,7%
Internal	93,9%	3,9%	98,7%	57,7%
PST	85,6%	0,3%	93,1%	0,3%
GLOBAL	92,0%	4,8%	97,7%	32,9%

Table 2 Global results with respect to the compliance with the 70% threshold – STEP 1 (CWE v. Core)

37. In the context of the monitoring of the compliance with the legal obligations by Elia it is crucial to stress that these results do not provide an answer to this question. For this purpose, the MACZT values are compared to the minMACZT in a second step later on.

38. It is however important, and relevant, to perform and publish the analyses in this section. The difference between the extent to which Elia is compliant with the 70% threshold on the one hand, and the minMACZT on the other hand, is linked exclusively to the degree to which loop flows from other bidding zones burden the Belgian network elements. In other words, constraining the loop flows within the allowable margin $\frac{1}{2} * (30\% - FRM)$ or $(30\% - FRM)$ would theoretically yet at all time allow Elia to provide margins of 70% to the cross-zonal market. Additionally, calculating the impact of the loop flows in 2022 compared to the same analysis in preceding years allows assessing whether this impact decreases. This would logically be expected following the increase in the minimal margins in the linear action plans in the neighboring countries. This will be further explored in section 0.

¹⁰ It is important to note that the analyses for 2020 did not span an entire year: because of the application of a derogation in the first quarter to develop the necessary IT tools and operational procedures, the analyses for that year were limited to the period between 1 April and 31 December.

4.2. STEP 2: COMPLIANCE WITH THE MINIMUM MARGINS

39. In a second step, the actual legal compliance with regards to the minimum offered margins (i.e. the minMACZT) is assessed. Given the individual minMACZT values for each CNEC, the difference between MACZT and minMACZT is calculated. Figure 6 and Figure 7 show, for all possible combinations of observed CNECs per MTU in the CWE and Core region respectively, these differences. It is immediately evident that the major share of the CNECs respects the legal obligations, at least when the MACZT including third country flows is considered.

Compliance with minMACZT threshold - STEP 2 (CWE)

Density curve of MACZTs compared to minMACZT, for all CNECs (01.01 - 08.06.2022)

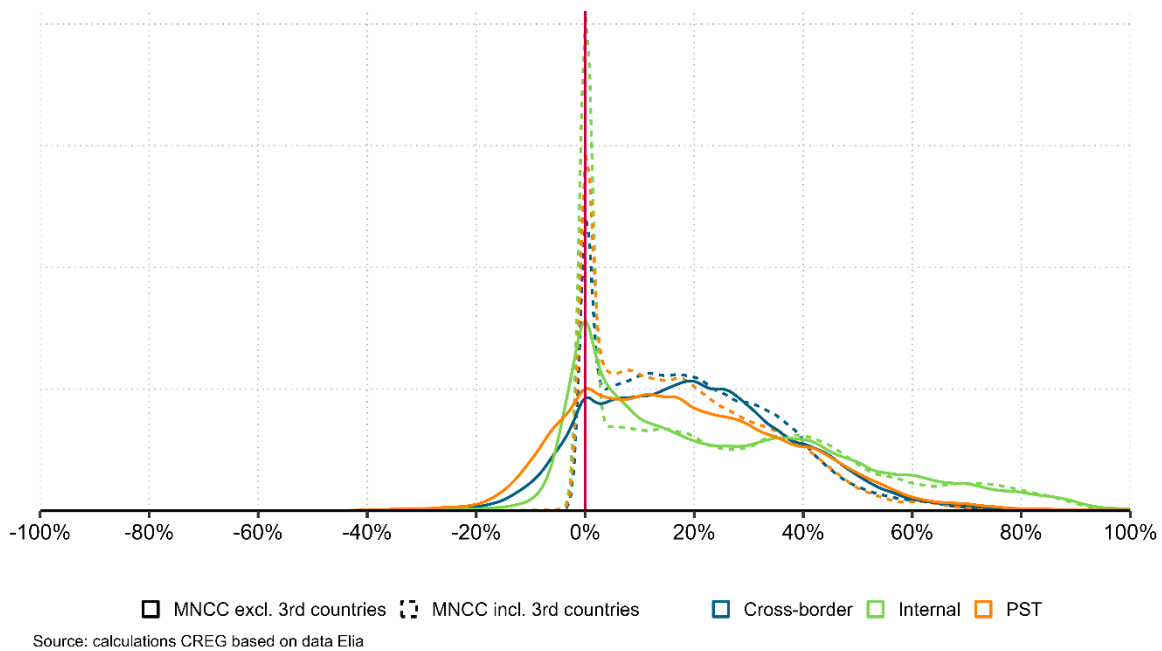


Figure 6 Compliance with minMACZT threshold – STEP 2 (CWE)

Compliance with minMACZT threshold - STEP 2 (Core)
 Density curve of MACZTs compared to minMACZT, for all CNECs (09.06 - 31.12.2022)

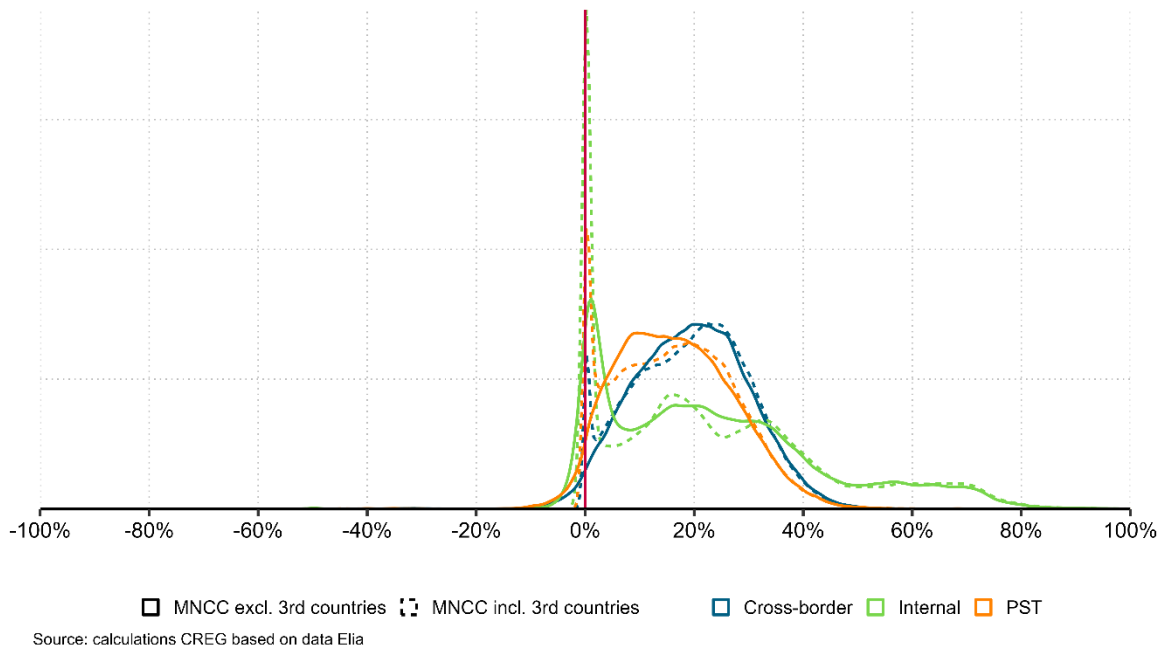


Figure 7 Compliance with minMACZT threshold – STEP 2 (Core)

40. In Figure 8 and Figure 9, the same analysis is repeated for the selection of CNECs with, per MTU, the lowest delta between the MACZT on the one hand and the minMACZT on the other hand, according to the same rationale as in the first step. Given the high concentration of observations around the critical threshold of 0% of F_{max} , another visualization is chosen: the individual observations are plotted per type of network element. It is clear that a significant share of the observations are located to the left of the red line: these are MTUs where the CNEC with the lowest delta does not comply with the legal obligations. The largest proportion of MTUs are, however, observed around 0%. Via the consideration of a tolerance margin of 0,5%, a relatively large share of the observations are considered to be compliant with the legal obligations.

Compliance with minMACZT threshold - STEP 2 (CWE)

MACZT compared to minMACZT, for CNEC with lowest MACZT-minMACZT per MTU (01.01 - 08.06.2022)

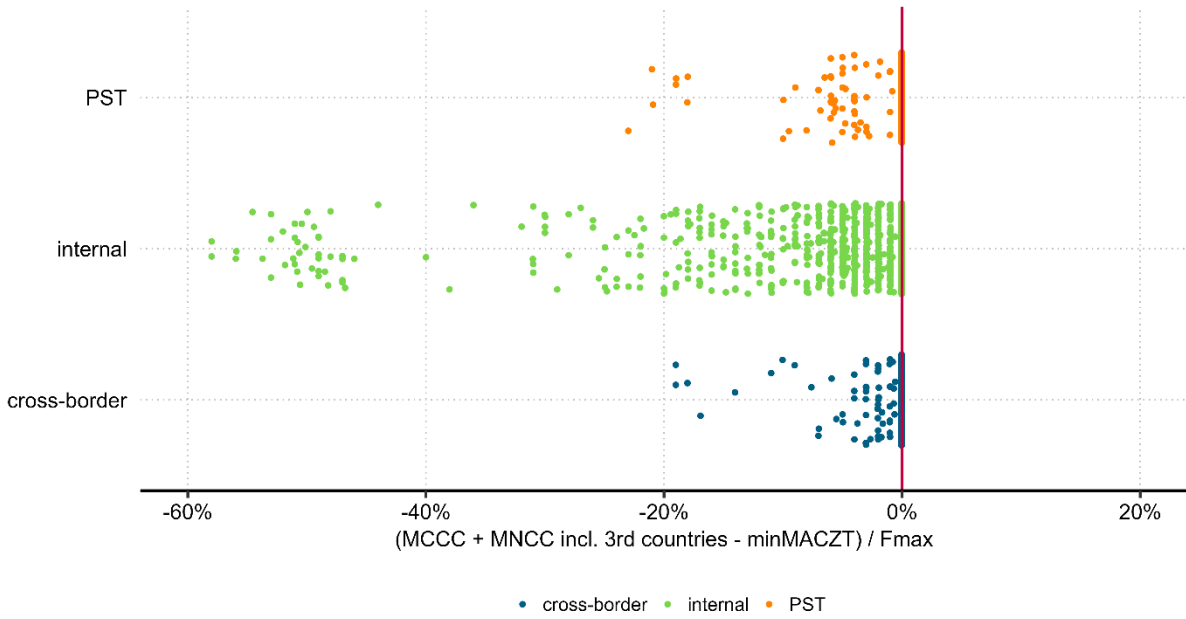


Figure 8 Compliance with minMACZT threshold – STPE 2 (CWE)

Compliance with minMACZT threshold - STEP 2 (Core)

MACZT compared to minMACZT, for CNEC with lowest MACZT-minMACZT per MTU (09.06 - 31.12.2022)

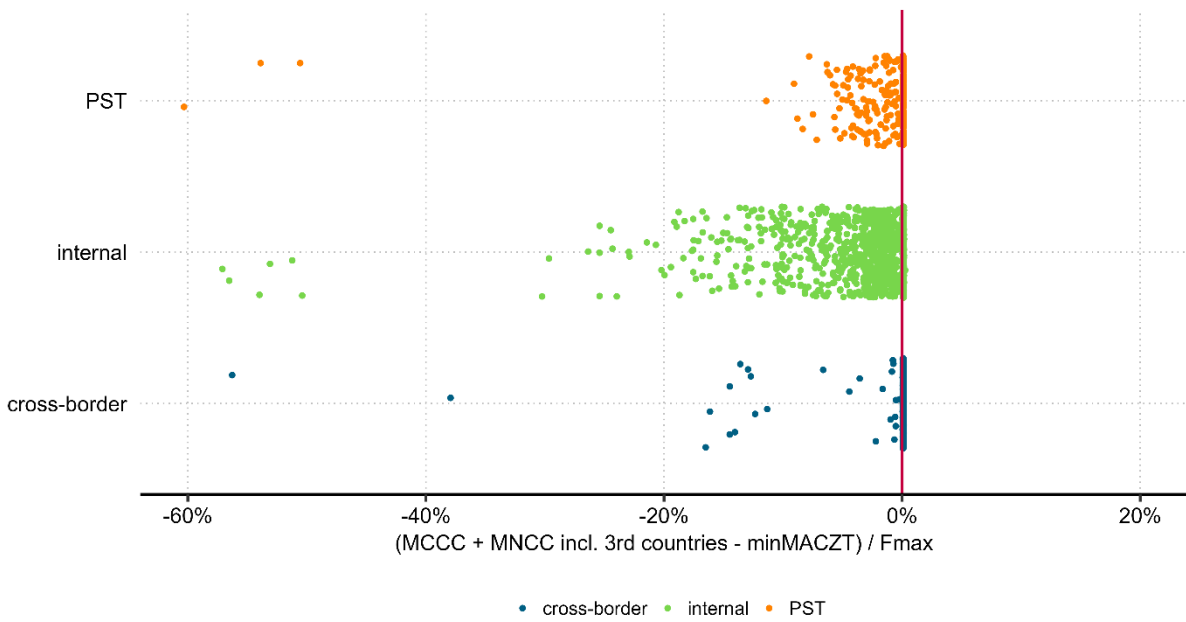


Figure 9 Compliance with minMACZT threshold – STPE 2 (Core)

41. **Table 3** summarizes the results for the second step in the analysis. Globally speaking in 2021, Elia offered at least the minimum margins on **99,7% of all CNECs** and during **78,3% of all MTUs**. At the level of all CNECs, this is a slight increase of the score since 2020 and 2021. Considering only the number of hours where the legal obligations are met, a clear improvement of the results is perceived: this score was still 62,2% in 2021. In 2020, however, this score was still at 81,3%

42. As in the previous step, the results are shown in **Table 4** for the CWE and Core regions separately. As previously, the remarkable improvement of the results, mainly at the level of internal network elements, is striking. When the lowest margin is observed on PSTs, a deterioration of the compliance score from 80,9% the CWE region to 57,8% in the Core region is perceived, however.

	2020		2021		2022	
	All CNECs	Per MTU	All CNECs	Per MTU	All CNECs	Per MTU
Cross-border	99,8%	95,0%	99,7%	90,9%	99,8%	89,2%
Internal	98,8%	77,2%	99,0%	50,6%	99,7%	77,7%
PST	99,7%	97,0%	99,6%	86,9%	99,8%	69,7%
GLOBAL	99,2%	81,3%	99,2%	62,2%	99,7%	78,3%

Table 3 Global results with regards to the compliance with minMACZT - STEP 2

	CWE (01.01 – 08.06.2023)		Core (09.06 – 31.12.2023)	
	Alle CNECs	Per MTU	Alle CNECs	Per MTU
Grensoverschrijdend	99,8%	86,3%	99,8%	92,9%
Interne CNEC	99,6%	63,7%	99,8%	83,4%
PST	99,7%	80,9%	99,8%	57,8%
GLOBAAL	99,6%	69,8%	99,8%	82,6%

Table 4 Global results with regards to the compliance with minMACZT - STEP 2 (CWE v. Core)

43. Just as in 2020 and 2021, the difference between complying with the 70% threshold and the minMACZT including the loop flow derogation is rather high in 2022. Especially at the level of the CNEC with the lowest value per MTU, this difference is striking: during only 23,5% of the MTUs the 70% threshold is respected on all CNECs while during 78,3% of the hours the minimum margin is respected. This demonstrates, again, the impact of the derogation for excessive loop flows. The delta between both scores has decreased significantly, though, suggesting that the impact of loop flows on the available margins (and the compliance scores) is becoming less.

4.3. STEP 3: ADDITIONAL CONSIDERATIONS

4.3.1. Active constraints in day-ahead market coupling

44. Notwithstanding the legal obligation for Elia to offer the minimum margins on all its CNECs during all MTUs, it is interesting to investigate the impact of possible violations of these margins on the outcomes of the CWE and Core FBMC. For this purpose, Elia reports the shadow price of all CNECs to ACER and the CREG. These measure the impact of a theoretical additional margin of 1 MW on the considered CNEC on the total created welfare in the CWE and Core FBMC (expressed in € per MW). Positive observations of the shadow price are associated to congestion in the network, on that specific CNEC (as no welfare can be created additionally by increasing the margin if there is no congestion). This CNEC is then considered to be the “active constraint” in the CWE and Core FBMC.

45. This analysis is explicitly not considered in the framework of assessing the compliance with the legal obligations, in the second step of the methodology, for multiple reasons:

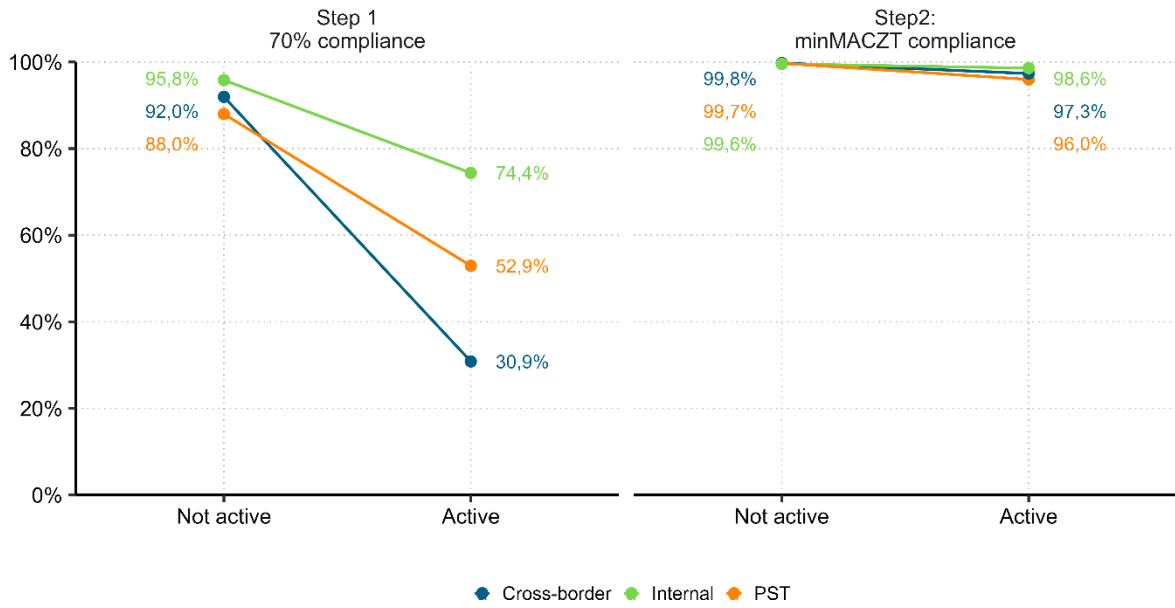
- The obligation to comply with the minimum margins in article 16 of the Electricity Regulation is valid, irrespective of the considered network element or its impact on the market coupling.
- The impact of a possible violation of the minimum margin is not limited to the CNEC on which it is observed. It is possible that a CNEC with a reported MACZT value below the minimum threshold does not constrain the market clearing or does not cause a positive shadow price on another CNEC in the network of Elia. The impact of such violation may manifest itself in the network of a neighbouring TSO through congestions (caused by high loop flows).

For these reasons, this analysis is only provided to contextualize the results of the compliance ex post in the broader framework of the CWE and Core FBMC.

46. **Figure 10** shows clearly that active network elements typically score lower in terms of compliance with the 70% threshold. Irrespective of the type of network elements a lower share of margins at least equal to 70% of F_{\max} are observed. This is similarly the case when considering compliance with minMACZT, yet to a much lesser – albeit unmistakable – extent. This indicates that low margins typically go hand in hand with a welfare loss, quantified by the shadow price of the active constraint.

Compliance with minMACZT threshold - STEP 2 (CWE)

Difference in compliance scores (step 1 and step 2) between active and non-active CNECs



Source: calculations CREG based on data Elia

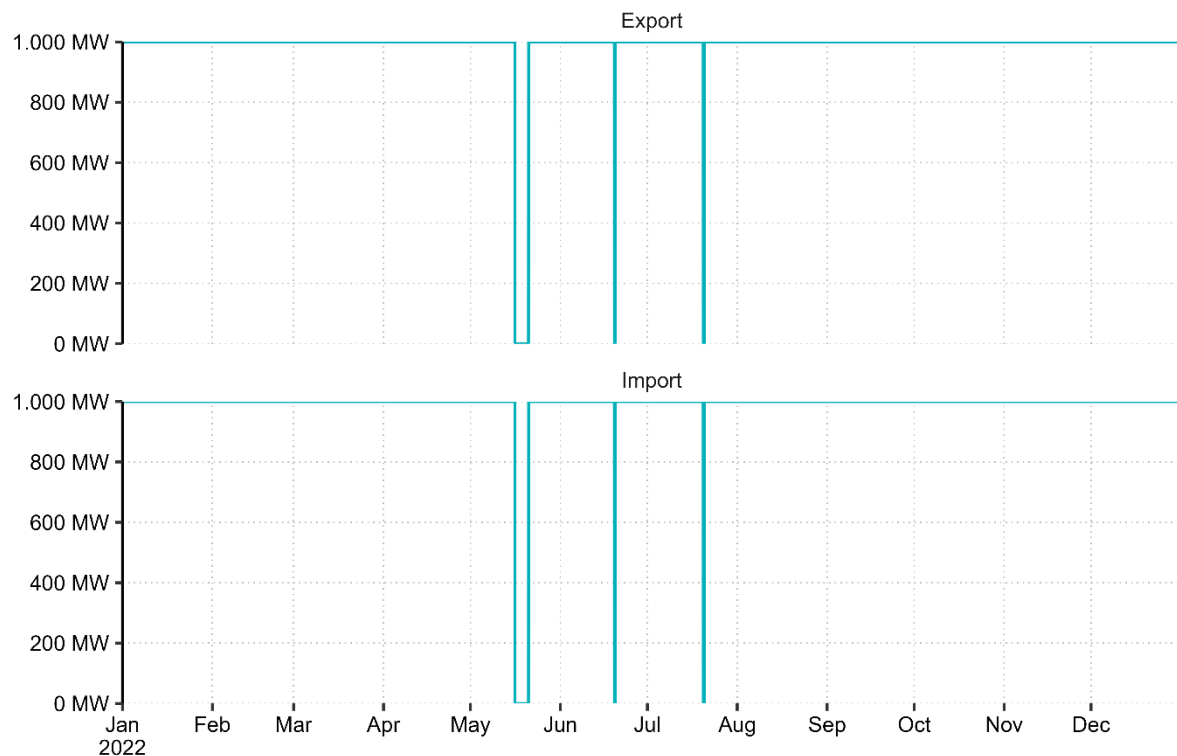
Figure 10 Margins on active CNECs

4.3.2. ALEGrO

47. The ALEGrO interconnector between Belgium and Germany entered into operation in November 2020 and was integrated in the CWE FBMC according to the conditions which were approved by the CREG in its Decision (B) 2106.¹¹ The maximum capacity of this direct current (DC) interconnector is 1.000 MW.

Net Transfer Capacity (NTC) on ALEGrO

Evolution of NTC values on ALEGrO interconnector (Belgium - Germany) in 2022 (in MW)



Source: calculations CREG based on data Elia

Figure 11 Net Transfer Capacity (NTC) on ALEGrO

48. **Figure 11** shows that, during the largest part of 2022 the maximum capacity on ALEGrO was given to the market coupling. These capacities were reduced during three specific moments, and no capacities (0 MW) were available according to Elia. This is the result of one planned outage between 15 and 20 May 2022 and two shorter, unplanned outages, on 19 June and 20 July 2022.¹² During 98,5% of all hours in 2022 the capacity reached 1.000 MW, however.

¹¹ In French (also available in Dutch): Décision (B) [2106](#) relative à la demande d'approbation de la proposition de la SA ELIA TRANSMISSION BELGIUM relative à l'adaptation apportée au couplage de marchés dans la région Europe Centre-Ouest (Central West Europe - CWE) faisant suite à l'introduction de la frontière entre les zones de dépôt des offres allemande/luxembourgeoise et belge à la suite de la mise en service de la liaison DC ALEGrO et aux adaptations consécutives à l'entrée en vigueur du règlement (UE) 2019/943

¹² This and other unavailabilities (in the past and in the future) in Elia's transmission network are published on Elia's web site: <https://www.elia.be/en/grid-data/transmission/unavailability-of-grid-components-380-220-kv>

4.3.3. Use of phase shift transformers

49. Elia has installed, on its borders, a number of phase shift transformers (PSTs) that allow to control active power flows on internal and cross-border network elements, to a certain extent. These make it possible to “push back” loop flows. The extent to which this is possible depends on the number of “taps” which can be used in the capacity calculation process. This number is agreed by all TSOs in the Core DA FBMC Project and has increased compared to the values agreed in the CWE FBMC. This allows TSOs to exert more control over loop flows.

50. **Figure 12** shows the impact of changing the PST taps on the observed loop flows, at the level of the entire Belgian scheduling area. The horizontal axis shows loop flows before PSTs are optimized, while the vertical axis shows the same loop flows after the optimization phase. The diagonal line is drawn at 45°, so that values below the line (at least in the upper right quadrant) indicate hours where the loop flows are reduced after the optimization phase. This indicates that PSTs have successfully reduced loop flows to a lower absolute level (in MW). This happened during 90,6% of all hours since 9 June (after the Core DA FBMC go-live); the absolute reduction of loop flows reached, on average, 273 MW.

Use of phase shift transformers and impact on loop flows
Hourly loop flows before (horizontally) and after (vertically) PST optimisation

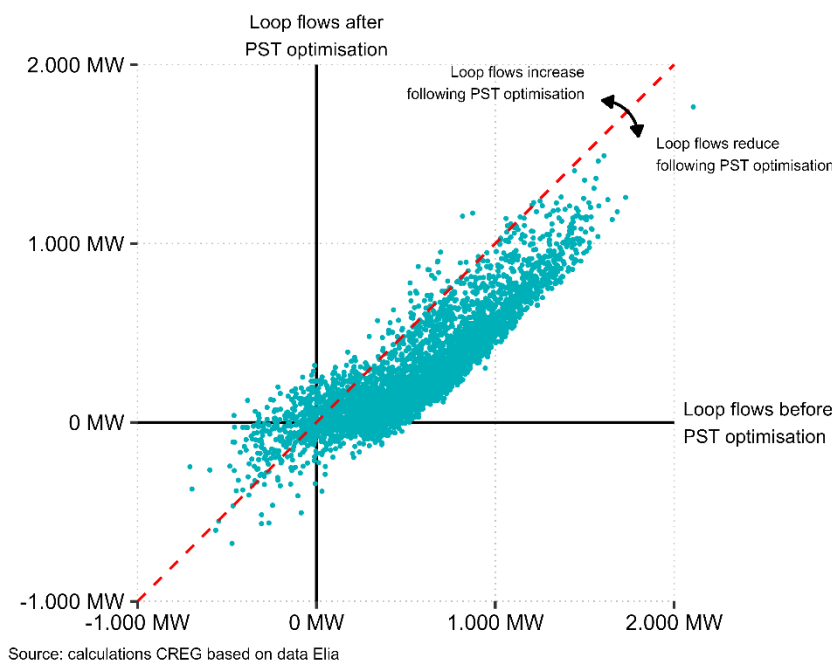


Figure 12 Use of phase shift transformers and impact on loop flows

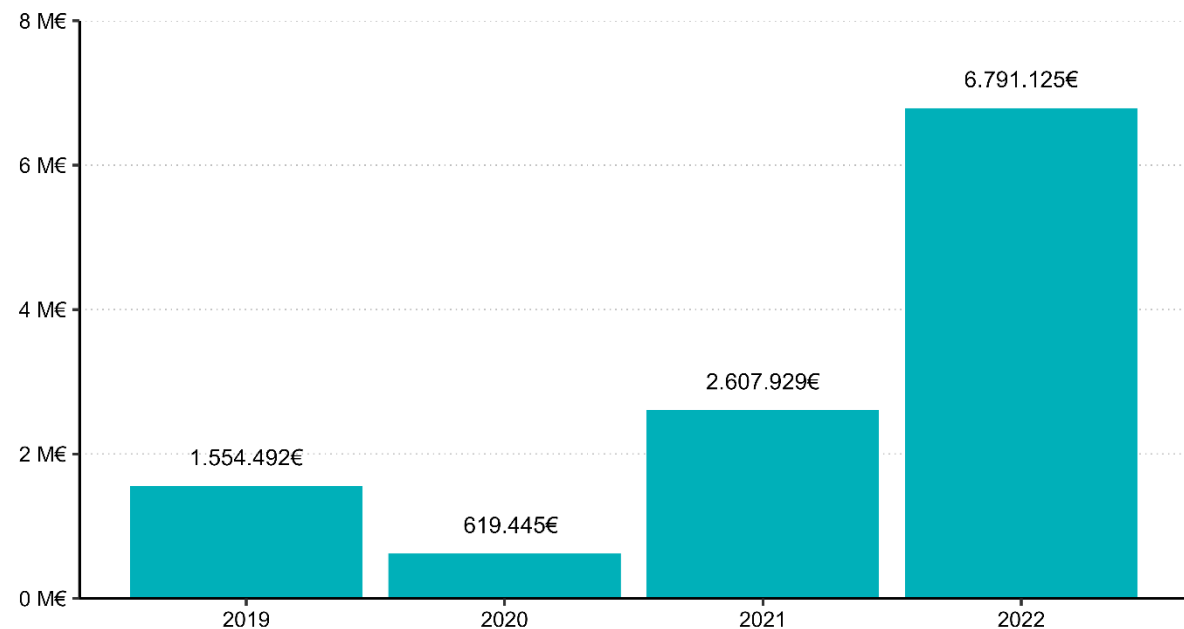
4.3.4. Use of costly remedial actions

51. Article 16, paragraph 4 of the Electricity Regulation states that transmission system operators need to use remedial actions such as redispatching and countertrading to maximize the available capacities with the target to reach the 70% threshold. This also includes cross-border redispatching, insofar as a coordinated and non-discriminatory process for these cross-border measures and the sharing of their costs is in place.

52. The costs associated to such means of congestion management are reported by Elia.¹³ The yearly total cost is shown in **Figure 13**: these have increased sensibly in 2022 compared to previous years, reaching 6,8 million €. A part of this increase may be attributed possibly to the general price increases in day-ahead markets, leading to increases in the remuneration paid by Elia to units that are redispatched (in €/MWh).

Cost of congestion management

Total yearly cost of all costly remedial actions performed by Elia



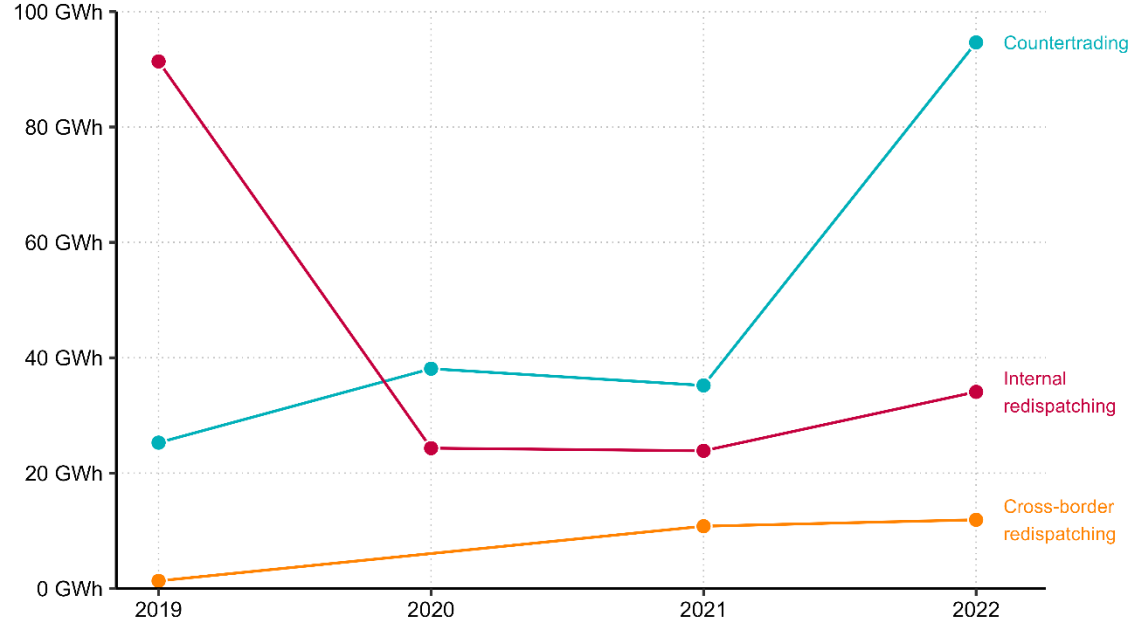
Source: calculations CREG based on data Elia

Figure 13 Costs of congestion management

¹³ These datasets are published on Elia's Open Data Platform: ods074 ("Congestion Management Costs"). The activated volumes per type of remedial actions are found in the datasets ods071, ods072 and ods073.

53. In an attempt to isolate the general price increases from this evolution, an overview is given of the activated volumes, split per type of remedial action (internal redispatching, cross-border redispatching and countertrading). This is done in **Figure 14**. The main share of the volume of activated remedial actions concerns countertrading, whereby through a cross-zonal transaction between two system operators the congestion on a line is relieved. This happened, according to Elia’s numbers, most often to relieve congestions on external network elements (i.e., in the zone of other system operators).

Activated volumes for congestion management
 Total yearly activations of all costly remedial actions performed by Elia



Source: calculations CREG based on data Elia

Figure 14 Activated volumes for congestion management

5. GENERAL DISCUSSION ON THE RESULTS

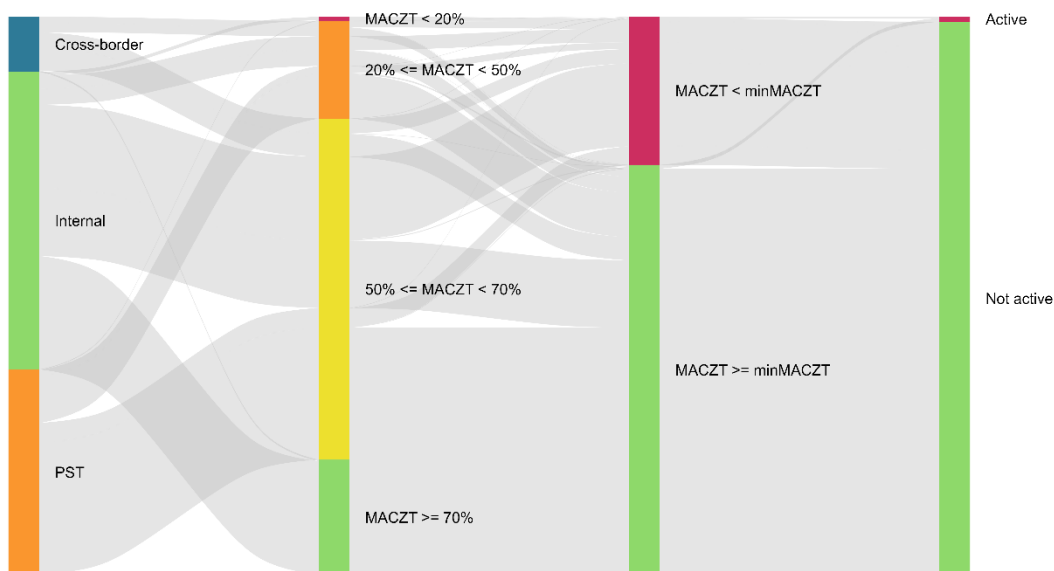
5.1. SUMMARIZING ANALYSIS

54. The results of the stepwise analysis in the first to the third step (sections 4.1, 4.2 and 0) are summarized in Figure 15. This *Sankey diagram* processes as input the dataset where, for each hour, the network element with the lowest margin between the MACZT and minMACZT was retained.¹⁴ Both the nodes (coloured) as well as the links (grey) summarize vertically to 100%, or 8.751 MTUs.

55. Firstly, the network elements are considered with regards to their type (internal, cross-border or PST). Subsequently, as in the **first step** of the earlier analyses, the second column with the nodes look at the category in which the MACZT is observed (compared to the F_{max}). the comparison is then made between the MACZT and minMACZT (as in the **second step**, where again a global compliance score of 62,2% of all MTUs may be observed). In the fourth column with nodes, finally, the degree to which the CNEC itself is the limiting factor (based on shadow prices) – as in the **third step**.

Compliance score of CNECs across different steps of the analysis

Sankey diagram showing characteristics of CNEC with lowest Δ (MACZT - minMACZT) per hour



Source: calculations CREG based on data Elia

Figure 15 Compliance score of CNECs at different steps in the methodology

¹⁴ Just as in Figure 8.

56. The flows between these nodes allow further insight into how the different characteristics of the most limiting CNEC per MTU compare to each other.

- When the CNEC with the lowest delta between MACZT and minMACZT per hour is considered, these are most often internal network elements (green bar in leftmost column). The lowest values are least often observed on cross-border elements.
- A large number of observations where 70% is not respected on a CNEC, complies with the minMACZT threshold nevertheless. This is shown by the flows from the yellow, orange and red bars in the second column to the green bar in the third column. This indicates that the minMACZT is (significantly) lower than the 70% threshold, by applying the loop flow derogation.
- In only a very limited number of hours the lowest margin is observed on an active network element. These low margins are, furthermore, most often above minMACZT. During 51 hours, however, this is a CNEC where the MACZT is lower than minMACZT.

5.2. DISCUSSION ON THE RESULTS

57. The results in chapter 4 show that Elia offers, on the major share of its network elements, margins that meet or surpass the minimum margins (either 70% in general or the minMACZT in application of the loop flow derogation). On **99,7% of all observed network elements** the observed capacities (MACZT values) were at least as high as the minimum margins (minMACZT values). At the same time, during **78,3% of the considered hours** all observed MACZT values on all network elements reached at least the minMACZT values. These numbers indicate an improvement of the number of hours where Elia met the legal obligations (from 62,2 in 2021 to 78,3% in 2022).

58. The CREG observes, however, no structural deficits (across time) nor extremely low margins. In principle, the provisions of article 14 and article 15 of the Electricity Regulation prescribe that the identification of structural congestions need to lead to the development of action plans or bidding zone reviews. The CREG is of the opinion that, on the basis of its analyses of the available margins, such measures are not to be considered at this moment.

59. The CREG however requests Elia to urgently strive for the implementation other possible measures that have a positive impact on the available margins, without delay and actively. The CREG considers, in particular:

- the implementation of the coordinated redispatching and countertrading methodology in the Core region, and the associated methodologies for sharing the costs of these remedial actions;
- the further development and refinement of Elia's and all Core TOSs' coordinated validation tool in the capacity calculation;
- the further development of forecasts that serve as input to the local validation tool, as the expected day-ahead market direction and the expected non-coordinated commercial and non-commercial flows (MNCC, respectively loop flows), hence improving the quality of the inputs to the local and coordinated validation tool; and

60. The CREG wishes to stress the specific position and the role of Elia and Belgium in the coordinated market coupling in the CWE and Core regions. First and foremost, the compliance with the legal obligations is obviously a task assigned to Elia. There are, however, external elements such as the significant impact of loop flows from other bidding zones on the one hand, and the joint responsibilities between all TSOs to implement the projects in paragraph 59 on the other hand. The CREG is therefore a strong proponent of harmonizing the obligations with regards to the compliance with articles 14, 15 and 15 and its monitoring across different Member States. The CREG has defended this position at numerous occasions in the appropriate fora and also fully supports ACER in its initiatives to harmonize these elements.

61. Furthermore, the CREG will continue to supervise that the compliance with the legal obligations by Elia on the one hand, and the transparency with regards to other TSOs' compliance on the other hand (as reported by the relevant regulatory authorities), improve in the future.

6. CONCLUSION

The CREG investigated, in this study, the compliance of Elia with the legal obligation with regards to the transmission capacities offered to cross-zonal exchanges. These legal obligations follow from article 16 of Regulation (EU) 2019/943 of the European Parliament and the Council of 5 June 2019 on the internal market for electricity.

The conducted analyses show a global compliance with the minimum margins on **99,7% of the observed network elements**, during **78,3% of the hours** in the considered period between 1 January and 31 December 2022.

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For the Commission for Electricity and Gas Regulation

Laurent JACQUET
Director

Koen LOCQUET
President of the Board of Directors