CREG

Commissie voor de Regulering
van de Elektriciteit en het Gas

# Study

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**15 April 2021**

## Study on the compliance of ELIA TRANSMISSION BELGIUM SA with the requirements related to the transmission capacity made available for cross-zonal trade in 2020

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 with the provisions in article 16 of the Electricity Regulation in 2020. The CREG is performing these analyse for all network elements in the considered periods between 1st April and 31st December 2020 (AC elements) and 1 January and 31 December 2020 (DC elements). This analysis follows a stepwise approach: in a first step the compliance with the 70% threshold is assessed for all considered hours across all considered 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. Finally, some additional considerations are identified, related to the circumstances under which the margins on these network elements have been observed, either in compliance or not with the legal obligations.

The analyses performed show that Elia, between 1 April and 31 December has respected the legal requirements related to the minimum margins, during **81,3% of the considered period** and on **99,2% of the observed network elements**.

Notwithstanding the derogation, Elia has offered a margin equal to at least the 70% threshold on 91,7% of the observed network elements. The number of hours during which all network elements respect the 70% threshold, nevertheless, only amounts to 1,5% of the hours in the considered period.

This study shows, furthermore, that the observed loop flows from neighbouring bidding zones have a significant impact on the ability of Elia to respect the 70% threshold 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. One could however reasonably assume that the decreasing impact of these loop flows in the future, combined with the efforts of Elia, will lead to higher capacities which will be made available to the cross-zonal markets.

# INTRODUCTION

The COMMISSION FOR ELECTRICITY AND GAS REGULATION (hereafter: “the 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: “the Electricity Regulation”).

In this study the CREG investigates to which extent the margins on transmission network elements which are offered by Elia comply with the minimum margins set by article 16 of the Electricity Regulation. 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 first time since the entry into force of the Electricity Regulation. CREG intends to repeat these analyses on an annual basis, hence allowing for a description of the evolution of the compliance of Elia, considering the evolution of the legal obligations.

This study contains six chapters. In the first chapter, the legal basis which contains the competence of CREG with regards to the monitoring of Elia’s compliance, is described. The second chapter describes 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. The annexes to this study present a few additional analyses, which complement and support the results observed in the fourth chapter.

This study has been approved by the CREG’s Board of Directors during its meeting of 15 April 2021.

# LIST OF ABBREVIATIONS

| | |
|---|---|
| **CCR** | *Capacity Calculation Regio* |
| **CWE FBMC** | *Central-West Europe Flow-Based Market Coupling* |
| **(c)NTC** | *(coordinated) Net Transfer Capacity* |
| **CEP** | *Clean Energy Package* |
| **CNE(C)** | *Critical Network Element (under Contingencies)* |
| **EIC** | *Energy Identification Code* |
| **$F_{max}$** | Maximum Capacity |
| **FRM** | *Flow Reliability Margin* |
| **IF** | *Internal Flows* |
| **JAO** | *Joint Allocation Office* |
| **LTA** | *Long Term Allocation* |
| **LF** | *Loop Flows* |
| **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* |
| **PTDF** | *Power Transfer Distribution Factor* |

# LIST OF FIGURES AND TABLES

# 1. LEGAL BASIS

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

*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. The Electricity Law assigns the CREG with the mandate to supervise the compliance by Elia with the obligations set out in European legislation, in particular when matters of cross-zonal relevance are involved.

> ***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.

## 2.1. COOPERATION WITH ACER AND REGULATORY AUTHORITIES

6. 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.

## 2.2. DEROGATION REQUEST BY ELIA

7. In application of article 16, paragraph 9 of the Electricity Regulation Elia has submitted at the end of 2019 a request for a derogation from the obligation to offer, at all times, 70% of the $F_{max}$ to cross-zonal trade, at least for AC network elements introduced in the CWE FBMC. The CREG has approved this derogation request.[3] The purpose of this derogation was to allow Elia to offer lower capacities to the market, in three foreseeable circumstances. These three cases may be summarized as follows.

a) Derogation D1 allows Elia to take into account loop flows above a certain margin (higher than ½ * [30% - FRM] on internal network elements and [30% - FRM] on cross-border network elements) in the calculation of the minimum margins;

b) Derogation D2 allows Elia to lower the minimum margins, in situations where the transmission network is not completely available as a result of a planned unavailability of

[11] 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] Décision (B) 2014 relative à la demande d'approbation, formulée par la SA ELIA SYSTEM OPERATOR, d'une dérogation à l'article 16, huitième alinéa du règlement (UE) 2019/943, portant sur une capacité minimale disponible pour les échanges entre zones

one or more network elements (for planned grid reinforcements), combined with a lack of redispatch potential;

c) Derogation D3 allows Elia to define the minimum margin as the 20% of the $F_{max}$, which was common at the time in the CWE FBMC at the time, in order to allow for the development of the necessary operational and technical processes to implement the 70%-rule. This derogation applied in the period between 1 January and 31 March 2021.

8. After the application of derogation D1 for loop flows, the minimum margin to be offered on each CNEC is defined as minMACZT[4]:

$$minMACZT = 70\% - max\ [0\ ; LF\_calc - LF\_accept]$$

9. During the approval process with regards to Elia's request for derogation, a remark was received from FEBEG in the public consultation leading up to the decision. This remark related to the possible overestimation of the available margins through the arbitrary equal division of the [30% - FRM] margin between loop and internal flows. For this purpose, as described in section 2.4, paragraph 26 of Decision (B) 2014, the minMACZT is calculated in an alternative manner. The goal of this alternative calculation is to assess the appropriateness and efficiency of the calculation method in paragraph 8. ANNEX 3 describes the comparison between the minMACZT as defined earlier and minMACZT'.[5]

$$minMACZT' = 70\% - \max[0; LF_{calc} - LFaccept], when\ LF_{calc} + IF_{calc} > 30\% - \mathrm{FRM}$$
$$minMACZT' = 70\%, when\ LF_{calc} + IF_{calc} \leq\ 30\% - FRM$$

10. The application of derogation D2 does not allow for monitoring in a detailed manner, due to the absence of a methodology to define the resulting minimum margin. The occurrences of these unavailabilities are published by Elia, however, and will be checked.

11. The application of derogation D3 is translated into the confinement of the considered period, for AC network elements in the CWE FBMC, to the period between 1 April and 31 December 2020.

[4] In Decision (B) 2014 the term "minRAM" is used. In order to ensure the consistency between the used terminology in this study and the reporting towards ACER, we refer to "minMACZT": both terms are equivalent in the framework of this study.

[5] The distinction between minMACZT and minMACZT' is only relevant on internal CNECs because of the absence of internal flows on cross-border CNECs.

## 2.3. MONITORING OF LEGAL COMPLIANCE WITH ARTICLE 16

12. ACER published, in December 2020, its first report on the monitoring of the margins made available by all TSO's in Europe during the first half of 2020.[6] This semi-annual report is drafted in application of the activities of ACER, described in article 15, paragraph 1 of the ACER Regulation,[7] related to the monitoring of the wholesale and retail markets.

13. 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 6). The CREG uses the 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 (see section 3.2) are identical to those reported to ACER and have been made available by ACER to the CREG.

14. The supervision of Elia's compliance with its legal obligations is, as described in chapter 1, a national competence attributed to the regulatory authority. This report is to be read from this angle.

[6] ACER Report on the Result of Monitoring the Margin Available for Cross-Zonal Electricity in the First Semester of 2020.

[7] Regulation (EU) 2019/942 of the European Parliament and the Council of 5 June 2019 establishing a European Union Agency for the Cooperation of Energy Regulators

# 3. METHODOLOGY

15. This chapter describes the considered periods, the data used for the analyses and the methodological approach applied in this study.

## 3.1. OBSERVED PERIOD

16. The approved derogation request from Elia for the year 2020 contained, as explained in section 2.2, a derogation from the obligation to offer a minimum margin of 70% between 1 January and 31 Mach 2020. This allowed Elia to develop the necessary operational and IT-processes and tools, during this period, to facilitate the integration of the 70% threshold in the capacity calculation processes.

17. Because of this derogation the considered period, where the available margins are checked, is confined to the period from **1 April until 31 December 2020** for the AC network elements covered by this derogation.[8] For DC network elements, the entire year 2020 will be considered.

## 3.2. DATA

18. 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[9]);
- an indication of any possible unspecified minMACZT as a result of a derogation ("yes/no");
- the MCCC and MNCC, including and excluding 3rd country flows (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.

[8] Between 1 January and 31 March the so-called *CWE minRAM (20%)* was the lower threshold for the available margins. This minimum margin was approved by the CREG in the framework of the general capacity calculation and allocation methodology in the CWE FBMC, in Decision (B) 1814.

[9] In order to take into account the different values for $F_{max}$ (between different CNEC's of for one CNEC during the considered period), values such as minmACZT, MCCC, MNCC are analysed in % of $F_{max}$, even though they are reported in MW.

19. 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*,[10] 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 ½ * [30% - FRM] (in MW).

20. 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 tables[11] to the human readable names of the observed CNEs and Cs. This allows the distinction between internal and cross-border CNE(C)s.

21. Through these combinations, 275 days or 6.600 hours are considered during the observed period. Per day, approximately 50.000 CNE(C)s introduced by Elia are reported, leading to a total of 13.257.393 Belgian CNE(C)s in the observed period or 14,0 GB of raw data.

22. Finally, publicly available data from Elia's web site and the *ENTSO-E Transparency Platform*[12] are used to perform additional analyses:

- the planned unavailabilities in Elia's transmission network;
- the *day-ahead* market prices in the CWE FBMC (in € / MWh).

## 3.3. OBSERVATIONS ON THE USED DATASETS

23. Despite the efforts of ACER and Elia with regards to the standardization of the used datasets, a number of remarks with regards to the (quality of) the used data may be expressed, especially in light of the size and complexity of the reporting framework:

- No datasets are available for three days: 4 May, 4 June and 15 November 2020. On 4 May and 15 November, problems in its local tools prevented Elia from reporting the data. On 4 June, problems in the CWE FBMC led to the application of the so-called *default flow-based parameters.* These 72 MTU's are therefore lacking from the analyses which will follow and the results for only 6.528 instead of 6.600 MTU's are presented.
- The reported datasets contain both absolute values with regards to the margins on CNECs (in MW) as well as values relative to the $F_{max}$ (in %). In order to eliminate possible round-off errors, either in this report or in the internal reporting tools of Elia, tolerance margins are applied. A CNEC with an MACZT higher than or equal to 69,5% of the $F_{max}$ is considered to be compliant with the 70% threshold. In addition, the minimal target is considered to be reached when an MACZT higher than or equal to 99,5% of the minMACZT is reported. These tolerance margins are also applied in the analyses performed by ACER.

[10] The *minRAM justification* refers to the minMACZT, but is used in the CWE FBMC.

[11] https://www.jao.eu/news/messageboard/view?parameters=%7B%22NewsId%22%3A%22e7de98dc-af34-4efd-82a1-aad90081fb13%22%2C%22FromOverview%22%3A%221%22%7D

[12] https://transparency.entsoe.eu

- The reported data only show the unique combinations of CNECs, both directions and each MTU. This means that possible duplicates as a result of LTA inclusion by Elia have been filtered out. Until October 2020, LTA inclusion in the CWE region was done via a methodology based on the *"virtual branches"* approach where every CNEC outside of the LTA domain was replaced by a set of limitations with the same RAM but with different PTDF values. This method resulted in a multiplication of the number of CNECs which were inputted to the *Euphemia* market coupling algorithm and proved to be no longer sustainable in light of the introduction of the new CWE bidding zone border DE/LU-BE through the ALEGrO interconnector. From November 2020 onwards, LTA inclusion was applied base on the principle of *Extended LTA inclusion*, but the method based on *"(Improved) virtual branches"* was kept for reporting and transparency purposes.

## 3.4. METHODOLOGY

24. 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 arguments in favour and against the consideration of both datasets are summarized below, in Table 1. The CREG explicitly chooses to present both analyses and to publish the results for both methods on an equal footing.

| | | |
|---|---|---|
| **CNEC with lowest observed MACZT value per MTU** | + | Compliance with 70% and minMACZT thresholds are guaranteed for all CNECs, if CNEC with lowest observed MACZT reaches these thresholds. |
| | - | It is possible that the CNEC with the lowest MACZT does not limit the exchanges. Similarly, it is possible that the CNEC which is limiting the exchanges, is not the CNEC with the lowest MACZT value. Other CNECs, where the MACZT is below the minRAM, with a high shadow price, are not taken into consideration. |
| **All CNECs** | + | The obligation to offer 70% or the minimum margin is imposed on all CNECs in all directions, irrespective of the circumstances. The consideration of all CNECs provides the most complete picture with regards to the compliance with the legal obligations by Elia. |
| | - | The results may be distorted by the observation of high MACZT values on CNECs which do not limit the exchanges. |

**Table 1** Arguments in favor and against the consideration of most limiting CNEC or all CNECs

25. 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 exceptions which are applicable in light of the approved derogation for Elia in the year 2020.

26. 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.

27. 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.

28. 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 and the possible application of derogation D2 in a **third step**.

29. This process is summarized and outlined below.

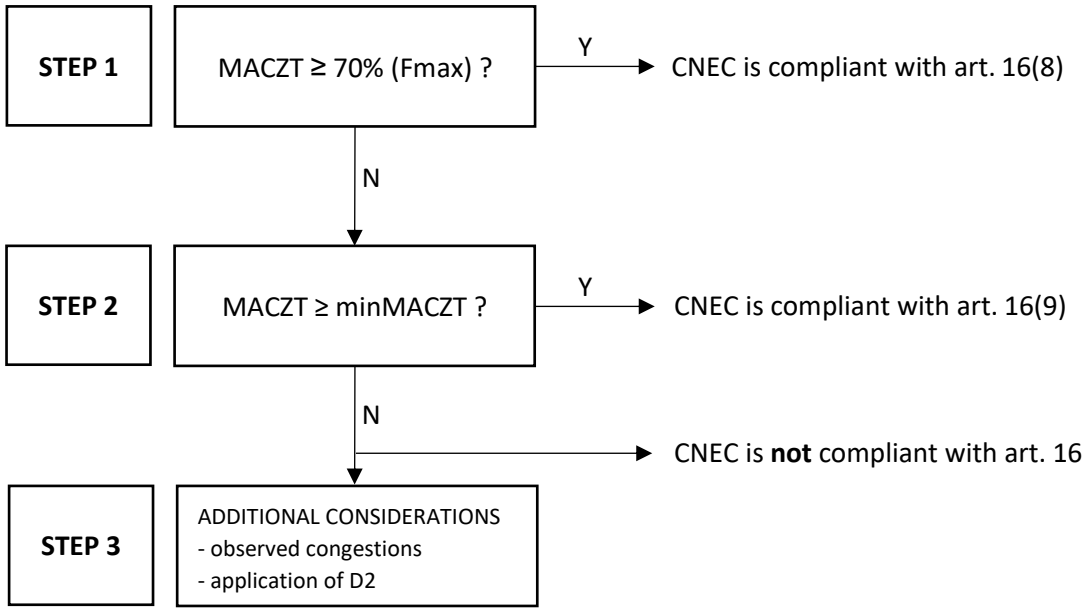


**Figure 1** Overview of stepwise approach for the performed analyses

# 4. COMPLIANCE WITH ARTICLE 16

30. In this chapter, the margins offered to cross-zonal trade are analyzed for the reported CNECs. The analysis is performed in a stepwise manner, according to the methodology described in section 3.4.

## 4.1. FIRST STEP: COMPLIANCE WITH THE 70% THRESHOLD

31. Figure 1 below shows the density function of the lowest MACZT values, considered according to the calculation method (including or excluding 3rd country exchanges) and according to the type of network element (cross-border or internal). It is shown distinctively that only in a very limited number of MTUs the lowest observed MACZT value surpasses the 70% threshold. The vast majority of MTU's show CNECs with a lowest MACZT value in the range of [40% - 70%] of their $F_{max}$.

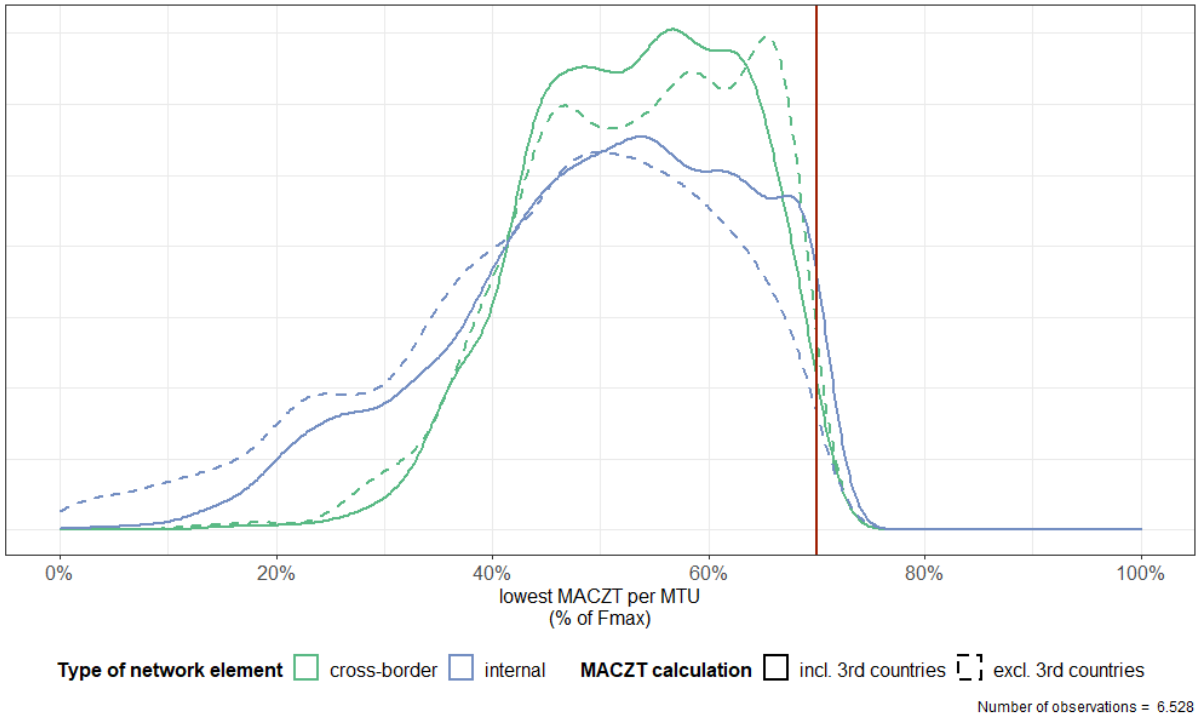


**Figure 2** Lowest observed MACZT per MTU
*(source: calculations CREG based on data Elia)*

32. Diving deeper into these results is possible, for example by checking whether the concerned CNECs have a shadow price associated to them. This implies that this CNEC is actively constraining the opportunity for additional exchanges for the market.[13] **Figure 3** clearly shows that the observed lowest MACZT values are generally lower when the CNEC is actively constraining the market, i.e. when the associated shadow price is higher than 0 € / MWh. Such hours – where the CNEC with the lowest MACZT has a positive shadow price – occur at relatively low frequency (208 of 6.528 observed hours or 3,2%)

[13] The shadow price quantifies the monetary value of an additional margin amounting to one MW on a CNEC, in € per MW.

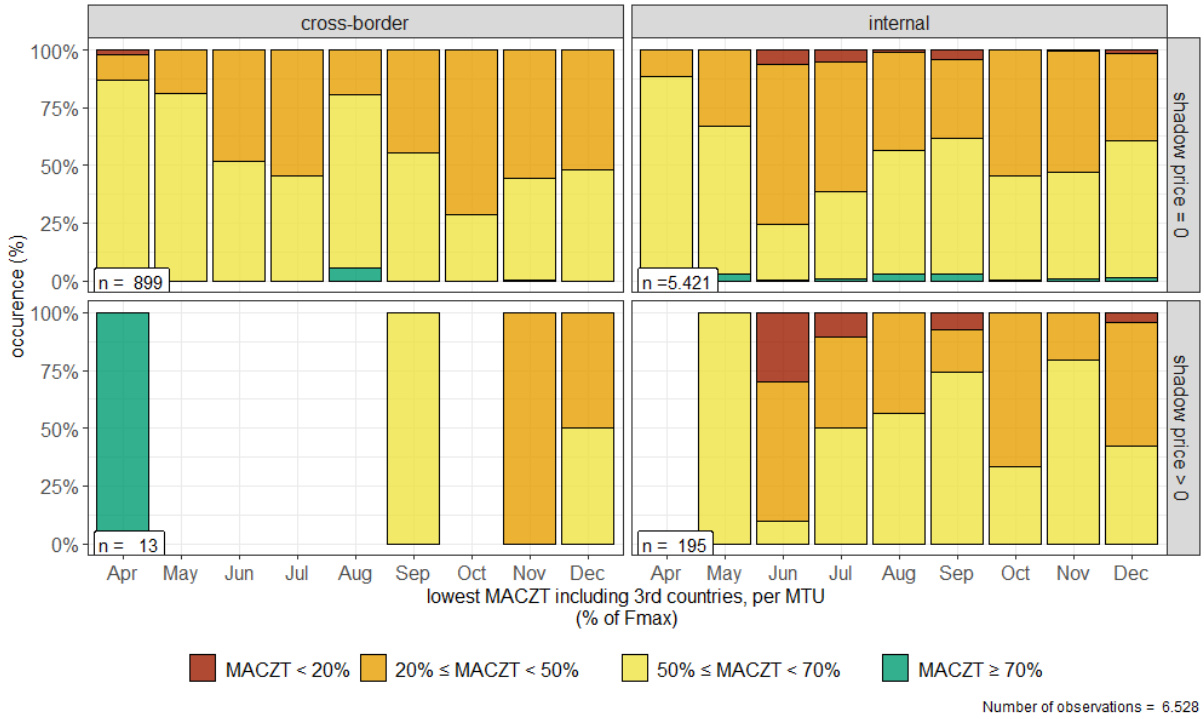


**Figure 3** Lowest observed MACZT (incl. 3rd country exchanges) per MTU
*(source: calculations CREG based on data Elia)*

33. The consideration of all reported CNECs, as summarized in Table 2 and Figure 4, obviously shows a different picture. The global compliance with the 70% threshold[14] is reached in 91,7% of the observed combinations of CNEC, direction and MTU, when the realized exchanges with third countries are considered.

| | MACZT incl. 3rd countries> 70% | MACZT excl. 3rd countries> 70% |
|---|---|---|
| Cross-border | 94,0 % | 90,9 % |
| Internal | 91,1 % | 85,5 % |

**Table 2** Fraction of all observed MACZT values higher than or equal to 70% of $F_{max}$
*(source: calculations CREG based on data Elia)*

34. **Figure 4** clearly shows that the largest part of the observed CNECs have an MACZT value around 70% of its $F_{max}$. The outliers (both towards 0% as towards 200%) are also interesting, yet the latter are perhaps less relevant given the fact that these margins are observed more frequently in the direction of the considered CNEC which is not relevant for the market.

[14] Cf. remark in paragraph 23: the threshold value is actually 69,5% of $F_{max}$.

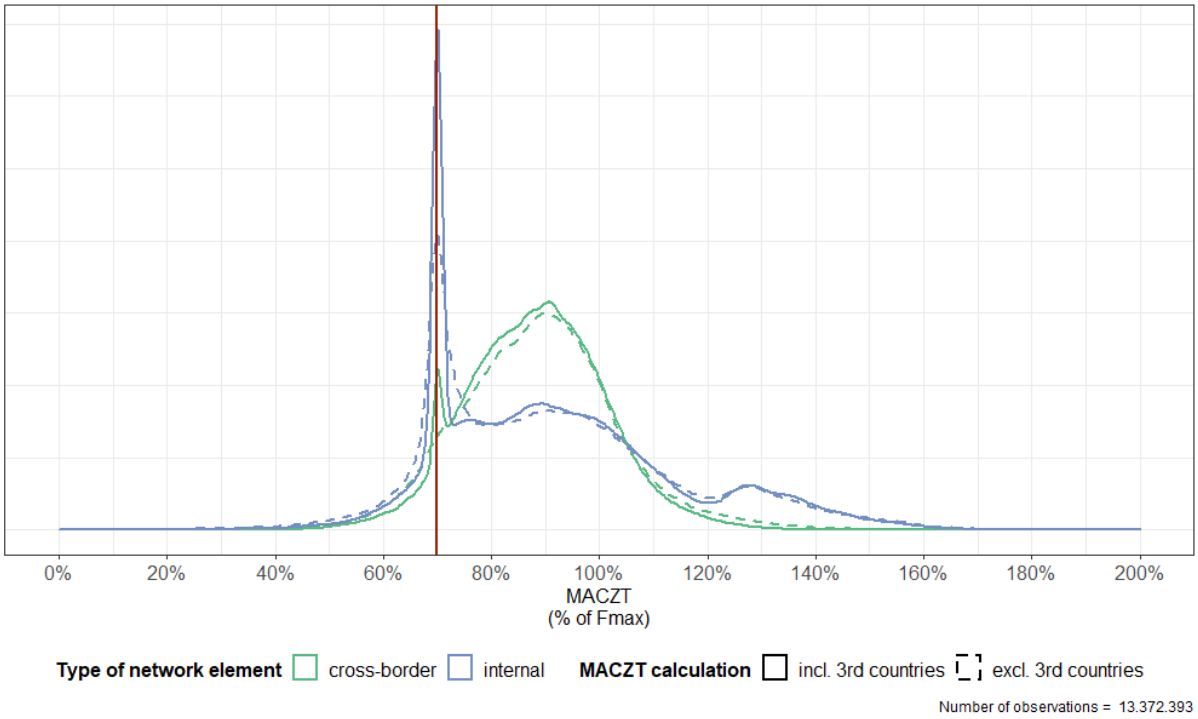


**Figure 4** All observed MACZT values
*(source: calculations CREG based on data Elia)*

35. Finally and as done before, the results may be refined further to check the type (cross-border or internal) and shadow prices of the concerned network element, in **Figure 5**. In this case, the results with regards to the offered MACZT margins are worse when looking at the CNECs with positive shadow prices. Furthermore, the 70% threshold is respected less frequently on internal CNECs than on cross-border CNECs. These results need to be interpreted in combination with the relative frequency of the occurrence of the considered criteria: the largest part of the observed MACZT values relate to internal CNECs without an associated shadow price (13.371.651 observations). CNECs with a positive shadow price appear, relatively speaking, much less frequently (742 observations).

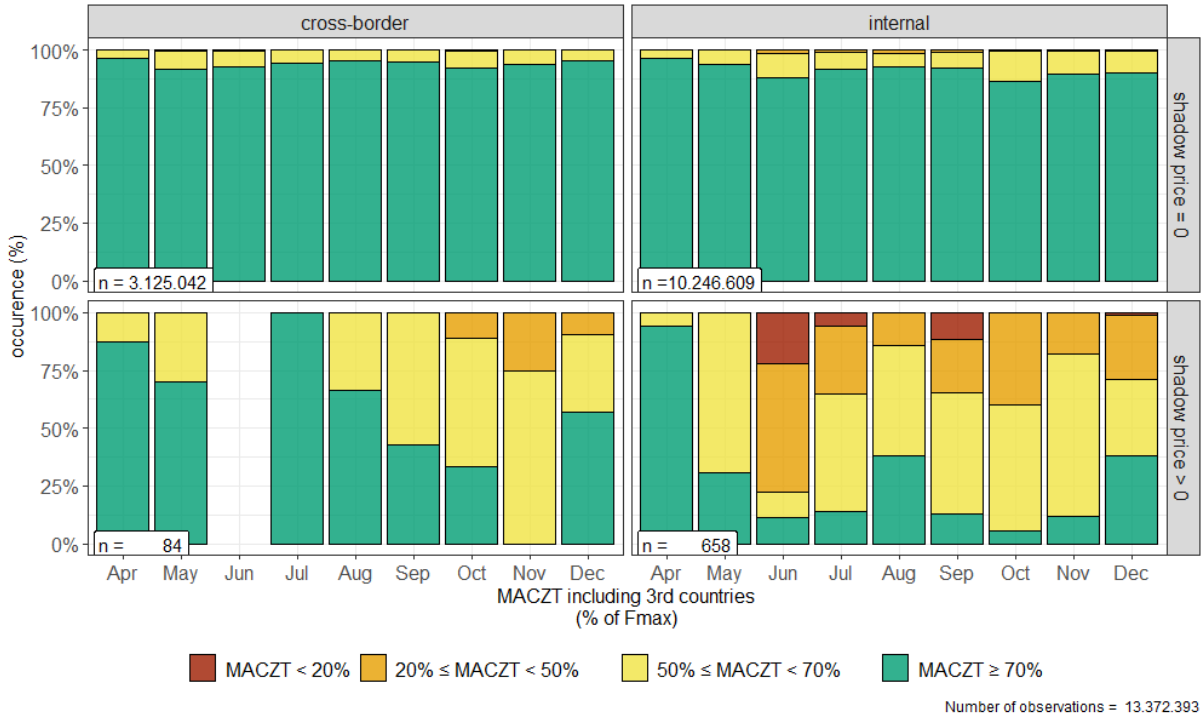


**Figure 5** All observed MACZT values (incl. 3rd country exchanges)
*(source: calculations CREG based on data Elia)*

36. 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.

37. 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 correlated nearly perfectly 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 ½ * [30% - FRM] or [30% - FRM] would theoretically yet at all time allow Elia to provide margins of 70% to the cross-zonal market.

## 4.2. **SECOND STEP:** COMPLIANCE WITH MINIMUM MARGIN

38. In a second step the actual legal compliance with regards to the offered margins (i.e. the minMACZT) are assessed. Given the individual minMACZT values for each CNEC, the difference between MACZT and minMACZT is calculated. Figure 6 shows, for each MTU, the lowest observed deltas between both factors.

39. The results show that during the large majority of observed MTUs the lowest MACZT is very slightly below the minimum margin: the differences are between 0,1 – 0,2% of $F_{max}$. There are however strong outliers, as shown in the bottom panel of the below figure. In these extreme cases, CNECs are observed with MACZT values up to 60% lower than the minMACZT – this corresponds to an MACZT value between 5% and 10% of $F_{max}$.

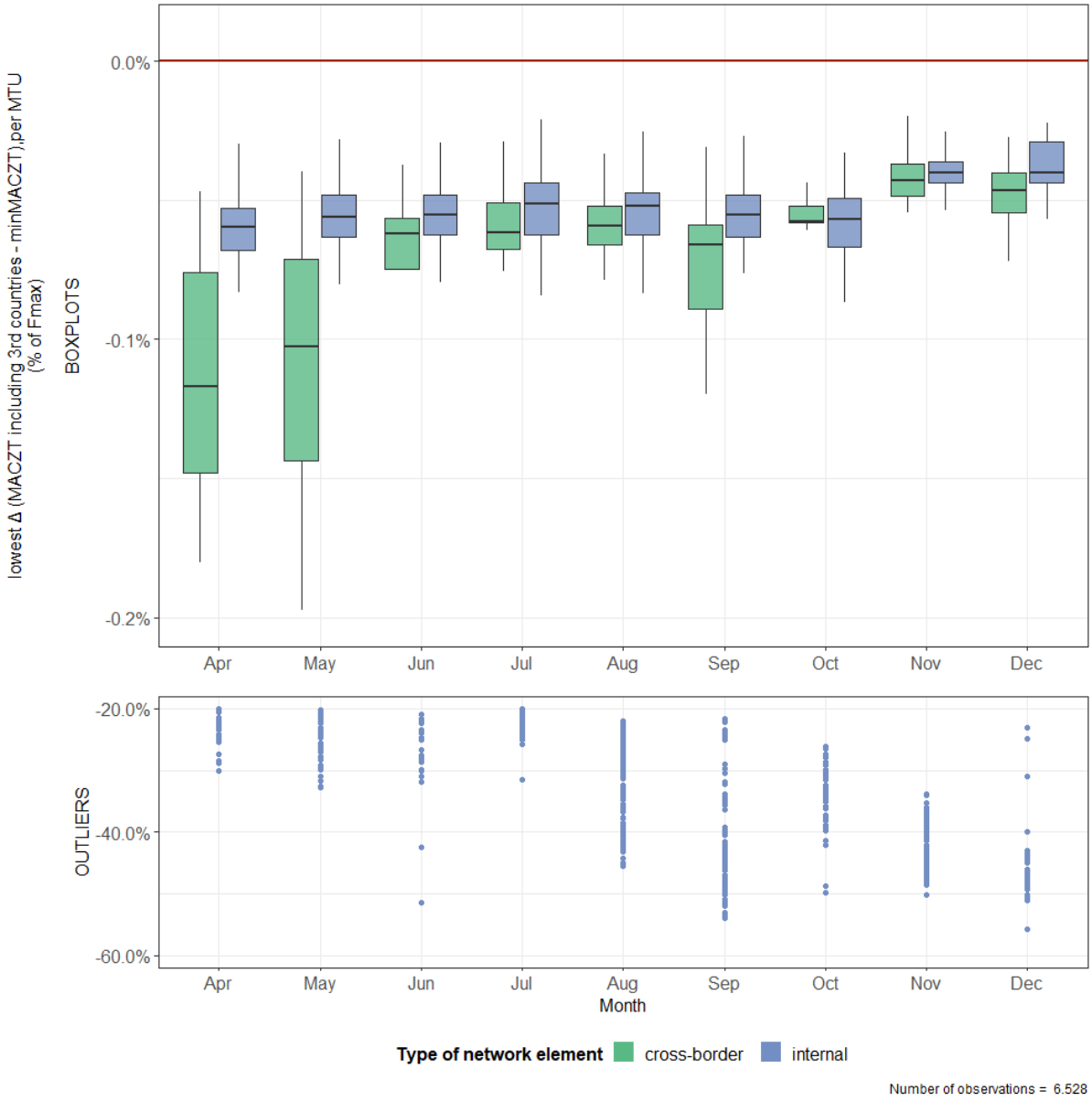


Figure 6 Lowest observed delta between MACZT and minMACZT per MTU
*(source: calculations CREG based on data Elia)*

40. During the observed period, the lowest MACZT-value equalled 99,5% of the relevant minMACZT in 81,3% of the considered MTUs.[15]

41. As in the first step, the compliance with the minimum margin is not only considered per MTU but also for all possible combinations between CNECs, directions and MTUs. For this purpose, all CNECs are assessed in a binary manner based on the comparison between the MACZT and minMACZT, in **Figure 7**. This leads to a global score of **99,2%**: of all observed CNECs in the considered period this is the percentage where the MACZT equals at least 99,5% of the minimum margin.

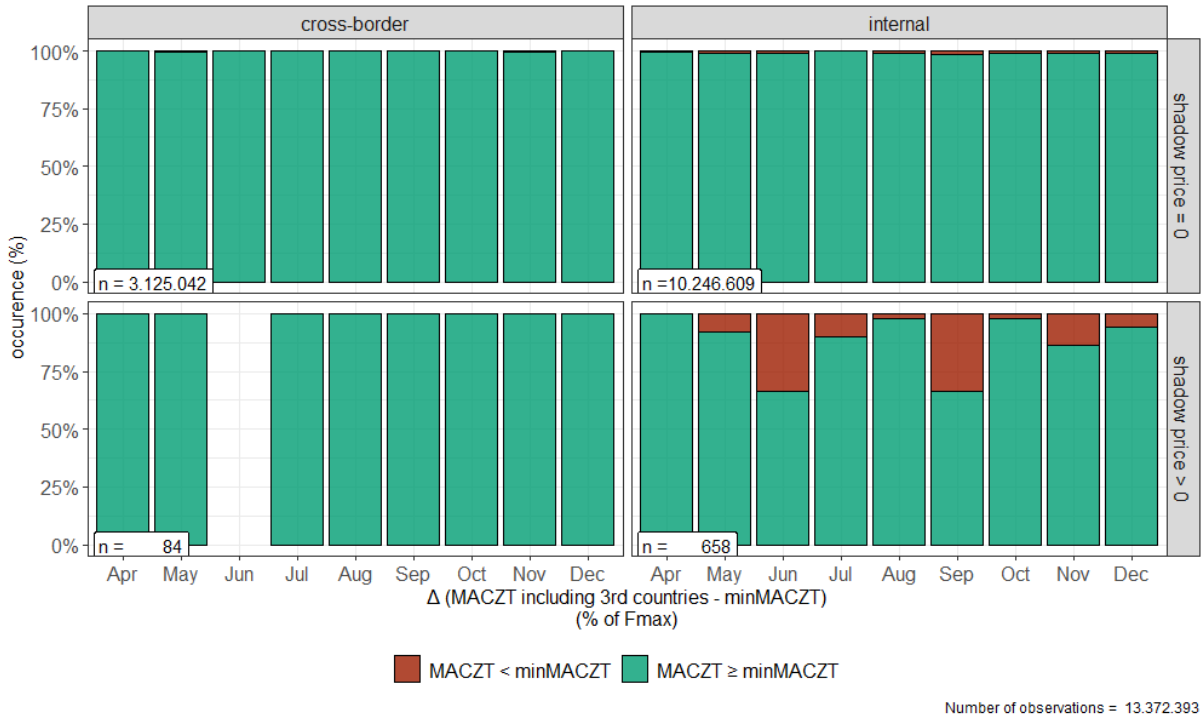


**Figure 7** All observed deltas between MACZT and minMACZT
*(source: calculations CREG based on data Elia)*

42. The results summarized in Figure 6 and **Figure 7** describe the extent to which Elia complies with the legal obligations in article 16 of the Electricity Regulation. The observed results (81,3% and 99,2%) express, as a fraction of the observed MTUs on the one hand and as a fraction of all considered CNECs on the other hand, when the observed margins are in line with the legal obligations.

## 4.3. **THIRD STEP:** ADDITIONAL CONSIDERATIONS

### 4.3.1. Application of derogation D2

43. The observed hours during and the observed CNECs on which Elia does not comply with the minimum margin requirements, materialize under different circumstances. A first additional consideration relates to the possible application by Elia of derogation D2 (cf. paragraph 7) when insufficient redispatch potential is available in the Belgian scheduling area to guarantee the minimum margin in specific situations. These situations are exclusively linked to the additional loading of network elements as a result of the planned unavailabilities of other network elements during works for grid reinforcements. Given the very specific impact of such unavailabilities, no methodology to

[15] Cf. remark in paragraph 23: the threshold value is actually 99,5% of the minMACZT.

calculate new minMACZT values, was developed during the elaboration and approval of the derogation request for 2020. It is therefore possible, and even likely, that for a number of the MTUs and CNECs where the reported minimum margins were not respected, this derogation (could have been) applied.

44. These planned unavailabilities ae published by Elia. An overview of historic and future unavailabilities can be found on the web site of Elia.[16] An assessment of these notifications show that 130 events of short and long(er) duration have had an impact on the transmission network in 2020. As may be seen from **Figure 16** (ANNEX 4) there are very few hours during which the derogation could not have been applied, in theory. Given the results in section 0, it can be easily stated that this has not happened in a structural manner.

45. This consideration does not allow the CREG to monitor, in an efficient manner, the compliance by Elia with its legal obligations with a sufficient level of accuracy. In part because of this reason, it has been decided to no longer consider this foreseeable ground as a basis for a future derogation.[17]

### 4.3.2. Analysis of observed congestions

46. 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 FBMC. For this purpose, Elia reports the shadow prices 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 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 margins if there is no congestion).

47. 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). This reasoning is investigated further in paragraph 52.

48. For these aforementioned reasons, the following analysis is only provided to describe the results of the compliance, ex post, in the broader framework of the CWE FBMC.

49. **Figure 8** shows, for all observed CNECs with a positive shadow price (on the vertical axis) the relationship to the extent to which the minimum margin has not been respected (on the horizontal axis). 70 observations are presented on a total of 108.849 CNECs (during 1.223 MTUs) where the minimum margin was not respected (irrespective of the shadow price). These 70 CNECs were observed during 61 different MTUs.

[16] https://www.elia.be/en/grid-data/transmission/unavailability-of-grid-components-380-220-kv

[17] Décision (B) 2136 à la demande d'approbation, formulée par la SA ELIA TRANSMISSION BELGIUM, d'une dérogation à l'article 16, huitième alinéa du règlement (UE) 2019/943, portant sur une capacité minimale disponible pour les échanges entre zones

50. While for these 70 observations where the shadow price is below 100€ per MW, the non-compliance of Elia with the minimum margin has had an impact on the outcome of the market coupling process. The observations in the red square are, in this regard, more problematic than other observations. These CNECs are exclusively internal network elements.

51. The observed shadow prices which have had a greater impact on the market coupling, namely those in the orange square (where shadow prices in excess of 100€ per MW were observed), are linked to CNECs where the minimum margin has been respected.

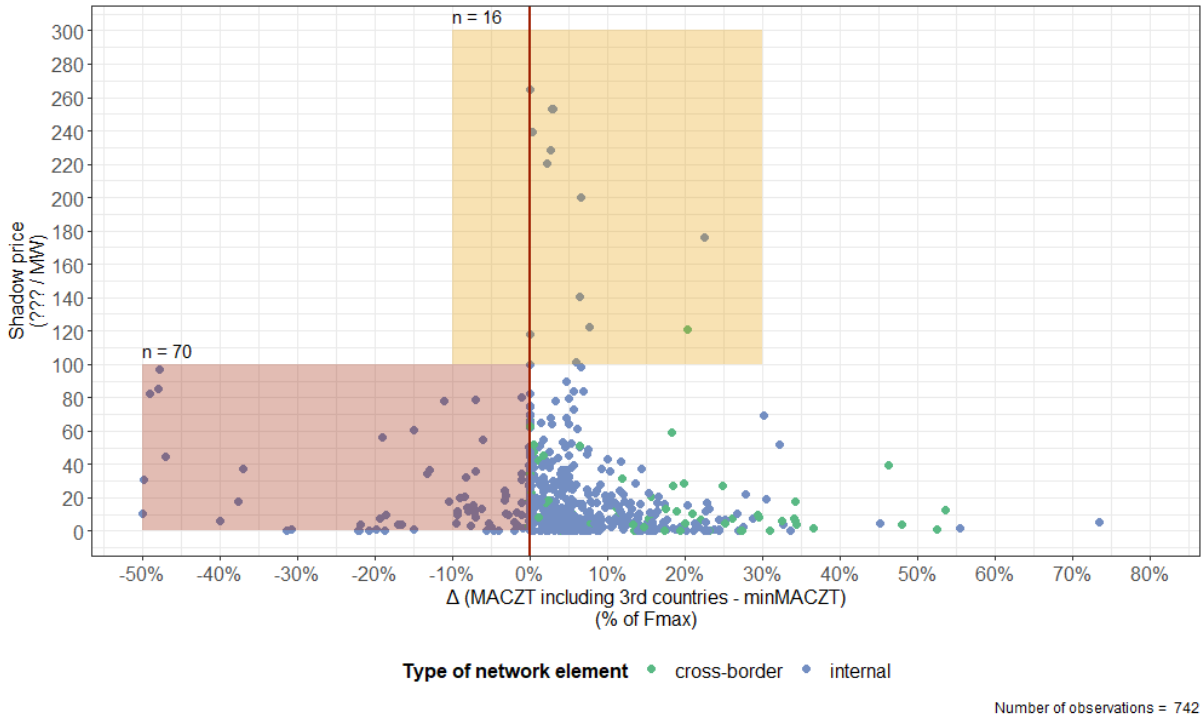


**Figure 8** Observed deltas between MACZT and minMACZT, and positive shadow prices
*(source: calculations CREG based on data Elia)*

52. In order to provide an estimation of the degree to which low MACZT values on Belgian CNECs are correlated to congestion on other network elements (i.e. not the CNEC where the MACZT is observed), these values are compared according to the outcome of the CWE FBMC during the associated MTU, in **Figure 9**. There is however no discernible effect which would seem to suggest that lower MACZT values on Belgian CNECs are associated with a more frequent occurrence of congestion in the CWE FBMC: the observed distributions are, month after month, similar.

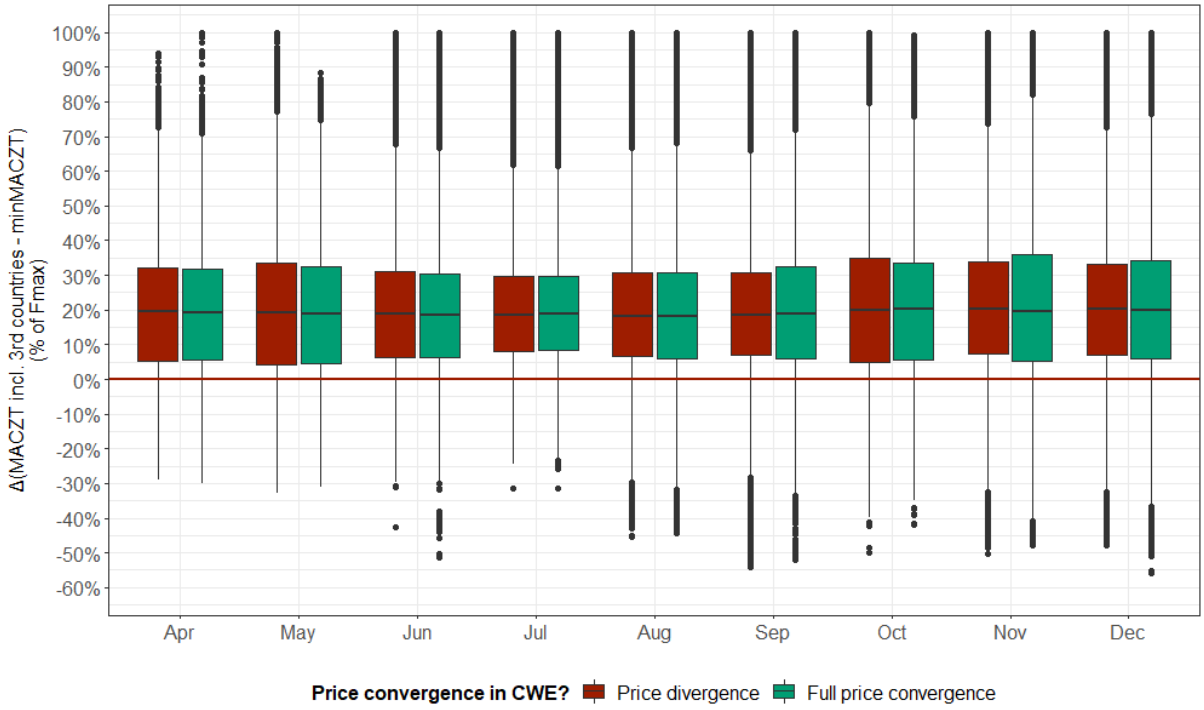


**Figure 9** All observed deltas between MACZT and minMACZT, and price convergence in the CWE FBMC
*(source: calculations CREG based on data Elia and ENTSO-E)*

53. An overview of the hours per month in the observed period where price convergence or divergence was observed, is added for information in ANNEX 2.

54. The relationship between the analyses in Figure 8 and Figure 9 provides an indication of whether the observed congestions are due to Elia (on the one hand) or to other CWE TSOs (on the other hand). Between 1 April and 31 December 2020, we observed 13.374.359 Belgian CNECs, of which 742 had a positive shadow price (or 0,005% of all Belgian CNECs). These CNECs were observed during 637 MTUs (on a total of 6.600 MTUs, indicating that Elia has caused a congestion in 9,7% of the observed MTUs). In total and during the same period, congestion (measured as divergence between the CWE day-ahead prices) has been observed during 3.669 MTUs (on a total of 6.600 MTUs or during 55,6% of the time). It can therefore be concluded that in little less than one fifth of the observed hours with congestion (17,4%), this congestion was caused by Elia. Elia has not respected the minimum margin on 75 of these CNECs (during 66 MTUs).

## 4.4. SUMMARY ANALYSIS OF AC NETWORK ELEMENTS

55. The results of the stepwise analysis in the first to third step (sections 4.1, 0 and 4.3) are summarized in **Figure 10**. This Sankey diagram processes as input the dataset where for each MTU the CNEC with the lowest margin between MACZT and minMACZT was retained.[18] Both the nodes (coloured) as well as the links (grey) sum up, vertically, to 100% or 6.6528 MTUs.

56. Firstly, the network elements are considered with regards to their type (internal or cross-border). Subsequently, as in the **first step** of the earlier analyses, the second column with nodes looks 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 81,3% of the MTUs may be observed). In the fourth and fifth column with nodes, finally, the degree to

[18] As in Figure 6.

which the CNEC is the limiting factor (based on shadow prices) or generally congestion is observed (based on bidding zone prices) is assessed – as in the **third step**.

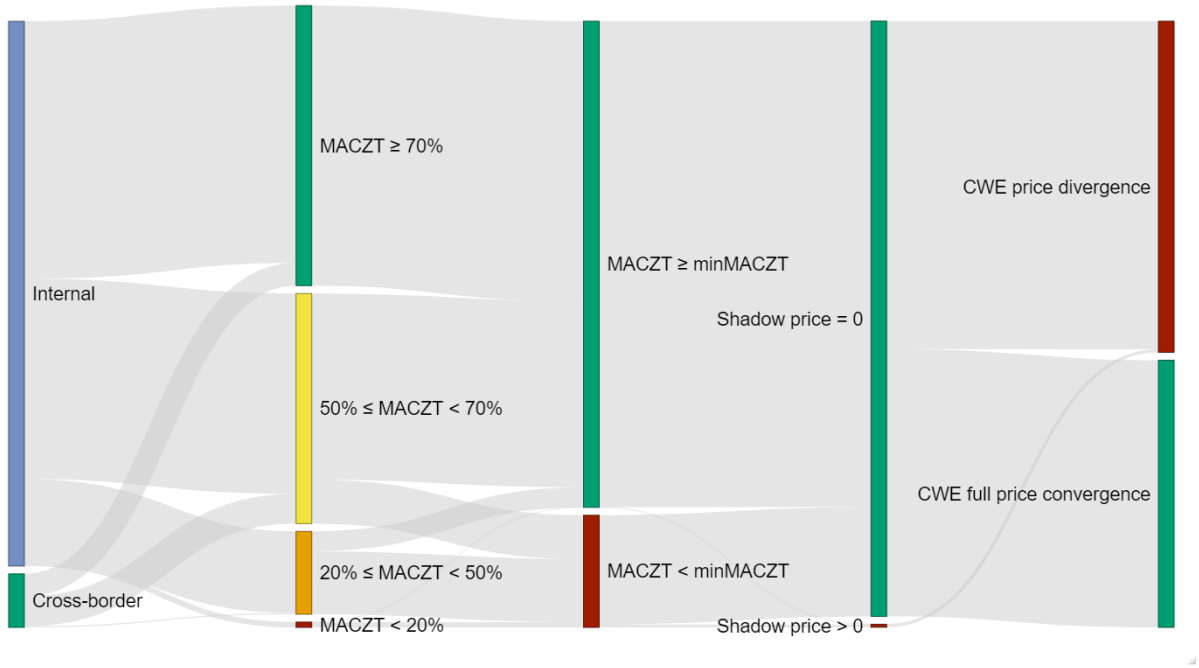


**Figure 10** Sankey diagram with lowest observed deltas between MACZT and minMACZT, per MTU
*(source: calculations CREG based on data Elia)*

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

- It is interesting to highlight that a number of CNECs where the observed MACZT is in the range [20% - 50%[ of $F_{max}$, the minMACZT is still respected (through the application of a significant reduction of the minMACZT by excessive loop flows). This is the case for 3,3% of the considered MTUs and is reflected through the grey flow from the orange node in the second column to the green node in the third column. There is even one MTU where the lowest MACZT is below 20% of $F_{max}$, yet still the CNEC is respecting the minMACZT, witnessed by the very fine grey flow from the red node in the second column to the green node in the third column.

- The comparison between the categories on the nodes in the second column do not mirror the results per MTU in the **first step** of the analyses described earlier: from high to low the observed percentages are: green – 46,8%, yellow – 38,5%, orange – 13,8% and red – 0,9%. These do not match the results in Figure 3 – the latter are based on the CNEC with the lowest MACZT per MTU. **Figure 10** shows the CNECs with the lowest delta between MACZT and minMACZT. For this reason, the results in the third column do correspond to those shown in Figure 6: green – 81,3% and red – 18,7%.

- Finally, we see that the complete fraction of CNECs with a positive shadow price is linked to situations where congestion is observed in the CWE FBMC (i.e. price divergence in the red node in the final column). This is logical, as the congestion is caused by the CNEC where the positive shadow price is observed (0,5% of the observed MTUs).

58. An extensive analysis per CNE is provided in ANNEX 1 in order to provide an estimation of the impact of loop flows on the minimum margins to be offered (minMACZT). The figures in this annex allow additional interpretations on the observed loop flows, internal flows and FRMs and the extent to which these influence the offered capacities. On different (mainly internal) network elements, structurally high loop flows are observed which – in combination with already high FRM values – inevitably lead to lower minMACZT, which set the objectives for Elia with regards to the margins to be offered.

## 4.5. ANALYSIS OF DC NETWORK ELEMENTS

59. The analyses in sections 4.1 until 4.3 are focused on the AC network elements which were observed in the CWE FBMC. Elia's transmission network also contains two DC network elements:

- The *Nemo Link* interconnector between Belgium and Great Britain ($F_{max}$ = 1.033 MW for the import direction, 1.013 MW for the export direction), operational since January 2019.
- The *ALEGrO* interconnector between Belgium and Germany ($F_{max}$ = 1.000 MW), operational since November 2020.

### 4.5.1. Nemo Link

60. The derogation, described in section 2.2, is limited to AC network elements in the CWE FBMC. The margins on the *Nemo Link* interconnector are therefore only compared to the 70% threshold, in application of the provisions in article 16 of the Electricity Regulation. The results of this comparison are summarized, for both market directions (export the left, import to the right) in **Figure 11**.

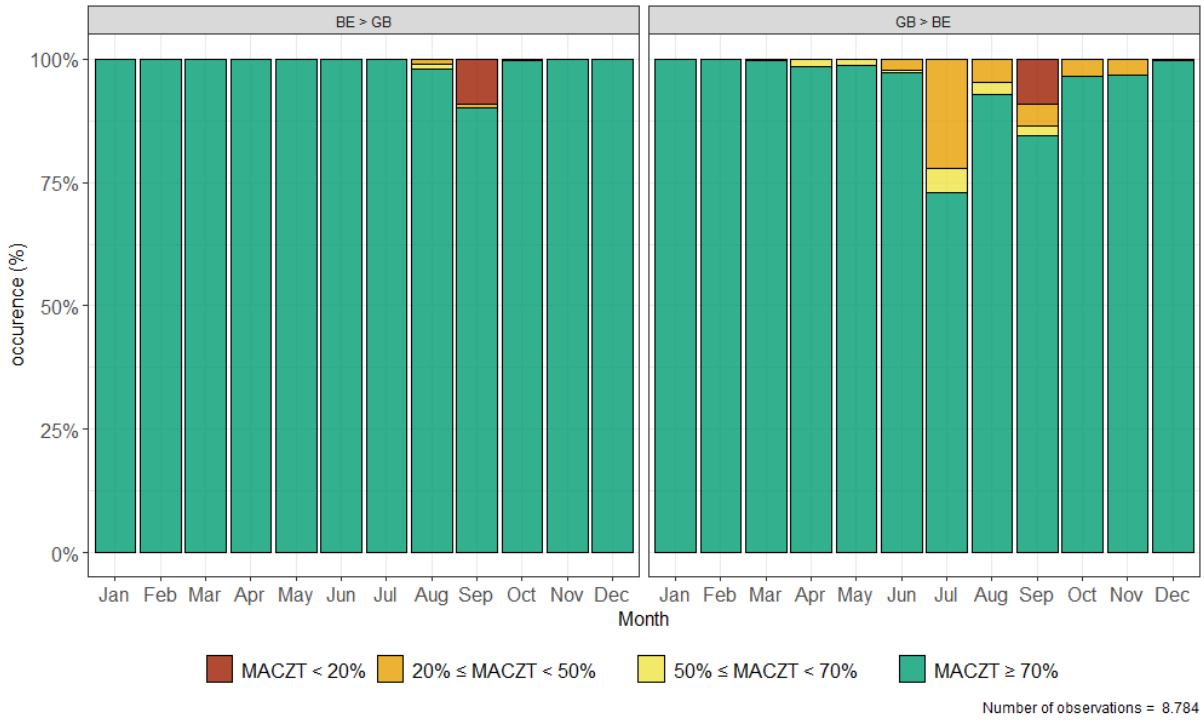


**Figure 11** All observed MACZT values on the Nemo Link interconnector
*(source: calculations CREG based on data Elia)*

61. With the exception of the months July (import) and September (import and export), consistently high MACZT values have been observed.

- The results in July, August and September 2020 show the impact of import limitations in the summer period, linked to the planned unavailability of the Avelgem-Horta line (380.102) between 8 June and 11 September 2020. Such limitation of the NTC values on Nemo Link is allowed, if linked to planned unavailabilities on certain network elements. Elia has provided a specific list of CNE's for the approval of the CREG in the framework of the *Channel* day-ahead capacity calculation method.[19]
- The results in September 2020, where in 130 MTUs the MACZT equaled 0 MW, are the result of the planned unavailability of the interconnector itself for yearly maintenance, between 21 and 25 September.[20]

Mindful of the provisions in the ACER recommendation (paragraph 6) and the approval of the Channel day-ahead capacity calculation methodology, these two periods can also be considered as compliant with the legal obligations.

62. During the considered period (1 January until 31 December 2021), the global compliance score by Elia with regards to the available margins on the Nemo Link interconnector amount to **95,7% (for the import direction)** and **99,7% (for the export direction)**. These numbers reflect the fraction of the number of MTUs where the NTC capacities on the interconnector equaled at least 70% of $F_{max}$.

### 4.5.2. ALEGrO

63. The ALEGrO interconnector between Belgium and Germany was put into operation on 18 November 2020 and has been introduced in the CWE FBMC according to the procedures approved by the CREG in its Decision (B) 2106.[21] After the commercial go-live in the day-ahead timeframe the available capacities were increase through a linear ramp-up approach, in a first step to 500 MW and in a second step to the full $F_{max}$ which amounts to 1.000 MW.

[19] More information and the list of CNEs may be found in the annexes to the Decision (B) 1867.

[20] https://www.nemolink.co.uk/news-news/planned-outage-w-c-21st-september-2020/

[21] 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

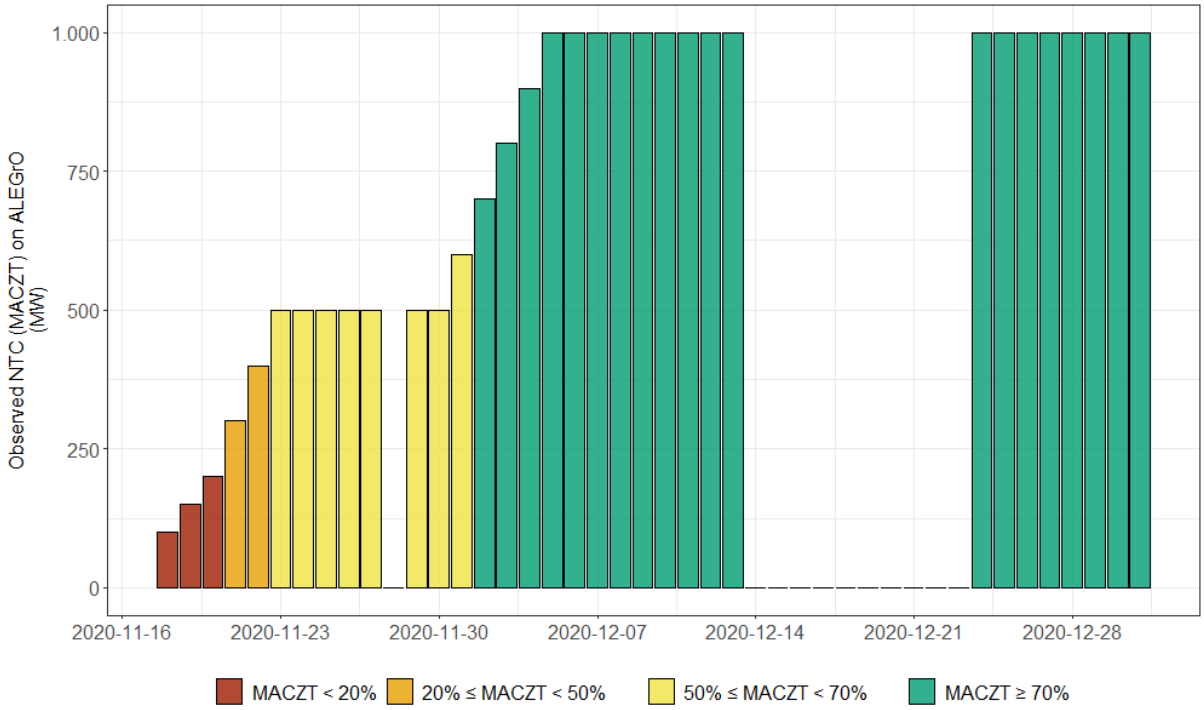


**Figure 12** All observed MACZT values on the ALEGrO interconnector
*(source: calculations CREG based on data Elia)*

64. **Figure 12** shows the available margins in the first weeks after the commercial go-live of the ALEGrO interconnector.

- On 28 November 2020, the capacity was reduced to 0 MW through the application of a so-called *external constraint*. This concerned an unplanned outage for an urgent intervention in the "*Oberzier"* station.
- In the period between 14 and 23 December 2020, the capacity was reduced to 0 MW, again through the application of an external constraint. This concerned a planned outage to execute an urgent repair to the interconnector.

Given the recent commercial go-live, combined with the linear trajectory and the planned outage, the results with regards to the compliance with article 16 of the Electricity Regulation are less relevant for the ALEGrO interconnector.

# 5. GENERAL DISCUSSION ON THE RESULTS

65. The results in chapter 4 show that Elia has provided the minimum margins (being 70% in general or the minMACZT in the specific application of the derogation) on the vast majority of its network elements (both AC and DC lines). On **99,2% of the observed AC network elements** the observed margins (MACZT) equaled at least the minimum margins (minMACZT). At the same time, during **81,3% of the considered hours**, the observed margins on all AC network elements at least equaled the minimum margins.

66. The monitoring of the compliance with the minimum margins on DC network elements show that for Nemo Link, the 70% threshold was respected during **95,7% (export direction) and 99,7% (export direction**).

67. Elia's results may be interpreted in several ways, especially when considering the identified violations of the minimum margins.

- On the one hand, the calculated values show on an individual, national level the result of the efforts of Elia for guaranteeing the availability of sufficiently high margins on all network elements, taking into account externalities on which Elia only has an indirect or limited impact. This relates especially to the impact of loop flows on Belgian transmission network elements.[22]
- On the other hand, margins were reported which in extreme cases were below 50 to 60% of the minimum threshold, even after correction for such externalities (i.e. after application of the loop flow derogation). These are of course outliers, but irrespective of the extent to which these have an impact on the functioning of the market (cf. section 4.3.2), Elia must guarantee its utmost efforts to reduce the occurrence of such low margins to the absolute minimum.
- The difference in the observed results according to the reference being either the 70% threshold or the minimum margin, indicates the degree to which Elia needs to reduce the available margins to cope with excessive loop flows. The comparison of the results in the first step of the described analyses (e.g. in Figure 5) with those in the second step (e.g. in **Figure 7**) show that the observed loop flows very often and consistently put pressure on the margins on these network elements. A preliminary analysis of this problem is introduced in ANNEX 1. In the future, the CREG will periodically monitor these data and incite Elia to introduce improvements in the individual and coordinated aspects of market coupling, namely through the calculation of FRMs, the (more extensive) use of *Dynamic Line Rating*, a stronger constraining of loop flows through PSTs…
- The exploration of a number of additional considerations with regards to the observed congestions (either as a result of limiting network elements in the Belgian transmission network, or not), allows to estimate the impact of possible violations with regards to the minimum margins on the market coupling results. This was calculated by the CREG in section 4.3. These nuances do not absolve Elia from the legal obligation to provide offer these margins to the cross-zonal markets.

[22] Through the development of regional methodologies (e.g. the Core ROSC methodology, the Core RD & CT cost sharing methodology), Elia can in an indirect manner define the maximum level of acceptable loop flows. Elia may also, to a limited extent, reduce loop flows through the PSTs but disposes – at this time – only of 1/3 of the range of the PST for the day-ahead market coupling.

68. As a general reflection on the reporting by Elia and the cooperation between ACER, Elia and the CREG it needs to be highlighted that the continued efforts of all involved parties since the entry into force of the Electricity Regulation have made this report and these results possible.

- The harmonization between the used calculation method for the available margins between ACER and CREG leads to unambiguous, clear and easily interpreted results. The competence of the CREG is broader than that of ACER with regards to the monitoring of the compliance with legal obligation. This does not prevent, however, that by starting from a shared goal and based on the same data, complementary analyses may be provided.

- The CREG recommends that – in the near future and to the extent possible – the reporting of the available margins is automated and integrated in the applicable market coupling processes. This is particularly relevant considering the development of the Core flow-based market coupling. The value of the assessment of the compliance of one TSO increases significantly when complemented with similar results of other TSOs in the same capacity calculation region. This is true through the creation of reference values (for benchmarking) but also through the non-deniable impact of the efforts of one TSO on the network elements of other TSOs. This remark is also relevant in light of the implementation of the *Loose Volume Coupling* methodology on the interconnectors with the United Kingdom. The CREG therefore calls on Elia to further invest in its own reporting processes on the one hand, and on the other hand to integrate and harmonize these as much as possible into the market coupling processes with other TSOs.

# 6. CONCLUSION

The CREG investigated, in this report, the compliance by Elia with the legal obligations with regards to the transmission capacities offered for cross-zonal exchanges. These legal obligations result from article 16 from 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 **99,2% of the observed network elements**, during **81,3% of the considered period**.

For the Commission for Electricity and Gas Regulation:

| | | |
|---|---|---|
| Andreas TIREZ | Laurent JACQUET | Koen LOCQUET |
| Director | Director | Acting President of the Board of Directors |

# ANNEX 1

## Compliance per CNE

The data reported by Elia consists of 27 network elements (CNEs), observed in combination with 40 contingencies (Cs). Of these CNEs, 7 are cross-border, 4 are PSTs and 16 are internal network elements (respectively green, yellow and blue in Figure 13 and Figure 14).

Figure 13 shows the distributions of the observed minMACZT, MACZT and $F_{max}$ values; grouped by CNE. The left manel shows the minMACZT values, where immediately the strong downward variance of these data for the CNEs "PST Zandvliet", "Doel – Zandvliet" and "Avelgem – Horta" draw the attention. Through these lower minMACZT values, these CNEs are more often compliant with the legal obligations, as shown in the middle panel.

This is not the case for other lines: when the observed minMACZT values in the left panel are distributed closely around 70% of $F_{max}$, the middle panel shows moments where these CNEs do not respect the minMACZT more frequently: these are the outliers to the left of the red line in the middle panel (for example and in particular for the lines "Doel – Mercator").

The third panel of Figure 13, finally, shows the average $F_{max}$ values[23] (of which 70% are shown in a darker shade) and the average MACZT values (including 3rd country exchanges).

These conclusions are obviously strongly linked to the presence of loop flows, which exert a downward pressure on the minMACZT through the application of derogation D1, discussed earlier. For this purpose, the distributions of FRMs, LFs and Ifs are shown for the same CNEs in Figure 14. As the median values of the LFs and LFs are close to zero (because both directions of the CNE are considered), so the average values in one direction of both LFs and IFs are shown through the red dots. The CNEs with the highest average LFs in one direction are, not coincidentally, those mentioned before with the highest downward variance of observed minMACZT values. This should of course be assessed in combination with the level of the observed FRMs, which directly impacts the threshold for acceptable loop flows ($LF_{accept}$ as described earlier).

Furthermore, the structural north-to-south direction of the loop flows stand out in the middle panel. The observed values (red dots) need to be interpreted in the direction of the naming convention of the CNE. For example: the average negative LFs (-19,9%) on the CNE "Doel – Zandvliet" need to be read from Zandvliet to Doel, i.e. from north to south. The naming convention on the southern interconnectors with France is inverted.

Finally, significant differences may be seen in the FRM values when considering the type of CNEs on which these are observed: these FRMs are structurally lower on cross-border elements (and to a lesser extent on PSTs) than on internal network elements. The observed values are very high (around 20% of $F_{max}$ for internal network elements): the CREG will continue to monitor in the future the correct and efficient calculation of FRM values by Elia.

[23] Elia does not apply static $F_{max}$ values: the application of Dynamic Line Rating leads to fluctuations in these $F_{max}$ values in function of ambient temperatures, thereby optimizing the available capacities. More information on this may be found in Decision (B) 1712.

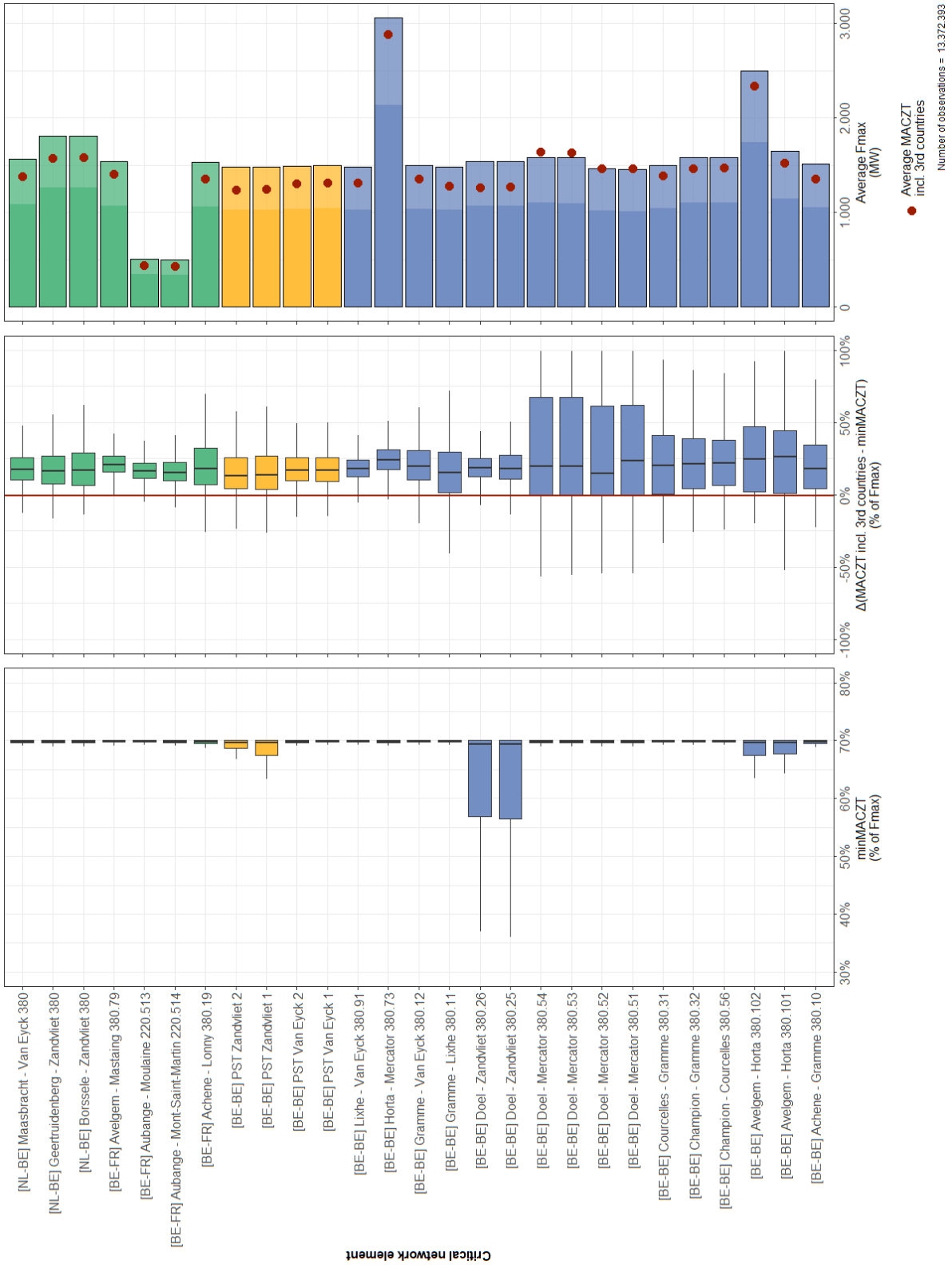


**Figure 13** All observed MACZT, minMACZT and $F_{max}$ values per CNE
*(source: calculations CREG based on data Elia)*

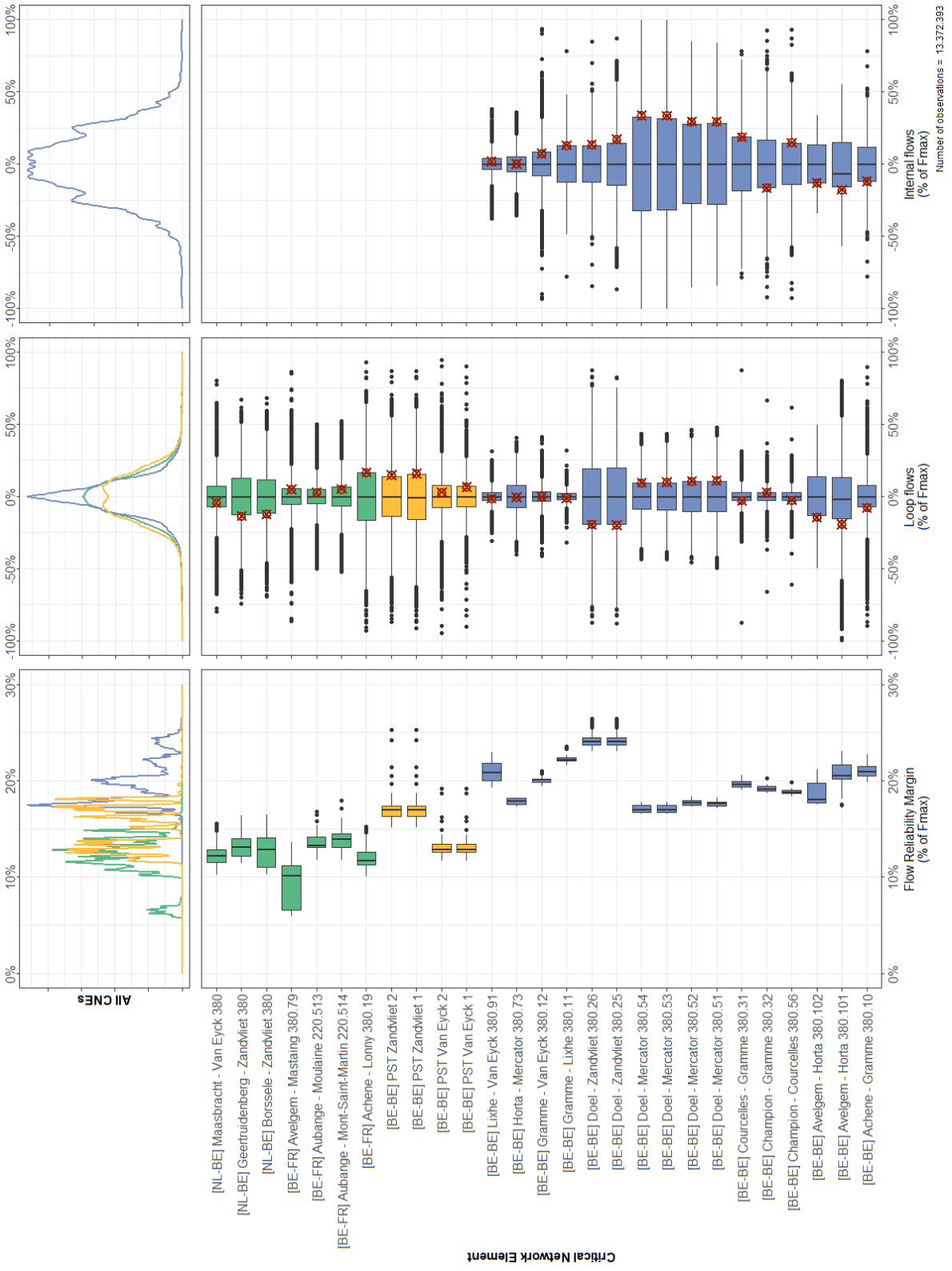


**Figure 14** All observed FRMs, loop flows and internal flows per CNE
*(source: calculations CREG based on data Elia)*

# ANNEX 2

## Price convergence in the CWE FBMC

The below **Figure 15** shows, for all months of 2020, the extent to which price convergence (green) and divergence (red) was observed. On average, between 1 April and 31 December 2020, prices in the CWE FBMC were equal in all bidding zones during **44,7%** of the MTUs. During **55,3%** of the time, price differences resulted from the FBMC, leading to at least one bidding zone having a different day-ahead price from the others.

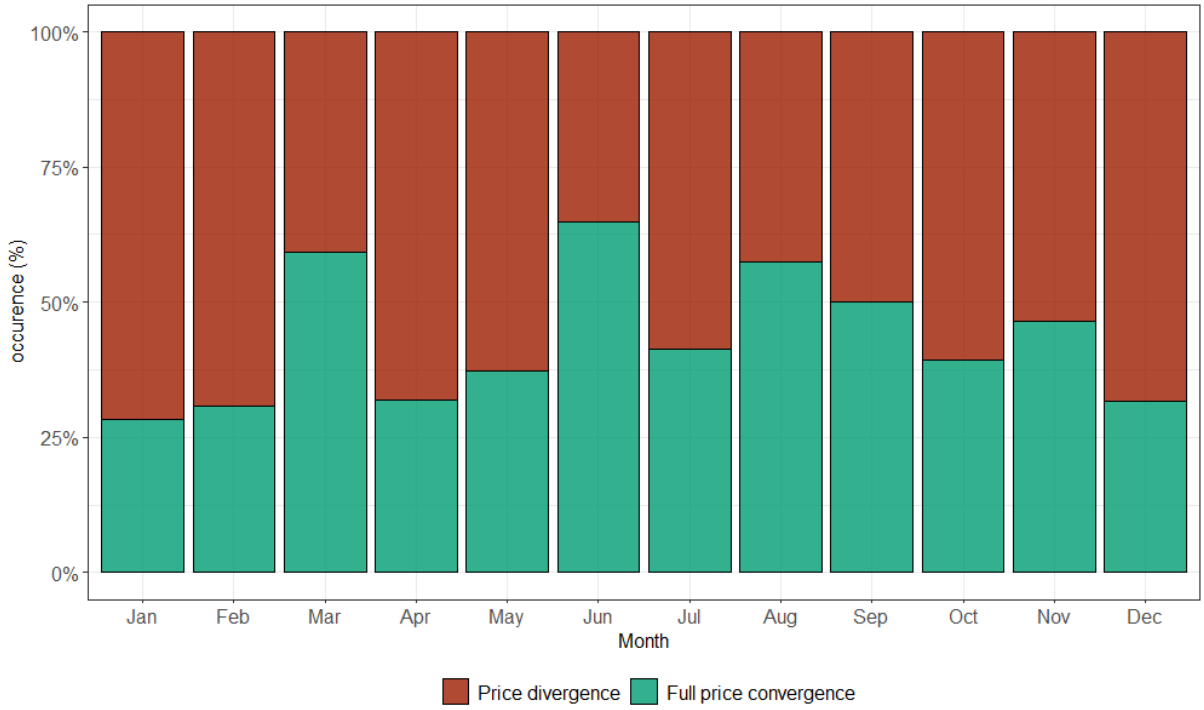


**Figure 15** Price convergence and divergence between bidding zones in the CWE region

# ANNEX 3

## Alternative calculation method for the minimum margin

As described in section 2.2, paragraph 9, the appropriateness of the calculation method for the minMACZT is evaluated by comparing the results to the application of minMACZT'.

$$minMACZT = 70\% - \max\left[0\,; LF_{calc} - LF_{accept}\right]$$

$$minMACZT' = 70\% - \max\left[0; LF_{calc} - LF_{accept}\right] indien\ LF_{calc} + IF_{calc} > 30\% - FRM$$
$$minMACZT' = 70\%\ indien\ LF_{calc} + IF_{calc} \geq\ 30\% - FRM$$

For all CNECs in both directions on all MTUs, the minMACZT and minMACZT' were calculated and compared to each other. The distribution between the observed $\Delta$(minMACZT – minMACZT) has been analysed. The calculation method results in only negative values, **Table 3** summarizes the occurrence of extreme values.

| | |
|---|---|
| $\Delta$(minMACZT' – minMACZT) < - 1 % $F_{max}$ | 8,0% of CNECs |
| $\Delta$(minMACZT' – minMACZT) < - 5 % $F_{max}$ | 5,1% of CNECs |
| $\Delta$(minMACZT' – minMACZT) < - 10 % $F_{max}$ | 2,9% of CNECs |
| Min ($\Delta$(minMACZT – minMACZT) | -76,0 % $F_{max}$ |

**Table 3** Observed deltas between minMACZT' and minMACZT
*(source: calculations CREG based on data Elia)*

The strongest negative values are observed in the presence of high internal flows, in a direction opposite to the loop flows. These have a relieving effect on the loading of the network elements which are caused by the loop flows above the acceptable threshold $LF_{accept}$ (being ½ * [30% - FRM]).

The difference between minMACZT and minMACZT' amounts to less than 1% on more than 90% of the observed CNECs. The CREG is therefore of the opinion that the applied minMACZT threshold adequately considers the impact of loop and internal flows compared to the acceptance threshold for the calculation of the margins to be offered.

# ANNEX 4

## Overview of planned unavailabilities for network reinforcements

**Figure 16** below provides the start and end dates of the planned unavailabilities, filtered on "planned works", as published by Elia on its web site.[24]

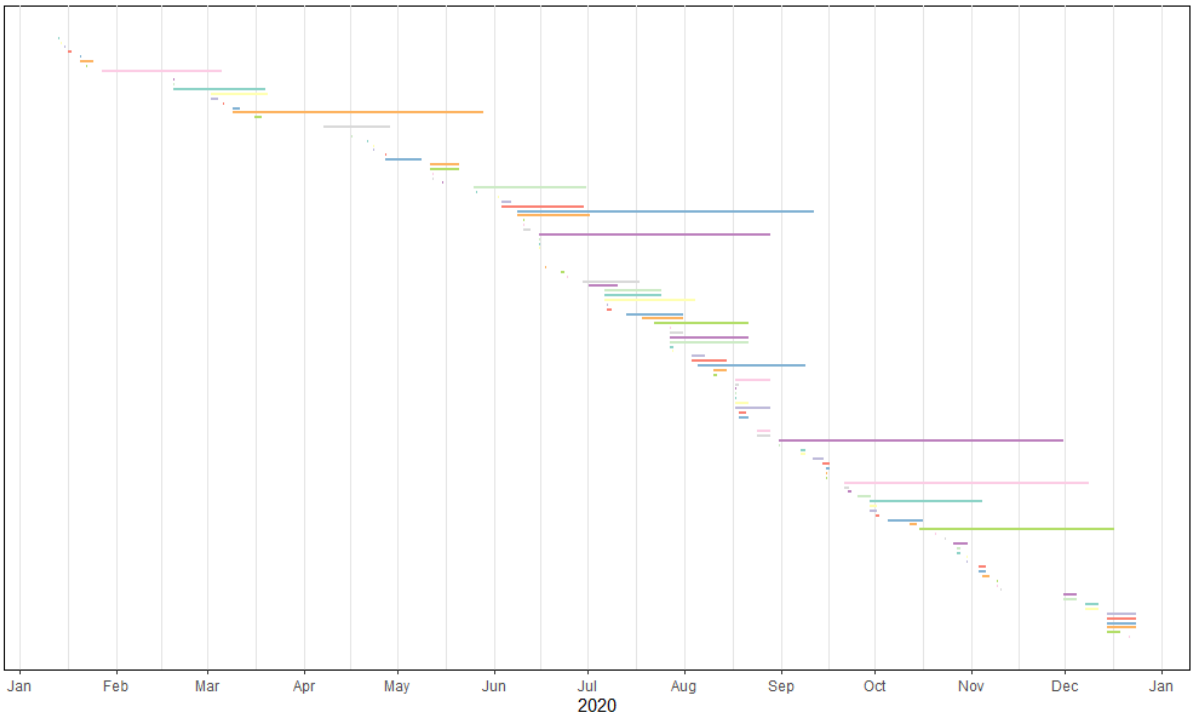


**Figure 16** Timeline of planned unavailabilities for network reinforcements
*(source: calculations CREG based on data Elia)*

[24] https://www.elia.be/nl/grid-data/transmissie/onbeschikbaarheid-van-netelementen-380-220-kv