ERSE
ENTIDADE REGULADORA
DOS SERVIÇOS ENERGÉTICOS

REPORT

Analysis of Portugal-Spain interconnection capacity and monitoring of compliance with the minimum levels of available capacity for cross-zonal trade in 2024

November 2025

Restelo Building - Rua Dom Cristóvão da Gama, 1

1400 – 113 Lisbon

Telephone: 21 303 32 00 - Fax: 21 303 32 01

Email: erse@erse.pt - Internet: www.erse.pt

TABLE OF CONTENTS

FIGURE INDEX

TABLE INDEX

1 INTRODUCTION

The current context of energy transition and the deepening of the European internal electricity market make interconnection capacity a key element for the evolution and integration of energy systems.

The European Council of 23 and 24 October 2014 considered, in its conclusions[1], that the Commission, supported by the Member States, should take measures to ensure that a minimum target of 10% of existing electricity interconnections is met by 2020, at least for Member States that had not yet reached a minimum level of integration in the internal power market. The European Council also stated that the Commission should also report regularly to the European Council with the aim of achieving a target of 15% by 2030.

In addition, Article 16(8) of Regulation (EU) 2019/943[2] of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity sets out the minimum interconnection capacity values to be made available by transmission system operators (TSOs) for cross-zonal trade:

> "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

[1] https://www.consilium.europa.eu/en/meetings/european-council/2014/10/23-24/

[2] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019R0943

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."

In turn, Article 59(1)(h) of Directive (EU) 2019/944[3] of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market in electricity, in its current wording, establishes that the regulatory authority of each Member State is responsible for "ensuring that transmission system operators make available interconnection capacities to the greatest extent possible, pursuant to Article 16 of Regulation (EU) 2019/943;".

In this regard, this report aims, on the one hand, to assess the evolution and current state of interconnection capacity between Portugal and Spain, and, on the other hand, to assess the degree of compliance by the national transmission system operator with the minimum levels of capacity available for cross-zonal trade, as provided for in Article 16(8) of Regulation (EU) 2019/943. It should be noted that the analysis of regulatory compliance may differ between the two countries, depending on the responsibilities of each network in limiting the interconnection capacity offered to the market.

Pursuant to Articles 121 and 122 of the Administrative Procedure Code, ERSE notified REN, in its capacity as Portuguese TSO, so that it could comment on the draft report on the "Analysis of Portugal-Spain interconnection capacity and monitoring of compliance with the minimum levels of available capacity for cross-zonal trade in 2024".

REN submitted its comments on the draft report on 6 November 2025.

ERSE took note of REN's comments, which concerned issues of detail and accuracy in the text, and these have been incorporated into this final version of the report. The comments received did not justify any changes to the conclusions in this final version of the report.

[3] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019L0944.

2 ANALYSIS OF PORTUGAL – SPAIN INTERCONNECTION

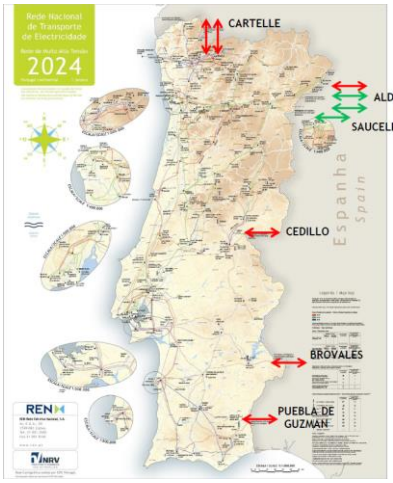
2.1 FRAMEWORK

The management of interconnections between Portugal and Spain is based on an implicit allocation model of available capacity for commercial purposes, exclusively through the daily and intraday markets, in addition to the possibility of the explicit use of financial mechanisms to cover the risk of the use of the interconnection. Congestion management is based on the application of a market splitting mechanism[4].

2.2 EVOLUTION OF INTERCONNECTION CAPACITY

The current interconnection between Portugal and Spain consists of six 400 kV lines and three 220 kV lines, for a total of 9 interconnection lines, identified below.

Figure 2-1– Interconnection lines between Portugal and Spain



Linhas
Linhas a 400 kV:
Alto Lindoso – Cartelle 1
Alto Lindoso – Cartelle 2
Lagoaça – Aldeadávila
Falagueira – Cedillo
Alqueva – Brovales
Tavira – Puebla de Guzman
Linhas a 220 kV:
Pocinho – Aldeadávila 1
Pocinho – Aldeadávila 2
Pocinho – Saucelle

[4] Auction mechanism for the interconnection capacity between two systems (known as price zones – bidding zones), implicit in the offers that agents make in the daily market, and which presupposes the existence of a single market managed by a single market operator. When the interconnection capacity between the two systems is greater than the load flows resulting from the closing of the market, the interconnection is not congested and there is a single market price, the same for both systems. Otherwise, when the interconnection capacity is lower than the load flows resulting from the market closure, the interconnection is congested at its limit and the markets are separated in terms of price, which is higher in the import market and lower in the export market.

In terms of transmission capacity, these lines, which thermal limits depend on the ambient temperature and operating conditions used by the operators of the interconnected networks, have the values shown in Table 2-1.

Table 2-1 – Thermal capacities of the interconnection lines between Portugal and Spain

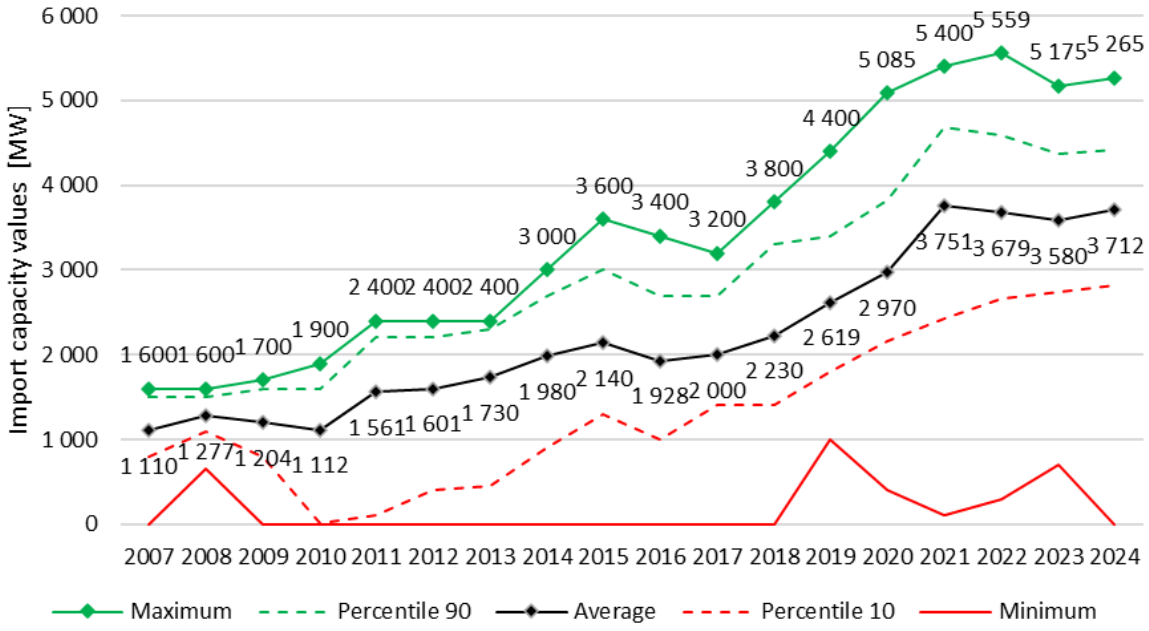
Lines	Minimum thermal capacity [MVA]
400 kV lines:	
Alto Lindoso – Cartelle 1	1499
Alto Lindoso – Cartelle 2	1499
Lagoaça – Aldeadávila	1469
Falagueira – Cedillo	1386
Alqueva – Brovales	1280
Tavira – Puebla de Guzman	1386
220 kV lines:	
Pocinho – Aldeadávila 1	374
Pocinho – Aldeadávila 2	374
Pocinho – Saucelle	360
Total	9627

Source: REN – Interconnection Characterisation as of 31 December 2024

Thus, for the purposes of characterising the value of the interconnection capacity, the sum of the minimum thermal capacities of the lines that constitute the interconnection is 9627 MVA.

The following figures illustrate the evolution of the interconnection capacity available for commercial purposes, in both import and export directions, between 2007, when the Iberian Electricity Market (MIBEL) came into operation, and 2024.

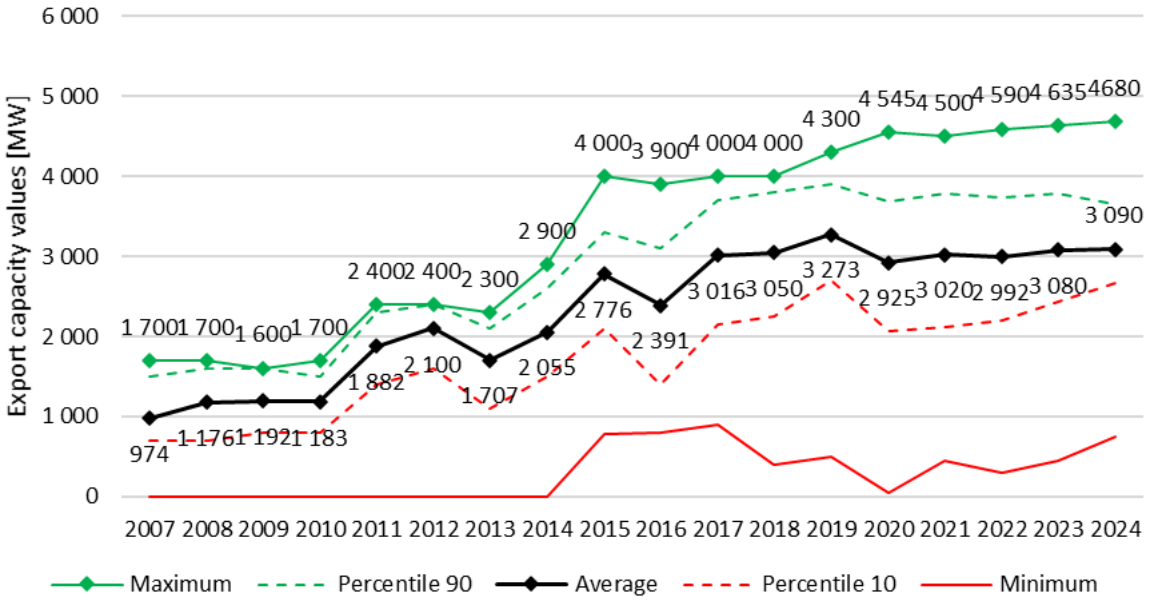
Figure 2-2 – Evolution of commercially available interconnection capacity – Imports



Source: REN data

During the period under review, there was a slight increase in maximum values compared to 2023, with a value of 5265 MW in 2024, which is still lower than the maximum recorded in 2022 (5559 MW). In terms of average values, the recorded value increased compared to the previous year to 3712 MW, approaching the highest historical average value, recorded in 2021, of 3751 MW. It should also be noted that practically in all years there are zero or almost zero values, despite the 1st decile being close to the average value.

Figure 2-3 – Evolution of available interconnection capacity for commercial purposes – Exports



Source: REN data

In terms of the export capacity for commercial purposes, the characteristic values observed in 2023 remained unchanged, with maximum and average values in the same order of magnitude, 4680 MW and 3090 MW, respectively. When it comes to the occurrence of zero values, this is less frequent than for imports, with the 1st decile remaining close to the average value.

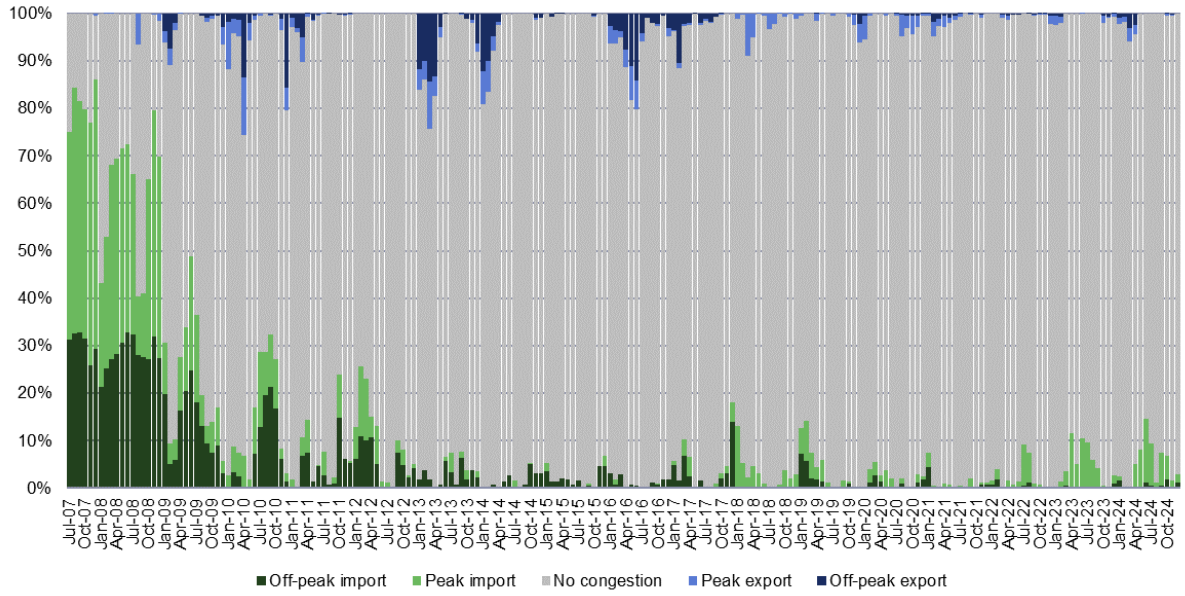
2.3 EVOLUTION OF CONGESTION AND CONGESTION RENTS

In 2024, congestion income from the interconnection between Portugal and Spain, resulting from the difference in zonal prices after market splitting, reached a total of €20.99 million, lower than in 2023 (€29.56 million). Despite the increase in the number of congested hours, from 464 to 547, the reduction in congestion income is justified by the reduction in the average spread, from EUR 1.17/MWh to EUR 0.42/MWh.

Translated into total congestion hours, the change from 464 hours in 2023 to 547 hours in 2024 (in both directions of the interconnection) continues to reflect strong integration of the Iberian markets.

The following figure illustrates the use of available commercial capacity in both directions on the Portugal-Spain interconnection from July 2007 (start of MIBEL) to December 2024.

Figure 2-4 – Monthly percentage of congestion hours on the Portugal-Spain interconnection, 2007 to 2024

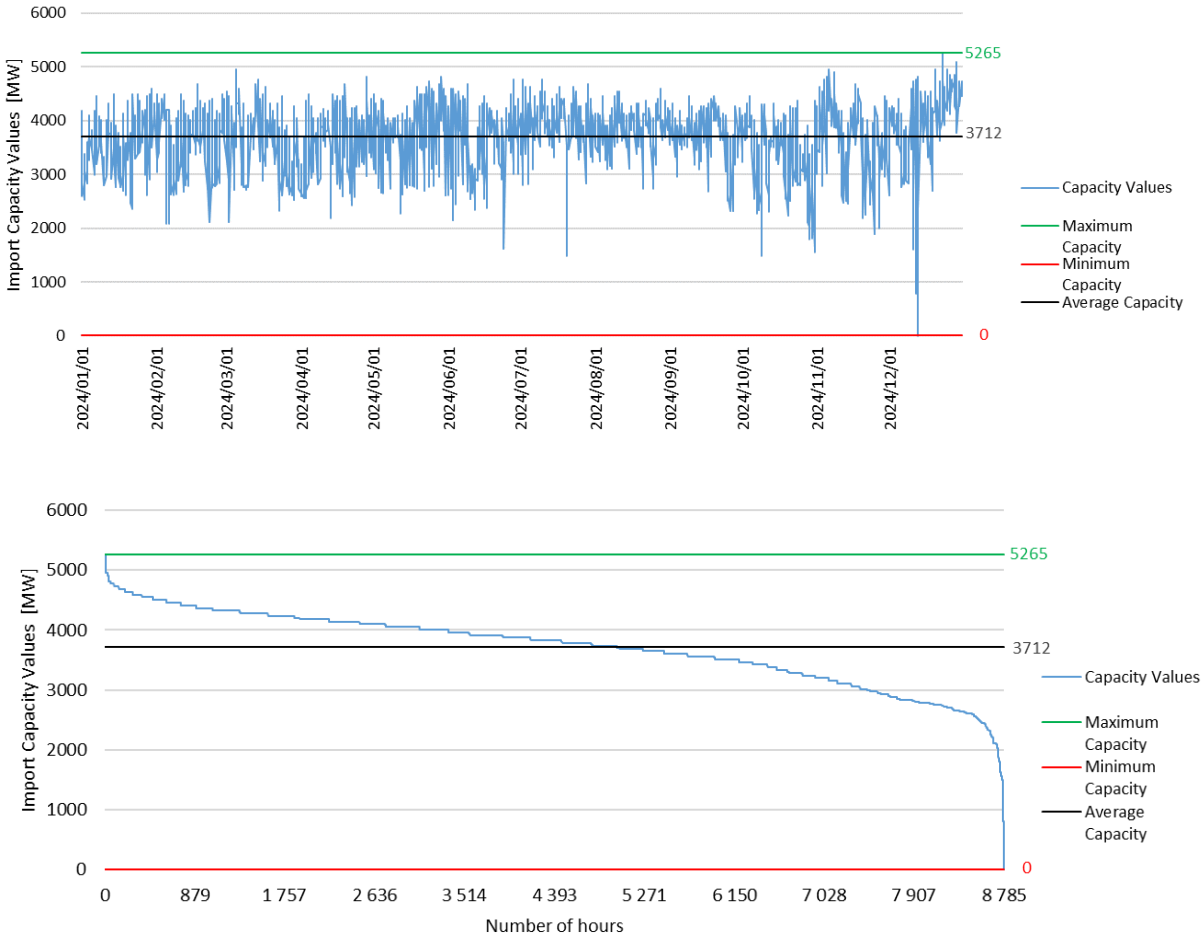


Source: REN and OMIE data

2.4 ANALYSIS FOR THE YEAR 2024

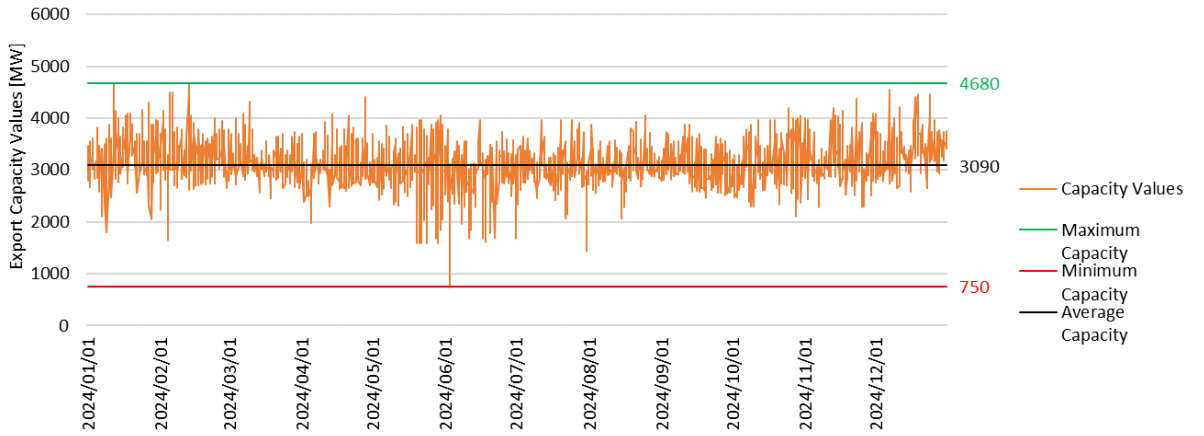
In 2024, the hourly interconnection capacity values made available to the market operator for commercial purposes were those shown in the following figures.

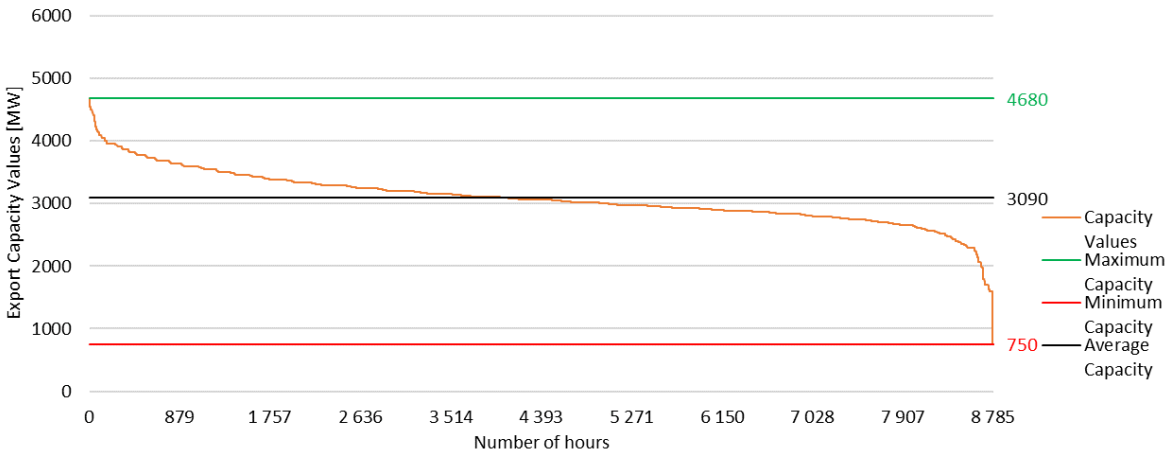
Figure 2-5 – Hourly interconnection capacity values available for commercial purposes in 2024 – Import



Source: REN data

Figure 2-6 – Hourly interconnection capacity values available for commercial purposes in 2024 – Exports





Source: REN data

From the analysis of these figures, it can be seen that the values naturally concentrate around their average value, which is around 3712 MW in the case of imports and 3090 MW in the case of exports. There are some extremely low values, such as 0 MW for imports and 750 MW for exports, but it can be seen that, for most of the year, capacities were relatively high. For example, in the case of imports, values were below 3000 MW for only 15% of the hours in the year.

2.4.1 INTERCONNECTION CAPACITY – MAXIMUMS, MINIMUMS AND AVERAGE VALUES

Analysing the data available[5] regarding the capacities made available to the market in 2024, it was possible to verify that in the import direction the maximum capacity was 5,265 MW, recorded between H12[6] and H15 on 23 December 2024. The minimum capacity recorded was 0 MW, recorded at H9 and between H19 and H22 on 13 December 2024.

Regarding the export direction, the maximum capacity was 4,680 MW, recorded between H2 and H4 on 12 January 2024 and H5 and H6 on 13 February 2024. The minimum capacity recorded was 750 MW, recorded between H12 and H15 on 3 June 2024.

[5]Data available at:
https://mercado.ren.pt/PT/Electr/Explora%C3%A7%C3%A3odosistema/Interlig/CapProg/Paginas/Mercado.aspx .

[6] H#: Notation used to designate the "#" hour of the daily market.

In terms of average capacity values, there was a value of 3712 MW in the import direction and a value of 3090 MW in the export direction. Compared to the previous year, there was an increase in the average capacity value both in the import direction (3580 MW in 2023) and in the export direction (3080 MW in 2023).

2.4.2 ANALYSIS OF INTERCONNECTION CONGESTION

One of the most relevant indicators for assessing interconnection performance is the number of hours of congestion.

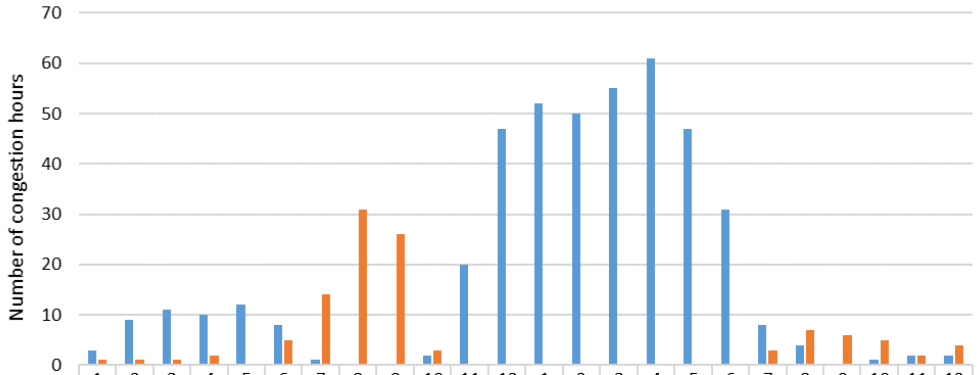
In 2024, congestion was recorded for 547 hours out of a total of 8,784 hours, representing only 6.2% of the total.

Analysing by time of day, there were more hours of congestion between H12 and H18, with the highest incidence at H16 (61 hours of congestion in 2024).

Performing the same analysis, but breaking it down by import and export direction, it was found that between H11 and H12 and at H5, all congestion hours occurred in the import direction. On the other hand, at H8, H9 and H21, congestion occurred only in the export direction. Between H1 and H4 and in H19, the number of congestion hours in the import direction was significantly higher. In H7, H10, H20, H22 and H24, the opposite was true, with higher congestion in the export direction. Finally, the number of congestion hours recorded at H23 throughout the year was the same in both the import and export directions. Despite the low number of congestion hours recorded in 2024, it should be noted that of the 547 hours recorded, 436 (80%) were in the import direction.

High levels of solar production in Spain lead to low market prices in the Spanish MIBEL zone, which explains the number and profile of congestion hours between H11 and H18, coinciding with the solar production profile.

Figure 2-7 – Number of congested hours, by hour of the day, in 2024

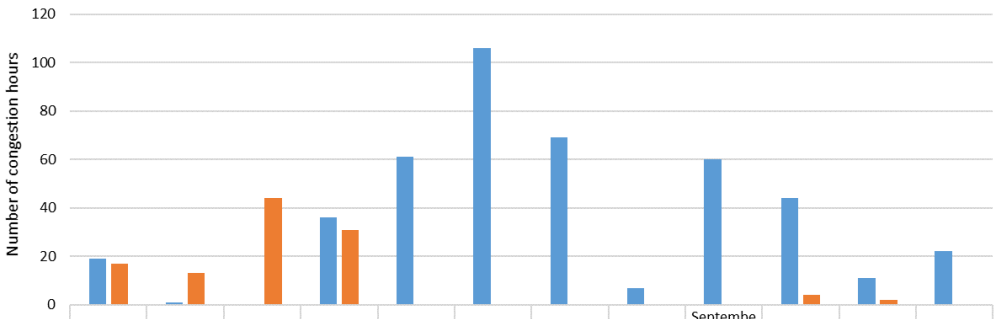


	1 AM	2 AM	3 AM	4 AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	12 PM	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	12 AM
Import [h]	3	9	11	10	12	8	1	0	0	2	20	47	52	50	55	61	47	31	8	4	0	1	2	2
Export [h]	1	1	1	2	0	5	14	31	26	3	0	0	0	0	0	0	0	0	3	7	6	5	2	4
Total [h]	4	10	12	12	12	13	15	31	26	5	20	47	52	50	55	61	47	31	11	11	6	6	4	6

Performing a similar analysis for each month of the year, it can be seen that congestion hours were mainly concentrated in the spring and summer months, with the highest number of congestion hours recorded in June (106 hours).

Breaking down the figures by import and export situations, it was found that in February and March, congestion occurred mainly in the export direction, with the opposite occurring in the remaining months of the year.

Figure 2-8 – Number of congested hours per month in 2024



	January	February	March	April	May	June	July	August	September	October	November	December
Import [h]	19	1	0	36	61	106	69	7	60	44	11	22
Export [h]	17	13	44	31	0	0	0	0	0	4	2	0
Total [h]	36	14	44	67	61	106	69	7	60	48	13	22

2.4.3 ANALYSIS OF PRICE DIFFERENCES IN CONGESTION SITUATIONS (*MARKET SPLITTING*)

Analysing the price differences between Portugal and Spain[7] , which occurred in a situation of congestion, it can be seen that the largest price difference in the import direction (price in Portugal higher than the price in Spain) was €96.77/MWh, recorded in H18 on 4 July 2024. On the other hand, the largest price difference in the export direction (price in Spain higher than the price in Portugal) was €68.79/MWh, recorded in H20 on 6 March 2024. These figures represent a decrease in the maximum price difference compared to 2023 for imports (€113.45/MWh in 2023) and a slight increase for exports (€64.35/MWh in 2023).

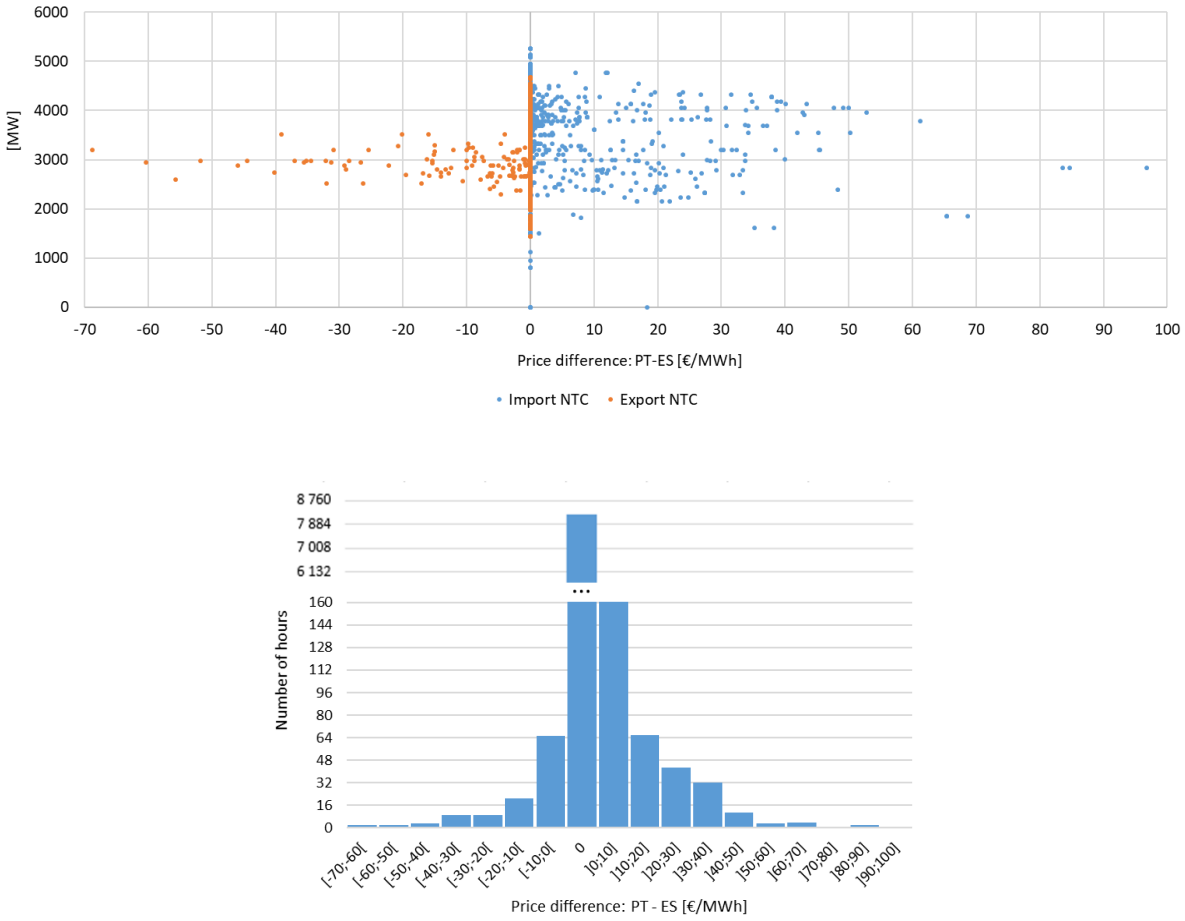
Figure 2-9 compares the price differences recorded with the values of capacity made available for commercial purposes (NTC - *Net Transfer Capacity*), in the import and export directions.

It can be seen that congestion occurred for NTC values between 0 MW and 4770 MW. The largest price difference in the import direction (€96.77/MWh) occurred with an NTC value of 2835 MW. On the export direction, the largest price difference (€68.79/MWh) occurred with an NTC value of 3195 MW.

Analysing the available data, it is clear that there is no significant correlation between the values of capacity made available for commercial purposes and interconnection congestion, i.e. the highest number of congestion situations (and even some of the highest price differences) did not occur for the lowest NTC values.

[7] https://www.mercado.ren.pt/PT/Electr/InfoMercado/InfOp/MercOmel/Paginas/Precos.aspx (Margin Available for Cross-Zonal Trade).

Figure 2-9 – Comparison between available capacities (NTC) and price differences in the market



Source: REN and OMIE data

Given that during 93.8% of the 8,784 hours in 2024 there was no interconnection congestion, with the consequent zero price differential between Portugal and Spain, it should also be noted that only in around 1.9% of the hours in the year was the price differential greater than €2/MWh.

3 MONITORING COMPLIANCE WITH MINIMUM LEVELS OF AVAILABLE CAPACITY FOR CROSS-ZONAL TRADE (ARTICLE 16(8) OF REGULATION (EU) 2019/943)

3.1 FRAMEWORK

3.1.1 LEGAL CONTEXT

The obligation to monitor compliance with minimum levels of available capacity for cross-zonal trade falls within the legal and regulatory framework already referred to in Chapter 1.

3.1.2 REQUESTS FOR DEROGATIONS

In order to facilitate the gradual compliance by Member States with the above-mentioned levels of available capacity for cross-zonal trade, Article 16(9) of Regulation (EU) 2019/943 allows regulatory authorities to grant a derogation from the requirement set out in paragraph 8 of that Article in relation to the minimum interconnection capacity offered, upon request from transmission system operators.

On 2 November 2023, ERSE received from REN, in its capacity as Portuguese TSO, the fifth request for a one-year derogation from compliance with the minimum MACZT levels in 2024[8] .

This new request for a derogation was justified on the basis of system operational security issues and the additional risks introduced by new processes and tools that make it possible to make interconnection capacities available to the market.

According to REN, in terms of processes, the difficulties were mainly related to the more frequent use of costly corrective actions, given the lack of operational experience in processes that make intensive use of this type of action, which could lead to operational security risks.

With regard to the new tools to be developed and used, REN identified that on 1 January 2024, the RCC (*Regional Coordination Centre*) would still be working on the migration process from the current capacity

[8] MACZT – *Margin Available for Cross-Zonal Trade*.

calculation IT tool to a new tool based on different technology, which would be necessary to complete the alignment of the tool with the SWE Region's capacity calculation methodology[9] .

The derogation request for the year 2024 included the following clauses:

a) REN committed to offer in 85% of the hours of the year covered by the derogation, at least the minimum capacity necessary to ensure compliance with the minimum MACZT levels;

b) During the derogation period, the RCC and TSOs in the SWE Region should:

   i. Complete the migration process from the current RCC capacity calculation IT tool to a new IT tool with different technology;

   ii. Complete the implementation of the second Intraday Capacity Calculation;

   iii. Complete the implementation of the Long-Term Capacity Calculation;

   iv. Continue developments of the Coordinated Security Analysis and Capacity Calculation processes for the Balancing Period.

After analysing the derogation request described above[10] , it was approved by ERSE on 14 December 2023.

3.1.3 METHODOLOGY FOR MONITORING COMPLIANCE WITH MINIMUM MACZT LEVELS

To monitor compliance with the minimum MACZT levels, this report used the methodology described in detail in the ERSE report " Analysis of Portugal-Spain interconnection capacity and monitoring of

[9] South-West Europe Region: Region of South-West Europe comprising Portugal, Spain and France.

[10] Reports analysing the Portugal-Spain interconnection capacity and monitoring compliance with the minimum limits of available capacity for cross-zonal trade (MACZT) and ERSE decisions on requests for derogations: http://www.erse.pt/atividade/regulamentos-eletricidade/acesso-as-redes-e-as-interligacoes/relatorios-maczt-e-pedidos-de-derrogacao/.

compliance with the minimum level of margin available for cross-zonal trade in 2020"[11] , based on ACER Recommendation 01/2019[12] .

In this report, ERSE also follows, to the extent applicable, the provisions of ACER's Practical Note on Monitoring Available Capacity for Cross-Zonal Trade[13] .

3.1.4 PERIOD ANALYSED

The period analysed in this report was the whole of 2024.

As mentioned in point 3.1.2, ERSE accepted a request for one-year derogation from REN regarding compliance with the minimum MACZT levels.

In this context, ERSE is responsible for monitoring and tracking the evolution of the interconnection capacity levels made available for cross-zonal trade and progress in complying with the minimum levels established, as well as assessing compliance with the objectives of the derogation.

3.1.5 DATA USED

This report uses data resulting from calculations made by Coreso[14] , which were made available by REN.

3.2 RESULTS

Figure 3-1 illustrates the level of compliance with the minimum levels of MACZT ($\frac{MACZT}{Fmax}$[15] $\geq 70\%$) in 2024.

[11] https://www.erse.pt/media/tjxbitoz/relat%C3%B3rio-interliga%C3%A7%C3%A3o-e-maczt-2020.pdf.

[12] https://www.acer.europa.eu/sites/default/files/documents/Official_documents/Acts_of_the_Agency/Recommendations/ACER%20Recommendation%2001-2019.pdf.

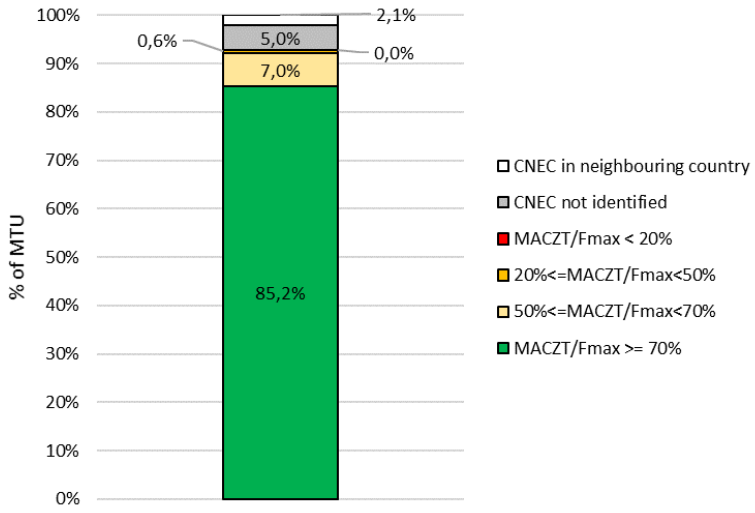
[13] https://extranet.acer.europa.eu//Official_documents/Acts_of_the_Agency/Publication/ACER%20and%20NRAs%20practical%20note%20MACZT.pdf.

[14] RCC, Regional Coordination Centre responsible for calculating capacity in interconnections in the SWE region.

[15] Fmax - Represents the capacity in a CNE, taking into account safety limits and considering contingencies, pursuant to Article 16(8) of Regulation (EU) 2019/943, and also applies in Flow-Based and Coordinated NTC approaches.

- In 85.2% of MTUs[16] with limiting CNEC[17] in Portugal, the minimum MACZT levels[18] were met (green area in the figure, MACZT≥ 70%).
- In 7.6% of MTUs with CNEC[19] limiting in Portugal, the minimum MACZT levels were not met.
- In 2.1% of MTUs, the identified CNEC did not belong to the Portuguese power system (white area in the figure).
- In 5% of MTUs, it was not possible to identify the limiting CNEC, which made it impossible to monitor compliance with the minimum MACZT levels (grey area in the figure).

Figure 3-1 – Compliance with minimum MACZT levels by the Portuguese TSO in 2024 at the PT-ES border in both directions



Compliance with minimum MACZT levels is assessed for each MTU, in each direction of the border considered. Analysing the two directions separately (ES -> PT and PT -> ES), for the total MTUs in 2024, it

[16] MTU - Market Time Unit. In this context, it also represents a specific time and direction of the border considered.

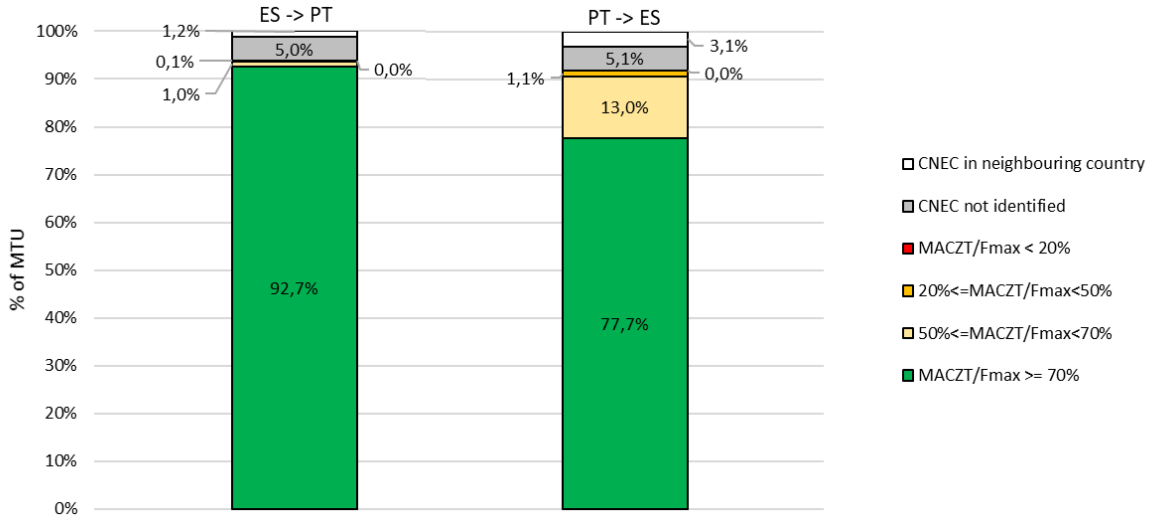
[17] CNEC – Represents a critical network element with a contingency that is used in capacity calculation.

[18] Compliance with MACZT minimum levels is assessed for MTU separately in both directions of the border in question, i.e. the number of cases expected to be assessed is equal to 2 x number of hours in the period in question.

[19] CNEC – Represents a critical network element with a contingency that is used in capacity calculation (*Critical Network Element with Contingency*).

can be seen that performance was better in the ES -> PT direction, with minimum MACZT levels being met in 92.7% of MTUs (77.7% in the PT -> ES direction).

Figure 3-2 - Compliance with minimum MACZT levels in 2024, in the ES -> PT and PT -> ES directions



Taking into account the characteristics of the Portuguese electrical system's interconnections with its neighbours, as well as its specific characteristics, it is not considered applicable to calculate these general results taking into account the influence of third-country flows or capacity allocation restrictions referred to in point 4 of ACER Recommendation 01/2019.

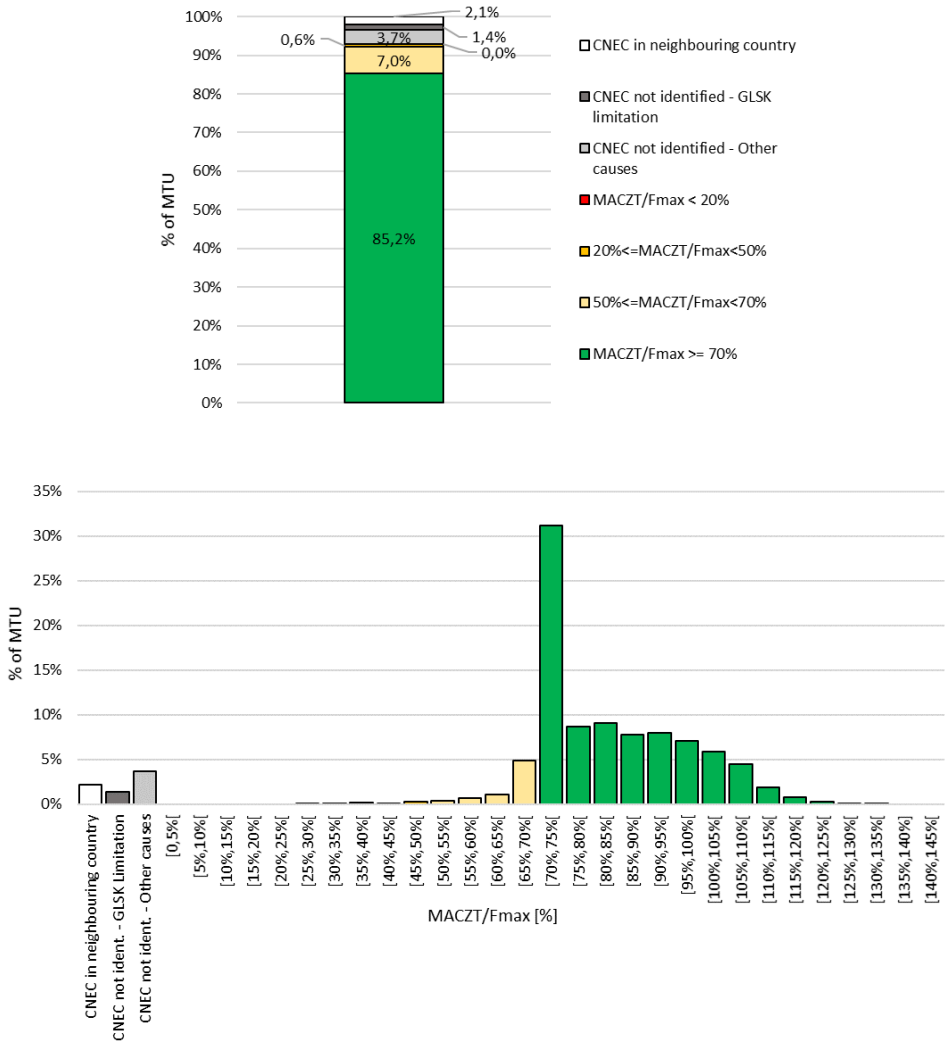
As already mentioned, there is no significant correlation between the values of capacity made available for commercial purposes and interconnection congestion, i.e. the highest number of congestion situations (and even some of the highest price differences) did not occur for the lowest NTC values.

3.2.1 DETAILED ANALYSIS

The results presented above provide an overview of compliance with the minimum MACZT levels, however, the data provided allows for a more detailed analysis of the degree of compliance with these levels.

Thus, based again on the results for the total number of MTUs in 2023, it can be seen fromFigure 3-3 that, of the 7.6% of MTUs that did not comply with the minimum MACZT levels, 7% relate to cases where the MACZT values were between 50% and 70% of Fmax.

Figure 3-3 – MACZT tiers in 2024 at the PT <-> ES border in both directions



This finding suggests that an increase, in some cases slight, in the capacity made available to the market would allow the minimum MACZT levels to be met in these MTUs.

Still with regard to MTUs where the minimum MACZT levels were not met, it can be verified atFigure 3-4 that the average MACZT/Fmax value was 63.4% for all MTUs. Breaking it down by direction, it can be seen atFigure 3-5 that the average value was 64.1% in the ES -> PT direction and 63.4% in the PT -> ES direction.

Figure 3-4 - Average MACZT/Fmax value for the total number of MTUs where the minimum MACZT levels were not met in 2024

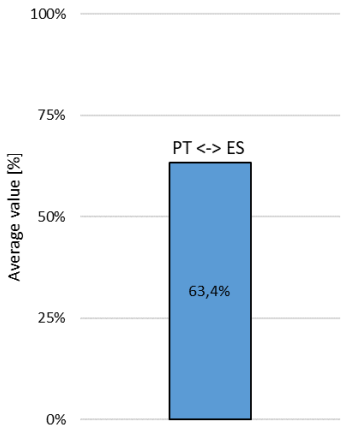
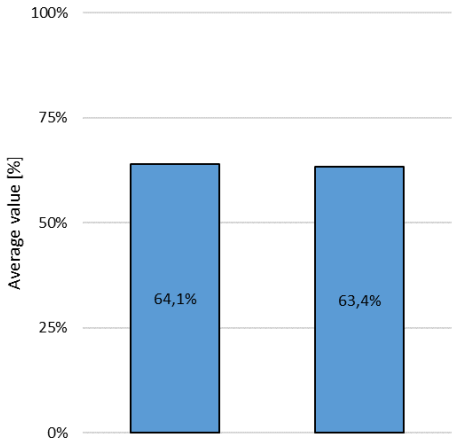


Figure 3-5 - Average MACZT/Fmax value for MTUs where MACZT levels were not met, by direction, in 2024



On the other hand, it is also possible to verify that the number of MTUs in which it was not possible to identify the limiting CNEC (5% of cases), as it does not allow the MACZT value to be quantified or additional NTC to be applied, if necessary, contributes to non-compliance with the minimum levels.

These 5% of MTUs where it was not possible to identify the CNEC are classified as cases where, in particular, there were IT problems, convergence problems in the capacity calculation tool, or situations where maximum generation was reached without a limiting CNEC being found (GLSK limitation).

Isolating GLSK limitation situations, it can be seen that these accounted for 1.4% of MTUs. Although the number of occurrences of this situation has been decreasing, it continues to represent a constraint on compliance with the established minimum levels.

With regard to the remaining cases, it is worth noting the failure to identify a CNEC for five full days (27 January, 5 and 6 February, 13 April and 22 June) due to a global failure of the process, caused by problems in the SWE region network modelling tool.

It is therefore clear that in order to achieve the objective of compliance with the minimum levels established in 100% of MTUs, it is necessary to progressively and significantly reduce the number of MTUs for which the limiting CNEC is not identified.

Critical Network Elements

Using the data provided, it is also possible to check which CNE[20] has been identified for each MTU and thus break down the results by CNE.

TheTable 3-1 lists the 11 CNEs identified as the responsibility of the Portuguese power system.

In fact, three of the identified CNEs, 10T-ES-PT-10004U (400 kV Alto Lindoso - Cartelle 1 interconnection line), 10T-ES-PT-00008S (400 kV Lagoaça – Aldeadávila interconnection line) and 16TLAMMLGC-----S (400 kV Armamar – Lagoaça line), represented 92.8% of the MTUs in which it was possible to identify a limiting CNE, and were therefore those that contributed most to the overall result. These three CNE performed very well, complying with the minimum MACZT levels (the resulting interconnection capacity limitation was not less than 70% of Fmax) in more than 87% of the MTUs for all of them.

[20] CNE – Critical Network Element.

Considering only the data for the MTU CCs[21] in the table below, it can be seen that the CNE was an internal element of the Portuguese power system in 11% of the MTUs, with the minimum MACZT levels being met in 97% of these situations, and that the CNE was an interconnection in 89% of these MTUs, with the minimum MACZT levels being met in 91% of these situations.

Table 3-1 – Breakdown of results by CNE identified as the responsibility of the Portuguese power system

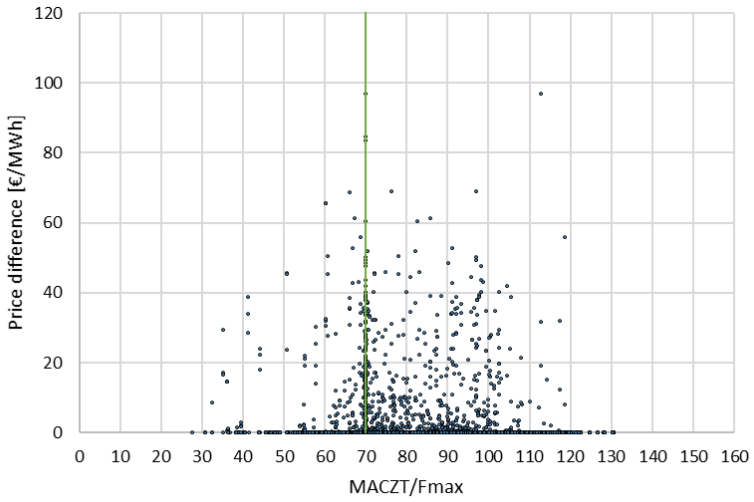
CNE		No. CC MTU	% of total CC MTU	MACZT ≥ 70% Fmax	MACZT < 70% Fmax
10T-ES-PT-000015	Pocinho - Aldeadávila 2 220 kV	3	0,02%	100%	0%
10T-ES-PT-000023	Pocinho - Aldeadávila 1 220 kV	14	0,08%	100%	0%
10T-ES-PT-000031	Alqueva - Brovales 380 kV	446	2,68%	85%	15%
10T-ES-PT-00005Y	Alto Lindoso - Cartelle 2 380 kV	250	1,50%	76%	24%
10T-ES-PT-00006W	Falagueira - Cedillo 400 kV	86	0,52%	99%	1%
10T-ES-PT-00008S	Lagoaça - Aldeadávila 400kV	8751	52,59%	94%	6%
10T-ES-PT-00013Z	Tavira – Puebla de Guzmán 400 kV	4	0,02%	100%	0%
10T-ES-PT-10004U	Alto Lindoso - Cartelle 1 380 kV	4929	29,62%	87%	13%
16TLALPDV------F	Alto Lindoso - Pedralva 400 kV	5	0,03%	100%	0%
16TLAMMLGC-----S	Armamar - Lagoaça 400 kV	1767	10,62%	97%	3%
16TLPDVRA------G	Pedralva - Riba de Ave 400 kV	8	0,05%	100%	0%

Finally, the following figure compares the hours when congestion occurred (price difference between Portugal and Spain, other than zero) with the MACZT values calculated for these MTUs (in each direction where possible).

Analysing the available data, it can be seen that in 89% of the MTUs where congestion occurred and monitoring was possible, the MACZT values were higher than the minimum levels defined. Thus, with regard to the price difference values between Portugal and Spain, it is not possible to find a relevant correlation between them and the MACZT values calculated for each MTU.

[21] CC MTU: Capacity *Calculation Market* Time *Unit*, which means the time unit for calculating the capacity considered

Figure 3-6 – Comparison between MACZT/Fmax values and interconnection congestion situations



3.3 ASSESSMENT OF COMPLIANCE WITH THE DEROGATION FOR 2024

In accordance with point 3.1.2, ERSE approved REN's request for a derogation from compliance with the minimum MACZT levels for 2024. In this request for derogation, REN made a series of commitments.

The analysis of compliance with the commitments set out in the approved derogation request concluded that REN, together with Coreso and the other SWE TSOs, achieved the following results:

1. It continued the necessary developments in order to implement the migration from the current RCC capacity calculation IT tool to a new IT tool based on a different technology;

2. Continued developments of the second intraday capacity calculation, as well as the long-term capacity calculation and coordinated security analyses;

3. Continued developments of the capacity calculation for the balancing period.

With regard to the objective of compliance with the minimum MACZT levels provided for in the derogation, and in accordance with the results shown in the previous points, it can be concluded that it was above the established minimum (compliance with the minimum MACZT levels in 85% of MTUs).

4 ASSESSMENT OF COMPLIANCE WITH THE MINIMUM MACZT LEVELS FOR IMDT PURPOSES

4.1 BACKGROUND

On 1 February 2022, following agreement between all the national regulatory authorities in the South-West Europe (SWE) Region, ERSE approved the amendment to the methodology[22] for calculating the interconnection capacity available for commercial purposes on daily and intraday basis, as proposed by the TSOs in the SWE Region. In this context, the methodology now includes mechanisms and procedures aimed at reducing or eliminating GLSK limitation situations. Comparing the number of GLSK limitation situations observed in 2024 and 2023, there has been a slight decrease in such situations. However, these situations continue to make it impossible to assess compliance with the minimum MACZT levels in around 1.4% of cases. Therefore, in order to progressively increase the level of compliance with the established levels, it is essential to continue reducing the number of MTUs in which this situation occurs.

With regard to the remaining situations where it is not possible to identify the limiting CNEC, the methodology also includes fallback procedures that enable the monitoring of compliance with the minimum MACZT levels. These procedures involve two key points:

i) consideration of the NTC value calculated in a coordinated manner for the long term (duly validated by the TSO) when the daily calculation process has not been successful; and

ii) consideration, for monitoring purposes, of the most representative CNEC for the previous quarter and average PTDFs for the same period in cases where it is not possible to identify the limiting CNEC.

Article 15(2) of the interconnection capacity calculation methodology provides for a trial period for the use of these procedures, assuming that their use would only be acceptable for a very small percentage of MTUs, and it is therefore essential that there is a significant reduction in these situations from the outset.

Comparing the results for 2023 with those for 2024, it can be concluded that there has been a positive development in this regard, with a decrease in the number of MTUs where it was not possible to identify

[22] https://www.erse.pt/media/a02fe4kw/swe-ccm-amendment_january2022_clean.pdf.

the limiting CNEC from 8.3% in 2023 to 5% in 2024 (between 2022 and 2023, there had already been a significant decrease from 16% to 8.3%).

Given the significant progress made in terms of the number of situations in which it is not possible to identify the limiting CNEC (40% reduction in cases), it is considered that the conditions are in place for, in accordance with ERSE's Memorandum[23] on the definition of criteria for assessing compliance with minimum MACZT levels for the purposes of the incentive to improve the technical performance of the RNT (IMDT), the results of using the fallback mechanism for monitoring MACZT to be considered for 2024.

The assessment of compliance with the minimum MACZT levels for the purposes of defining the IMDT value follows specific criteria, taking into account the national context in which this incentive is applied. Even so, some of the criteria adopted by ERSE are in line with ACER's criteria in its 2024 assessment and published in its Report[24] on "Capacities for cross-zonal trade and congestion management", such as the "Limiting element in the Spanish system" and "Recognition of fallback procedures".

Taking into account the criteria established in the Memorandum, the following changes to the results of monitoring compliance with MACZT limits are noted.

Limiting element in the Spanish system – 2.14% of MTUs.

The minimum MACZT levels are considered to be met in cases where the identified limiting CNEC is not part of the Portuguese power system. This criterion is already taken into account in the analysis presented.

The 2.14% in both directions (376 MTU) corresponds to 3.1% in the Portugal – Spain direction (272 MTU) and 1.21% in the Spain – Portugal direction (106 MTU).

[23] ERSE memorandum issued in December 2023 on the definition of criteria for assessing compliance with minimum MACZT levels for the purpose of encouraging improvement in the technical performance of the RNT (IMDT). This Memorandum was drawn up following comments from REN on the assessment of its compliance with the minimum level of capacity available for cross-zonal trade (MACZT).

[24] https://www.acer.europa.eu/sites/default/files/documents/Publications/ACER-Monitoring-Report-2025-crosszonal-electricity-trade-capacities.pdf.

Recognition of fallback procedures – 3.17% of MTUs

The significant reduction in the number of MTUs in which the limiting CNE is not identified and, therefore, fallback is used, was a condition of ERSE for accepting this fallback procedure. The significant reduction of 40% from 2023 to 2024 thus justified considering the *fallback* results in the 2024 assessment.

The use of the most representative CNEC for monitoring MACZT in the 881 MTUs where it was not identified allowed 557 MTUs with MACZT>70% in both directions (3.17%) to be validated, corresponding to 2.56% in the Portugal – Spain direction (225 MTUs) and 3.78% in the Spain – Portugal direction (332 MTUs).

The following figures allow a comparison of the results of applying these criteria with ACER's assessment published in its report on MACZT in 2024.

Figure 4-1 –ACER assessment by direction in 2024

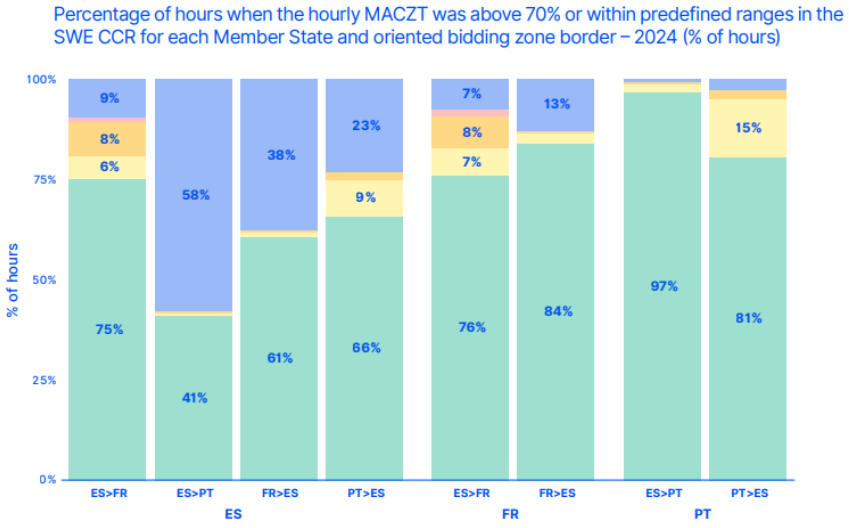
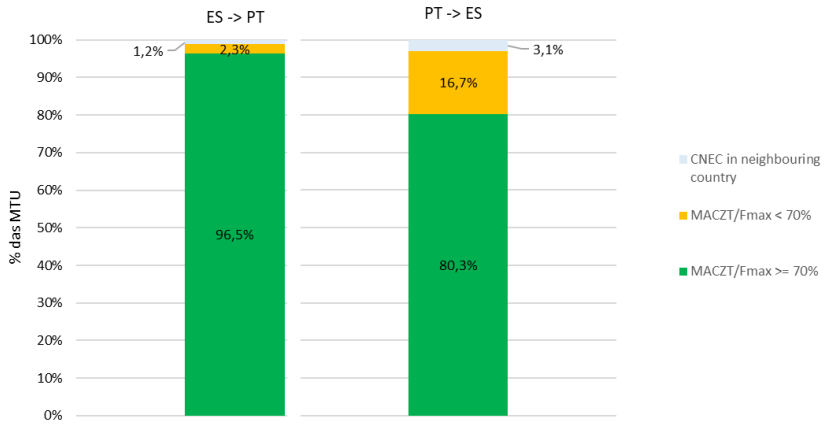


Figure 4-2 – ERSE assessment, considering *fallback* mechanism, by direction, in 2024



NTC proposed by Coreso reduced by Spanish TSO - 4.51% of MTUs.

REN identified the situations in which there was a reduction by the Spanish TSO, breaking down those in which the minimum MACZT levels would have been met if there had been no reduction in the NTC and those in which, even with the capacity calculated before the reduction, the minimum levels would not have been met. Only the former were considered to have complied with the minimum MACZT levels.

The 4.51% in both directions (792 MTU) corresponds to 8.36% in the Portugal-Spain direction (734 MTU) and 0.66% in the Spain-Portugal direction (58 MTU).

Insufficient additional NTC value due to Spanish counter-trading technical limit – 2.56% of MTU.

In situations where the minimum MACZT levels have not been met due to the Spanish counter-trading technical limit, the MACZT ≥ 70% criteria are considered to have been met, with REN having identified these situations.

However, when non-compliance occurs due to limitations imposed by both the Portuguese and Spanish TSOs, the non-compliance is also attributable to the Portuguese TSO, and will therefore continue to be attributed to both systems. The minimum MACZT levels are not considered to have been met in these situations.

The 2.56% in both directions (450 MTU) corresponds to 4.99% in the Portugal-Spain direction (438 MTU) and 0.14% in the Spain-Portugal direction (12 MTU).

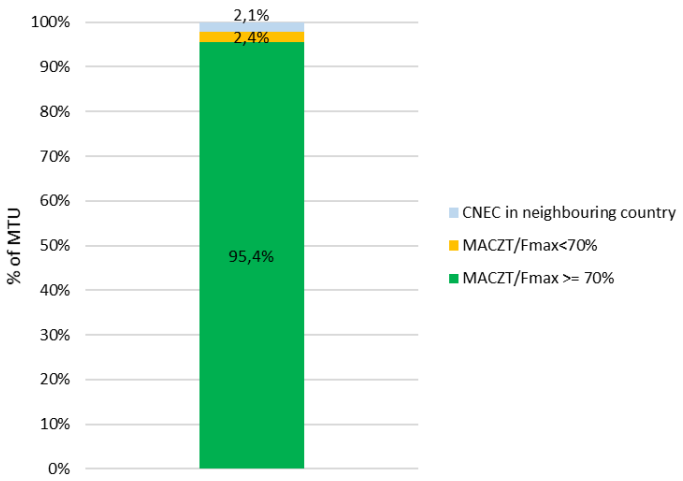
4.2 RESULTS

The criteria established in the aforementioned Memorandum were adopted in this analysis, and the results of the assessment of compliance with the minimum MACZT levels were updated as follows, as illustrated in Figure 4.3.

- In 97.58% of MTUs (85.2+2.14+4.51+2.56+3.17), the minimum MACZT levels (MACZT > 70%) were met, of which 2.14% correspond to a limiting CNEC located in Spain.

- In 2.4% of MTUs, the minimum MACZT levels were not met.

Figure 4-3 – ERSE assessment for IMDT purposes, in both directions, in 2024



5 CONCLUSIONS

According to European regulations, the assessment of compliance with the minimum MACZT levels is the responsibility of the regulatory authority of each Member State.

After the first four monitoring exercises (2020, 2021, 2022 and 2023), and taking into account the commitments made by REN in its request for a derogation for 2024, approved by ERSE, this report assesses the current degree of compliance with those commitments.

As set out throughout the report, ERSE reached the following main conclusions:

- Following the initial criteria, the minimum MACZT levels at the Portugal-Spain border were met in 85.2% of MTUs (77.7% in the export direction, PT->ES, and 92.7% in the import direction, ES->PT);
- There was a significant reduction in the number of MTUs where it was not possible to identify the limiting CNE (approximately 40% between 2023 and 2024), thus justifying the use of the fallback procedure for MACZT monitoring in these cases;
- Adopting the criteria defined at national level for the purposes of the IMDT, the minimum MACZT levels at the Portugal-Spain border are met in 97.6% of MTUs, of which 2.1% correspond to situations where the limiting CNEC was located in Spain (the minimum MACZT levels are not met in 2.4% of MTUs);
- The objectives of the derogation relating to the development of tools and methodologies for calculating and monitoring the capacity available for cross-zonal trade were met;
- The degree of compliance with the minimum MACZT levels was above the commitment made by REN in the derogation request for 2024 (which was compliance with the minimum MACZT levels in 85% of MTUs);
- There is no significant correlation between the values of capacity made available for commercial purposes and interconnection congestion, i.e. the highest number of congestion situations did not occur for the lowest NTC values.