



# REPORT

## MONITORING OF THE COMPLIANCE WITH MACZT MINIMUM LEVELS

2021



## REPORT

### **Analysis of Portugal-Spain interconnection capacity and monitoring of compliance with the minimum level of margin available for cross-zonal trade in 2021**

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## 1 INTRODUCTION

The current context of energy transition as well as the intention to implement the European internal electricity market, make interconnection capacity a key factor for the evolution and integration of energy systems.

The European Council of 23 and 24 October 2014 considered, in its conclusions<sup>1</sup>, that the Commission, supported by the Member States, should take measures to ensure compliance with a minimum target of 10% of existing electricity interconnections, by 2020, at least for the Member States that had not yet reached a minimum level of integration into the internal energy market. The European Council further noted that the Commission should also periodically report to the European Council with the aim of achieving a target of 15% by 2030.

On the other hand, Article 16(8) of Regulation (EU) 2019/943<sup>2</sup> of the European Parliament and of the Council, of 5 June 2019, on the internal market for electricity, establishes the minimum values for the capacity of the interconnection 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;

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<sup>1</sup> <https://www.consilium.europa.eu/en/meetings/european-council/2014/10/23-24/>

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



(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.”

Article 59(1)(h) of Directive (EU) 2019/944<sup>3</sup> of the European Parliament and of the Council, of 5 June 2019, on common rules for the internal market in electricity, provides that the regulatory authority of each Member State is responsible for “Ensuring that transmission system operators make available interconnector capacities to the utmost extent pursuant to Article 16 of Regulation (EU) 2019/943;”.

In this sense, this report intends, on the one hand, to assess the evolution and current status of the interconnection capacity between Portugal and Spain, and, on the other hand, to assess the degree of compliance with the minimum level of available capacity for cross-zonal trade, foreseen in Article 16(8) of Regulation (EU) 2019/943.

Pursuant to Articles 121 and 122 of the Administrative Procedure Code, ERSE notified REN, in its capacity as the Portuguese TSO, so that, if willing, REN would comment on the draft report on the “Analysis of Portugal-Spain interconnection capacity and monitoring of compliance with the minimum level of margin available for cross-zonal trade in 2021”.

REN sent its comments to the draft report on 21 July 2022.

ERSE took good note of REN’s comments, having made some clarifications in the text of the report, however they did not lead to any change in the conclusions for this final version of the report.

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

## 2 ANALYSIS OF PORTUGAL-SPAIN INTERCONNECTION

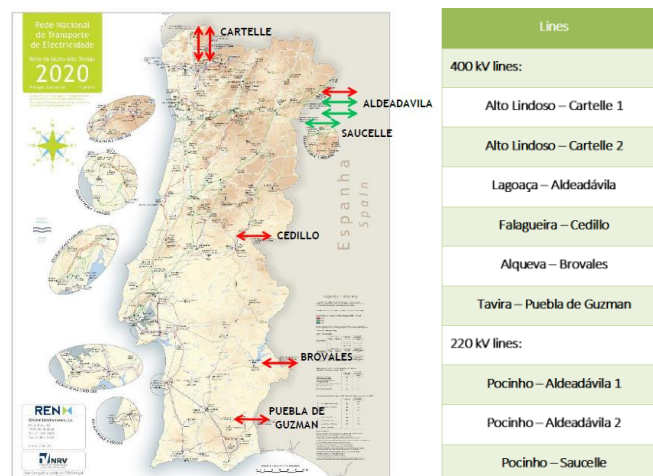
### 2.1 FRAMEWORK

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<sup>4</sup>.

### 2.2 EVOLUTION OF INTERCONNECTION CAPACITY

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

Figure 2-1 – Interconnection lines between Portugal and Spain



<sup>4</sup> 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 and operating temperature conditions used by the operators of the interconnected networks, present the values shown in Table 2-1.

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

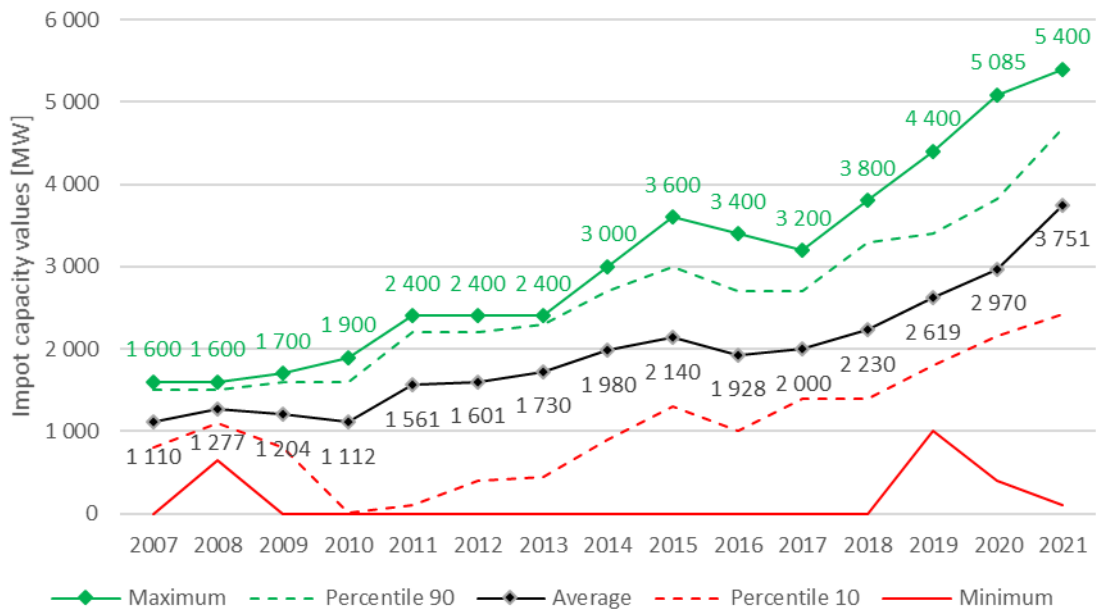
Lines	Minimum thermal capacity [MVA]
<b>400 kV lines:</b>	
Alto Lindoso – Cartelle 1	1477
Alto Lindoso – Cartelle 2	1477
Lagoaça – Aldeadávila	1469
Falagueira – Cedillo	1386
Alqueva – Brovales	1280
Tavira – Puebla de Guzman	1386
<b>220 kV lines:</b>	
Pocinho – Aldeadávila 1	374
Pocinho – Aldeadávila 2	374
Pocinho – Saucelle	360
<b>Total</b>	<b>9583</b>

Source: REN – Interconnection Characterization as of 31 December 2021

Thus, for the purposes of characterizing the value of the interconnection capacity, the sum of the minimum values of the thermal capacities of the lines that constitute the interconnection is 9583 MVA.

The following figures illustrate the evolution of the interconnection capacity available for commercial purposes, in the import and export directions, between 2007, the year in which the Iberian Electricity Market (MIBEL) came into operation, and 2021.

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

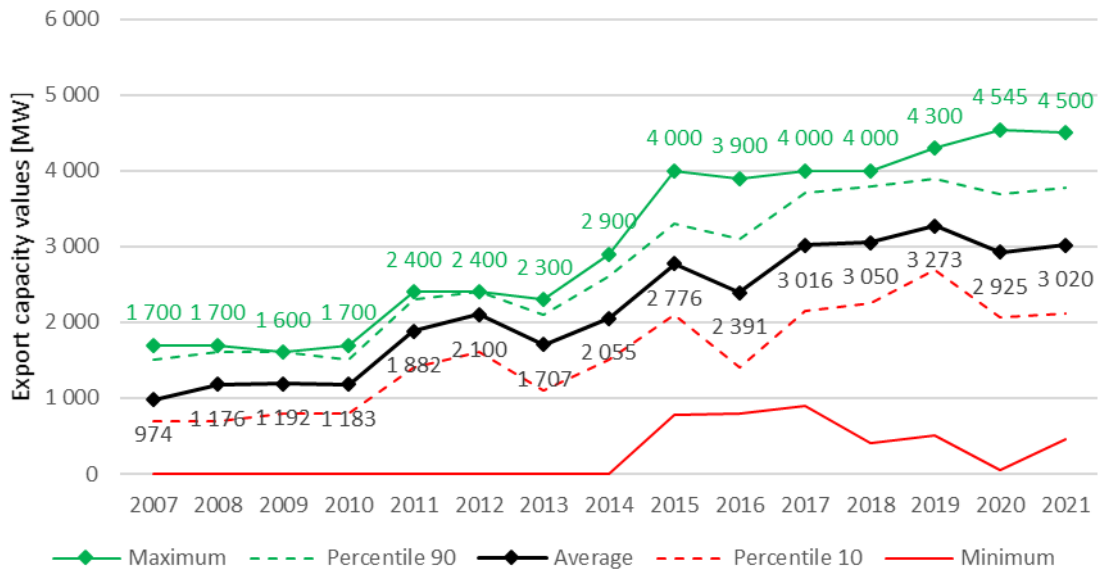


Source: REN and OMIE data

During the period under review, 2021, confirms the tendency of increase observed from 2017 to 2020, reaching a maximum value of 5400 MW. In terms of average values, a relevant increase was observed in relation to 2020, going from 2970 MW to 3751 MW. It should be noted that practically every year there is an occurrence of null values, despite the 1st decile<sup>5</sup> being close to the average value.

<sup>5</sup> The 1st decile is the cut-off point for the lowest 10% of the data, i.e., the 10th percentile.

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



Source: REN and OMIE data

In terms of export capacity for commercial purposes, the characteristic values of 2020 were maintained, with the maximum and average values being in the same order of magnitude. In terms of the occurrence of null values, it is less frequent than that of imports, maintaining the 1st decile close to the mean value.

## 2.3 EVOLUTION OF CONGESTION AND CONGESTION INCOME

In 2021, congestion rents for the interconnections between Portugal and Spain, resulting from the difference in zonal prices after applying the market splitting, reached a total of 4.15 million euros, a value higher than the one recorded in 2019 (4.07 million of euros). Given the reduction in the total number of hours in which the interconnection was congested, this evolution resulted from the increase in the average value of the absolute price differential.

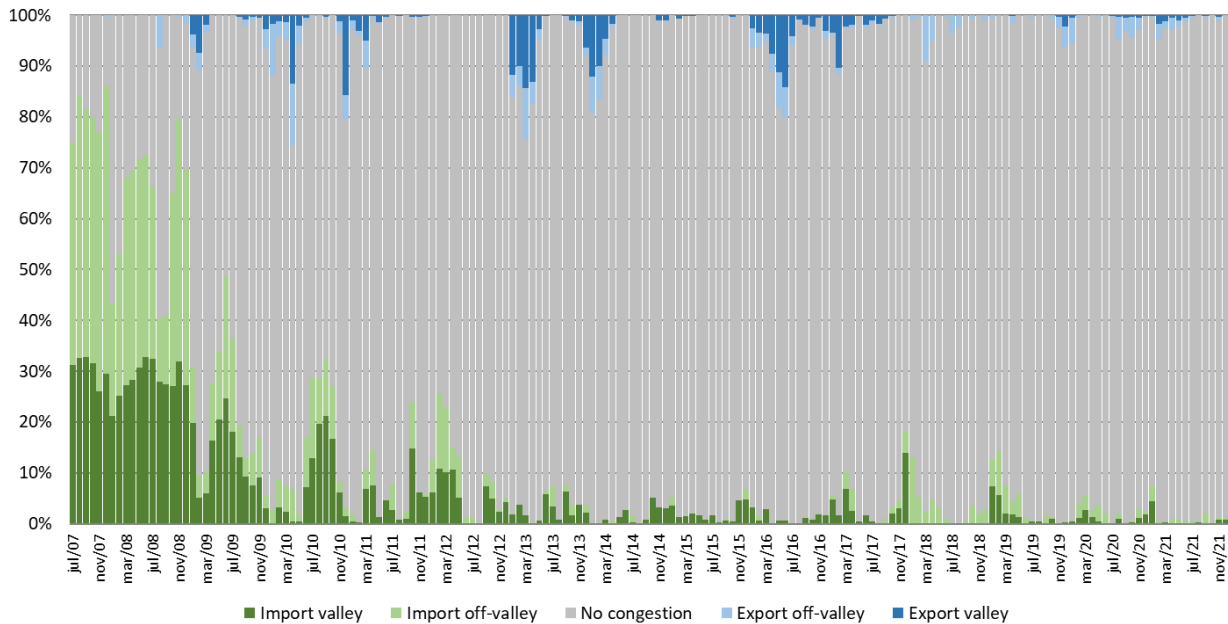
Translated into the total number of hours of congestion, the change was from 358 hours in 2020 to 230 hours in 2021 (in both directions of the interconnection) and reflects strong market integration.

In terms of the price differential, in 2021, there was a positive average spread of 0.07 €/MWh, in the import direction, higher than the one recorded in 2020, also in the import direction, of 0.03 €/MWh. The values

of the price differential remained reasonably low throughout the year, with an inversion in the direction of congestion in some months of the year.

The following figure illustrates the percentage of hours of congestion, in both directions, on the Portugal-Spain interconnection, in the period from July 2007 (beginning of the MIBEL) to December 2021, making it possible to identify the reduction in the number of hours of congestion in both directions.

**Figure 2-4 – Monthly percentage of hours of congestion on the Portugal-Spain interconnection, 2007 to 2021**

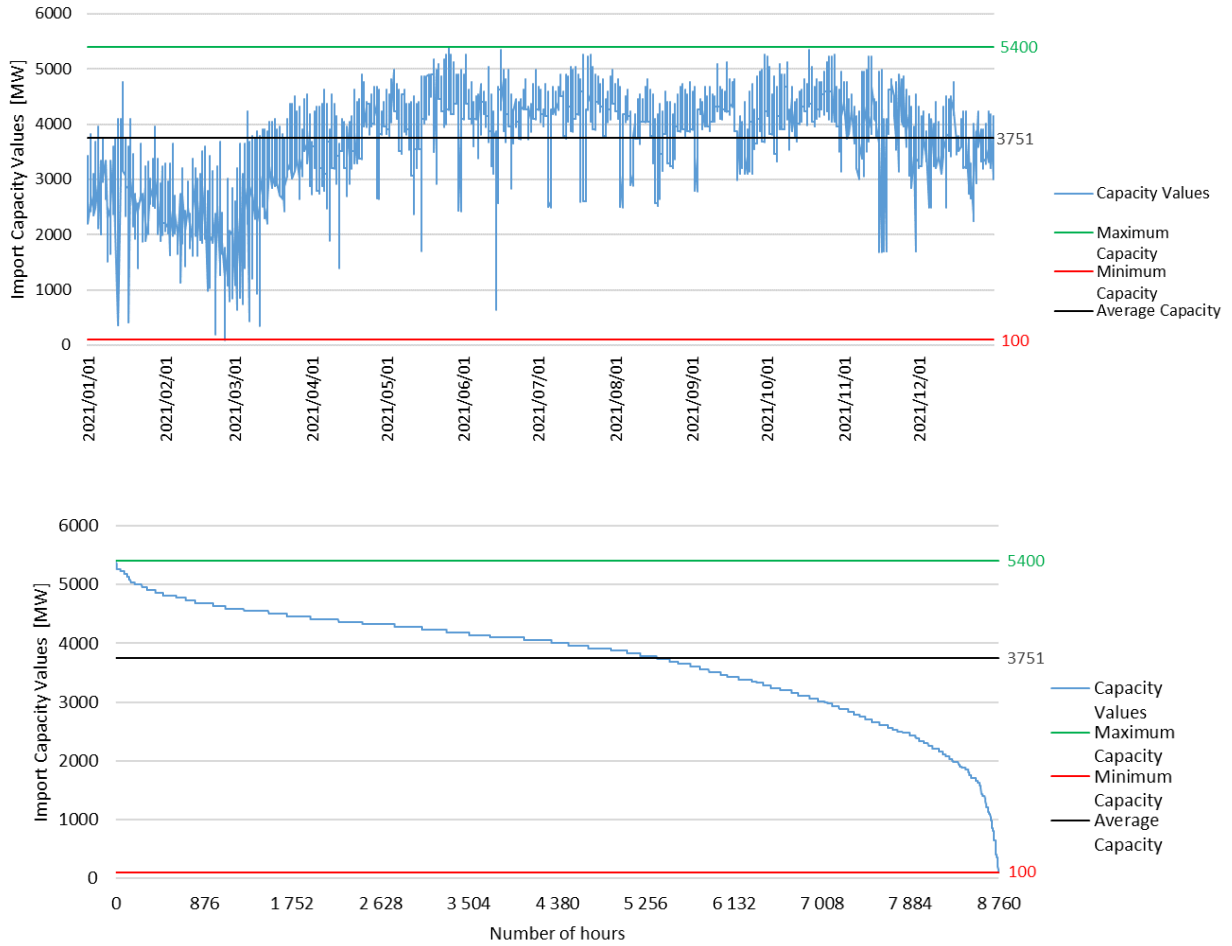


Source: REN and OMIE data

## 2.4 ANALYSIS OF YEAR 2021

In 2021, the hourly values of the interconnection capacity available for commercial purposes were the ones shown in the following figures.

Figure 2-5 – Hourly values of interconnection capacity available for commercial purposes in 2021 – Import



Source: REN data

Figure 2-6 –Hourly values of interconnection capacity available for commercial purposes in 2021 – Export



Source: REN data

Through the analysis of these values, it is possible to verify that they are naturally concentrated around their average value, which is around 3751 MW for import and 3020 MW for export. Although there is no occurrence of null values, in some rare occasions extremely low values were recorded, as is the case of 100 MW in the import direction or values around 450 MW in the export direction.



#### 2.4.1 INTERCONNECTION CAPACITY – MAXIMUM, MINIMUM AND AVERAGE VALUES

Analysing the available data<sup>6</sup> regarding the capacities made available to the market, in 2021, it was possible to verify that in the import direction the maximum capacity was 5400 MW, having been recorded between 10 am and 11 am on 26 May 2021. The minimum capacity value recorded was 100 MW, having been recorded between 4 pm and 6 pm on 25 February 2021.

Regarding the export direction, the maximum capacity was 4500 MW, recorded between 5 am and 7 am on 6 January 2021 and between 10 am and 11 am on 24 December 2021. The minimum capacity value was 450 MW, recorded between 7 am and 11 am on 31 May 2021.

In terms of average capacity values, they were of 3751 MW in the import direction and 3020 MW in the export direction. In relation to the previous year an increase of the average capacity values was observed both in the import (2970 MW in 2020) and export direction (2925 MW in 2020).

#### 2.4.2 INTERCONNECTION CONGESTION ANALYSIS

One of the most relevant indicators to assess interconnection performance is the number of hours of congestion verified.

In 2021, there was interconnection congestion in 230 hours out of a total of 8760 hours, which represents only 2.6% of the total.

Analysing by period of the day, it was found that the highest number of interconnection congestion hours occurred between 8 am and 9 am, with the highest incidence at 9 am (44 congested hours in 2021).

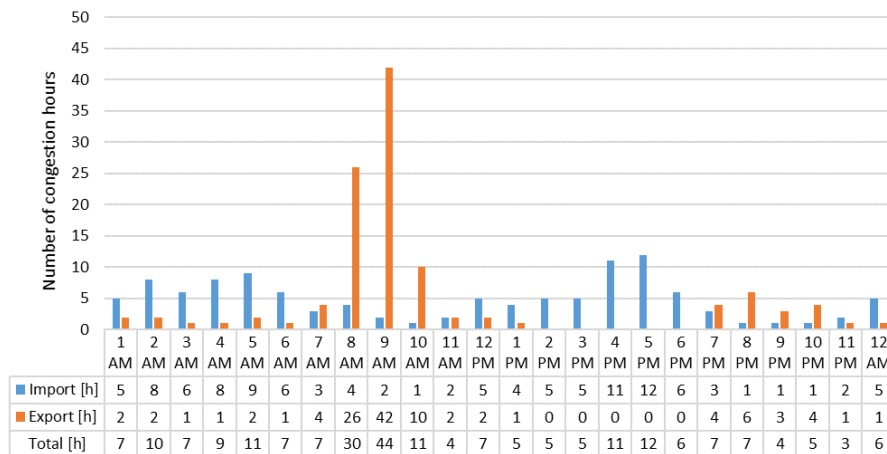
Carrying out the same analysis, but disaggregating the results by import and export direction, it was found that between 2 pm and 6 pm all congestion hours were in the import direction. Between 7 am and 10 am and between 7 pm and 10 pm, there was congestion mainly in the export direction, and, finally, between 11 pm and 6 am and between 12 pm and 1 pm, the congestion was mainly in the import direction. The

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<sup>6</sup> Data available in: <https://mercado.ren.pt/PT/Electr/Explora%C3%A7%C3%A3odosistema/Interlig/CapProg/Paginas/Mercado.aspx>

number of hours of congestion observed at 11 am throughout the year was equal both in the import and export direction.

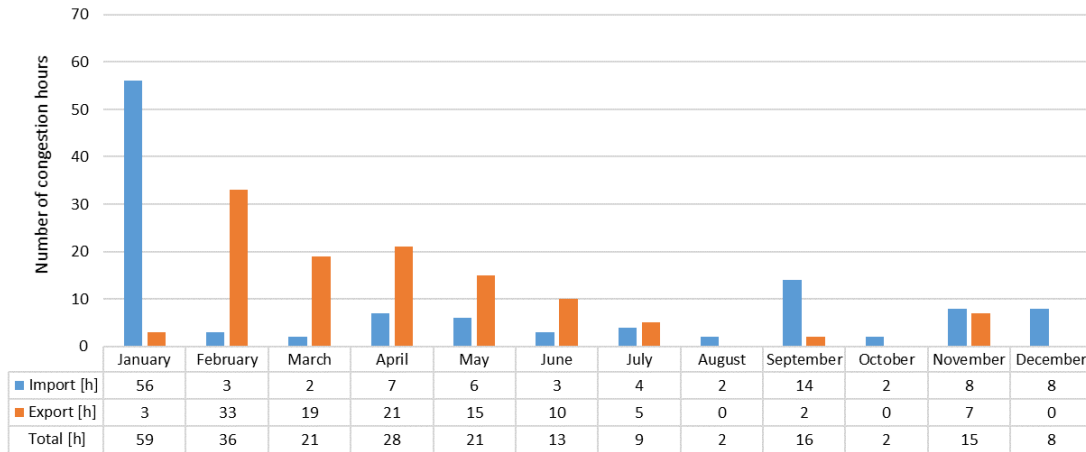
Figure 2-7 – Number of interconnection congestion hours, in 2021



Doing a similar analysis by month of the year, we see that the interconnection congestion hours were concentrated mainly in the first five months of the year, with the highest number of congestion hours in January (59 hours) and the lowest number of hours of congestion in the months of August and October (2 hours).

Evaluating separately import and export situations, it was found that between February and July interconnection congestion was mostly verified in the export direction, while in the remaining months it was mostly in the import direction.

Figure 2-8 – Number of interconnection congestion hours, by month, in 2021



### 2.4.3 ANALYSIS OF PRICE DIFFERENCES IN CONGESTION SITUATION (MARKET SPLITTING)

Analysing the price differences between Portugal and Spain<sup>7</sup>, which occurred in a situation of interconnection congestion, it can be seen that the biggest price difference in the import direction (price in Portugal higher than the price in Spain) was 64.87 €/MWh, recorded at 5 pm on 18 July 2021. On the other hand, the biggest price difference in the export direction (price in Spain higher than the price in Portugal) was 33.35 €/MWh, recorded at 11 pm on 20 February 2021. These values represent an increase in the maximum price difference values, in both directions, to approximately the triple in relation to 2020 (from 19.02 €/MWh to 64.87 €/MWh in the import direction and from 10.62 €/MWh to 33.35 €/MWh in the export direction).

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

One may observe that all interconnection congestion situations occurred for NTC values between 150 MW and 4410 MW.

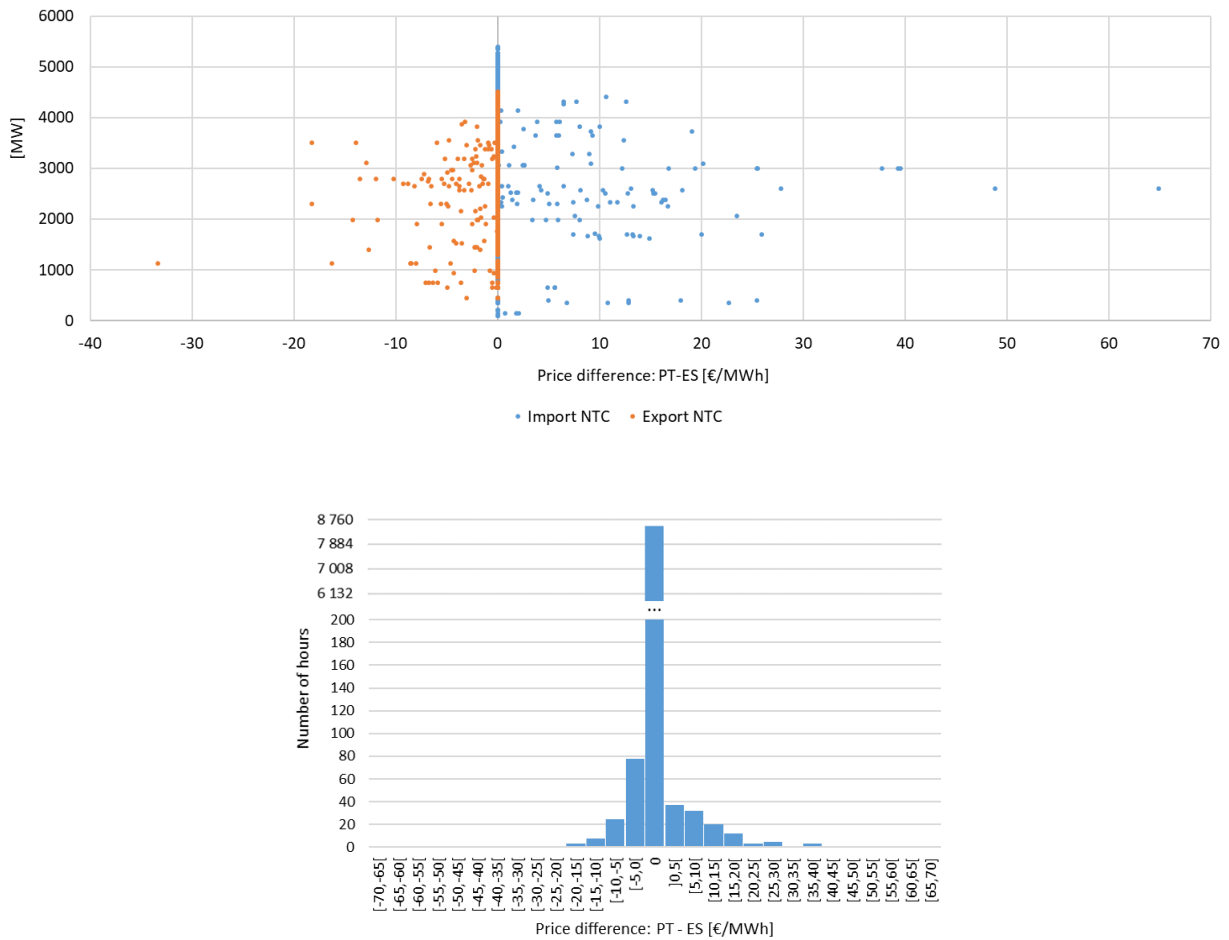
The highest price difference in the import direction (64.87 €/MWh) occurred for a NTC value of 2600 MW.

<sup>7</sup> <https://www.mercado.ren.pt/PT/Electr/InfoMercado/InfOp/MercOmel/Paginas/Precos.aspx>

In the export direction the highest price difference (33.35 €/MWh) occurred for a NTC value of 1125 MW.

Analysing the available data, it is also noticeable that there is no significant correlation between the values of capacity made available for commercial purposes and the congestion of the interconnection, seeing that the largest number of congestion situations (and even the highest price differences) did not occurred for the lowest NTC values.

Figure 2-9 – Comparison between NTC and price differences in the market



Source: REN and OMIE data

Knowing that during 97.4% of the 8760 hours in 2021 there was no interconnection congestion, with the consequent zero price differential between Portugal and Spain, it is also worth highlighting that this

percentage increases to 98% when considering a price differential lower than or equal to 2 €/MWh (price differential higher than 2 €/MWh only in 173 hours).

### **3 MONITORING OF THE COMPLIANCE WITH THE MINIMUM LEVEL OF MARGIN AVAILABLE FOR CROSS-ZONAL TRADE (ARTICLE 16(8) OF REGULATION (EU) 2019/943)**

#### **3.1 FRAMEWORK**

##### **3.1.1 LEGAL CONTEXT**

The obligation to monitor the compliance with the minimum level of available capacity for cross-zonal trade is part of the legal and regulatory context already referred to in Chapter 1.

##### **3.1.2 DEROGATION REQUESTS**

In order to facilitate a progressive compliance with the aforementioned minimum level of available capacity for cross-zonal trade by Member States, Article 16(9) of Regulation (EU) 2019/943 allows regulatory authorities to grant a derogation from the requirement set out in paragraph 8 of the same article, in relation to the minimum interconnection capacity offered, at the request of the transmission system operators:

“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.”

In 16 October 2020, ERSE received from REN, in its capacity as the Portuguese TSO, a second request for a one-year derogation to comply with the minimum level of MACZT<sup>8</sup>.

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<sup>8</sup> MACZT – Margin Available for Cross-Zonal Trade

This new derogation request was justified on the basis of operational security issues of the system and on the additional risks that could be introduced by the new processes and tools needed in order to provide higher interconnection capacities to the market.

According to REN, at the process level, the difficulties would mainly be related to the more frequent use of costly remedial actions, having in mind the lack of operational experience in processes with intensive use of these type of actions, which could lead to operational security risks.

Regarding the new tools to develop and use, REN, identified that on 1 January 2021, the necessary tools to evaluate if the minimum level of interconnection capacity was met, and if not, to calculate the additional capacity needed, would still not be available.

The derogation request for 2021 included the following clauses:

- a) REN committed to offer in 70% of the hours of the year covered by the derogation, at least the minimum capacity needed in order to comply with the minimum level of MACZT;
- b) During the derogation period, the RCC (Regional Coordination Centre) and the SWE<sup>9</sup> (South-West Europe) TSOs must:
  - i. Develop a regional validation tool, which will allow the RCC to identify cases where the available remedial actions are sufficient to achieve the required capacity values while ensuring security of supply;
  - ii. Finalize and put into service the regional monitoring of the compliance with the minimum level of MACZT;
  - iii. Finalize the development and put into service the intraday capacity calculation, as well as the implementations related to the data collection foreseen in article 82 (4) of CACM<sup>10</sup> Regulation, and also starting the development of the long term capacity calculation;

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<sup>9</sup> SWE Region: South-West Europe Region composed by Portugal, Spain and France.

<sup>10</sup> Commission Regulation (EU) 2015/1222, of 24 July 2015, that establishes a guideline on capacity allocation and congestion management.

- iv. Analyse the need to update the SWE capacity calculation methodology, in accordance to the provisions of Regulation (EU) 2019/943, and, if needed, submit a proposal for approval by the respective regulatory authorities;
- v. Study the technical and regulatory framework to allow, if needed, the use of costly remedial actions, namely counter trading and coordinated redispatching.

After the analysis of the derogation request described above, it was approved by ERSE on 22 December 2020.

### 3.1.3 MONITORING OF THE COMPLIANCE WITH THE MINIMUM LEVEL OF MACZT

For the monitoring of the compliance with the minimum level of MACZT, the methodology used in this report was the one described in detail in ERSE's report "Analysis of Portugal-Spain interconnection capacity and monitoring of compliance with the minimum level of margin available for cross-zonal trade in 2020"<sup>11</sup>, that was based on ACER's Recommendation 01/2019<sup>12</sup>.

In this report ERSE also follows, to the extent applicable, the provisions of ACER's Practical Note on monitoring the margin of capacity available for cross-zonal trade<sup>13</sup>.

### 3.1.4 ANALYSED PERIOD

The period of analysis considered in this report was the entire year of 2021.

As mentioned in point 3.1.2, ERSE accepted a request for a one year derogation by REN to comply with the minimum MACZT level.

In this context, it is ERSE's responsibility to follow up and monitor the evolution of the level of interconnection capacity made available for cross-zonal trade and the progress towards compliance with

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<sup>11</sup> <https://www.erse.pt/media/qp3fakz1/interconnection-and-maczt-monitoring-report-2020.pdf>

<sup>12</sup> [https://documents.acer.europa.eu/Official\\_documents/Acts\\_of\\_the\\_Agency/Recommendations/ACER%20Recommendation%2001-2019.pdf](https://documents.acer.europa.eu/Official_documents/Acts_of_the_Agency/Recommendations/ACER%20Recommendation%2001-2019.pdf)

<sup>13</sup> [https://extranet.acer.europa.eu//Official\\_documents/Acts\\_of\\_the\\_Agency/Publication/ACER%20and%20NRAs%20practical%20note%20MACZT.pdf](https://extranet.acer.europa.eu//Official_documents/Acts_of_the_Agency/Publication/ACER%20and%20NRAs%20practical%20note%20MACZT.pdf)



the established minimum level, as well as the assessment of the compliance with the objectives of the derogation.

### 3.1.5 DATA USED

In this report two sets of data were used.

The data relating to the calculations for the first quarter of 2021 were provided to ERSE by ACER, similarly to what happened for the 2020 report.

On the other hand, and seeing that, in accordance with the provisions of the derogation approved for 2021, Coreso<sup>14</sup>, as of 1 April 2021, had at its disposal the tools to carry out the necessary calculations, from that date and until the end of 2021, data from the calculations made by Coreso were used. These data were made available by REN.

## 3.2 RESULTS

### 3.2.1 GLOBAL RESULTS

Figure 3-1 demonstrates the level of compliance with the minimum MACZT level  $\frac{MACZT}{F_{max}^{15}} \geq 70\%$  during 2021.

As can be seen, the minimum MACZT<sup>16</sup> level was complied with only for 55.9% of the MTUs<sup>17</sup> (green area in the figure).

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<sup>14</sup> RSC - Regional Security Coordinator, responsible for the SWE interconnection capacity calculation.

<sup>15</sup> Fmax – Represents the maximum flow on a critical network element, as referred to in Articles 23(3)(a) and 29(7)(a) of the CACM Regulation and applies equally to the flow-based and coordinated NTC approaches. It also means the capacity respecting operational security limits taking into account (or after deduction of) contingencies of critical network elements as referred to in Article 16(8) of Regulation (EU) 2019/943.

<sup>16</sup> The assessment of the compliance with the minimum MACZT level is carried out for each hour, separately in both directions of the considered border, meaning that, in reality, the number of cases expected to be evaluated is equal to 2 times the number of hours of the considered period.

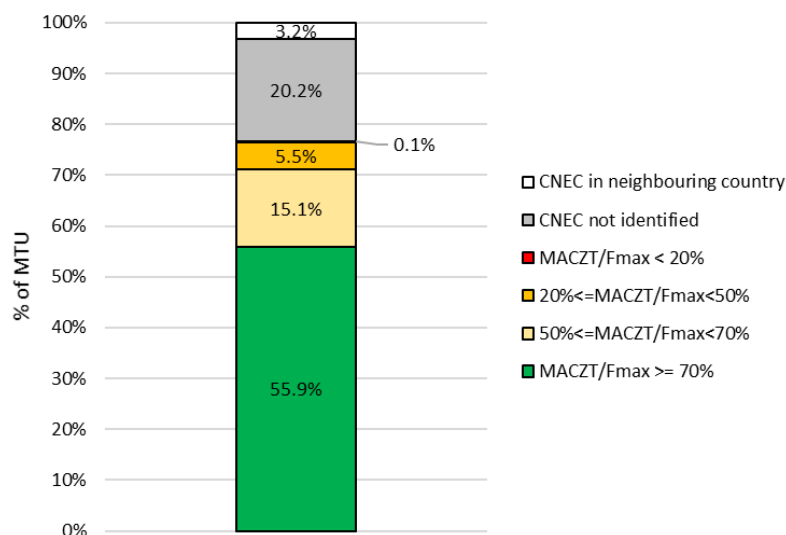
<sup>17</sup> MTU –Market Time Unit. In this context, it also represents a specific hour and direction of the considered border.

In 3.2% of the MTUs (white area of the figure) the identified CNEC did not belong to the Portuguese electrical system.

Of the MTUs for which it was possible to calculate the MACZT values, the minimum level was not met in 20.7% of them.

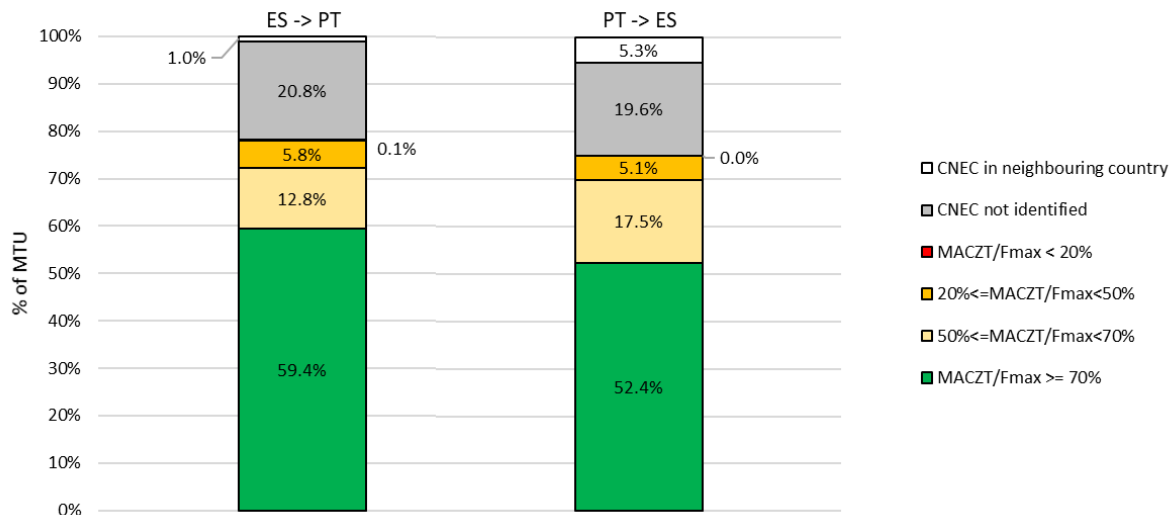
It is also possible to confirm that for about 20.2% of the MTUs (grey area in the figure) it was not possible to identify the CNEC and therefore it was also not possible to calculate the MACZT.

**Figure 3-1 – Compliance with the minimum MACZT level, in 2021, for both directions of the PT <-> ES border**



Compliance with the minimum MACZT level is evaluated for each hour, in each direction of the considered border. Analysing the two directions separately (PT -> ES and ES -> PT), for the total of hours of 2021, it is possible to verify that the performance was better in the ES -> PT direction, with the minimum MACZT level being met in 59.4% of the MTUs (52.4% in the PT -> ES direction), although there was a higher number of MTUs in which it was not possible to identify the limiting CNEC, 20.8% (19.6% in the PT -> ES direction).

Figure 3-2 – Compliance with minimum MACZT level, in 2021, in ES -> PT and PT -> ES directions



Taking into account the characteristics of the interconnections of the Portuguese electrical system with its neighbours, as well as its specific characteristics, accounting for the influence of third country flows or allocation constraints, in the calculation of these global results, was not considered applicable.

### 3.2.2 DETAILED ANALYSIS

The results presented above provide an overview of compliance with the minimum MACZT level, however, the available data allow a more detailed analysis of the degree of compliance of this minimum level.

Thus, starting again from the results for the total number of MTUs in 2021, it is possible to verify from Figure 3-3 that, although the minimum level was only met in 55.9% of the cases, in 15.1% of the cases the MACZT values were between 50% and 70% of the Fmax.

This finding suggests that, in some cases, a slight increase in the interconnection capacity made available to the market would allow compliance, in these MTUs, with the minimum MACZT level established.

Also, relating to the MTUs where the minimum MACZT level was not achieved, it is possible to verify by Figure 3-4 that the average MACZT/Fmax value was 55.8% for the total of these MTUs. Disaggregating by directions, Figure 3-5, shows that the average value was 53.9% in the ES -> PT direction and 57.4% in the PT -> ES direction.

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 (20.2% of the cases) contributed significantly to the non-compliance with the minimum level. As can be seen in Figure 3-3, the number of cases in which it was not possible to identify the limiting CNEC was almost equal to the number of cases in which the calculated MACZT was below 70% of the Fmax.

Those 20.2% of MTUs in which it was not possible to identify the CNEC were identified as cases of IT problems, problems with convergence of the capacity calculation tool or as situations in which the maximum generation capacity is reached without having been found a limiting CNEC (GLSK Limitation).

Isolating the situations of GLSK Limitation, a specific characteristic of the Portuguese system, it appears that they accounted for 7.5% of the MTU, thus representing a significant constraint on the compliance with the established minimum MACZT level.

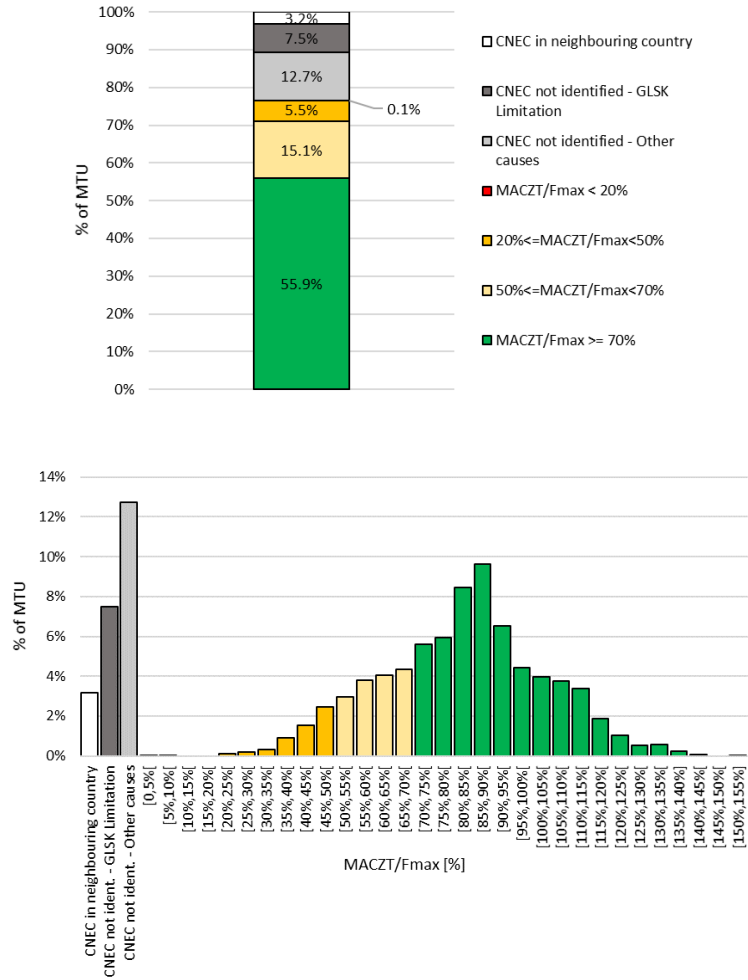
Regarding the remaining cases, and taking as examples situations that occurred in the third quarter of 2021, it is worth noticing the non-identification of CNEC for four full days:

- July 6<sup>th</sup> – Problems with the input data led to a global failure of the tool's calculation process
- July 20<sup>th</sup> – Problems with the network models led to a global failure of the tool's calculation process
- August 8<sup>th</sup> – Calculations performed correctly, however, during the validation phase an operator mistake led to the consideration of long-term NTC<sup>18</sup> values for all borders;
- September 3<sup>rd</sup> – An event, external to Coreso, led to the failure of its internet services. Due to the lack of time to complete the calculations, the global system failure process was activated and the long-term NTC values applied to all borders and directions.

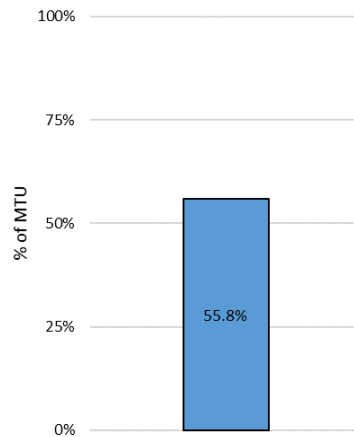
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<sup>18</sup> NTC – Net Transfer Capacity.

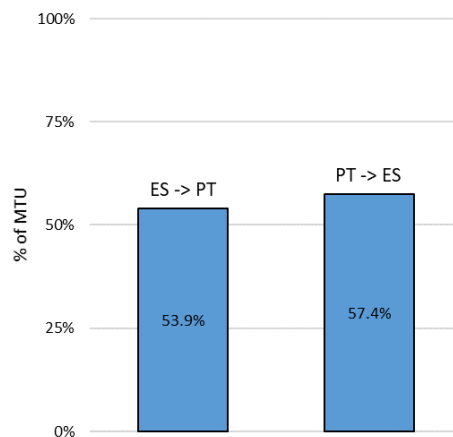
Figure 3-3 – MACZT tiers, in 2021, in both directions of the PT <-> ES border



**Figure 3-4 – Average MACZT/Fmax value for the total number of MTUs where the minimum MACZT level was not achieved, in 2021**



**Figure 3-5 – Average MACZT/Fmax value for the total of MTUs where the minimum MACZT level was not achieved, for each direction, in 2021**



Thus, it can be seen that, in order to achieve the objective of complying with the minimum MACZT level established in 100% of the MTUs, it will be necessary to progressively and significantly reduce the number of MTUs for which it is not possible to identify the limiting CNEC.

ERSE approved, on 1 February 2022, and after agreement between the SWE national regulatory authorities, the amendment of the methodology<sup>19</sup> for the calculation of the interconnection capacity available for commercial purposes on the daily and intraday timeframes, proposed by the SWE TSOs. In this context, the amended methodology included mechanisms and procedures that aim to reduce or eliminate situations of GLSK Limitation.

Regarding the remaining situations in which it is not possible to identify the limiting CNEC, the amended methodology also includes fallback procedures that aim to make it possible to monitor compliance with the minimum MACZT level. However, the methodology foresees an experimental period for the use of these procedures. Its use will only be acceptable for a very small percentage of MTUs, which is why it is essential that there is a very significant decrease in these situations from the outset.

Through the available data, it is also possible to verify which CNE<sup>20</sup> was identified for each MTU and thus disaggregate the results by CNE.

Table 3-1 lists the 13 CNE identified as responsibility of the Portuguese electrical system.

In fact, three of the identified CNEs, 10T-ES-PT-10004U, 10T-ES-PT-00008S and 10T-ES-PT-00005Y, represented 84.3% of the MTUs in which it was possible to identify a CNE, being, therefore, those that contributed the most to the overall result.

CNE 10T-ES-PT-10004U and CNE 10T-ES-PT-00005Y concern the two 400 kV Alto Lindoso – Cartelle interconnection lines (Alto Lindoso – Cartelle 1 and Alto Lindoso – Cartelle 2, respectively). Analysing these two CNEs separately, a different behaviour can be observed. For CNE 10T-ES-PT-10004U (the most representative) the minimum MACZT level was met in 72% of the cases. On the other hand, the CNE 10T-ES-PT-00005Y, although significantly less representative, presented a much lower performance, having fulfilled the MACZT minimum level in only 27% of the cases.

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<sup>19</sup> [https://www.erse.pt/media/a02fe4kw/swe-ccm-amendment\\_january2022\\_clean.pdf](https://www.erse.pt/media/a02fe4kw/swe-ccm-amendment_january2022_clean.pdf)

<sup>20</sup> CNE – Critical Network Element

CNE 10T-ES-PT-00008S, which concerns the Lagoaça – Aldeadávila interconnection, represented around 32.9% of the cases, being the second most representative. For these MTUs, the minimum MACZT level was met in 96% of the cases, having performed well above the previous ones.

Considering only the data for the MTUs in the table below, it can be seen that the CNE was an internal element of the Portuguese electrical system in 11% of the MTUs, having complied with the MACZT minimum level in 84% of these situations, and that the CNE was an interconnection in 89% of these MTUs, having complied with the minimum MACZT level in 72% of these situations. Analysing only the MTUs for which the CNE was identified as a responsibility of the Portuguese electrical system, the minimum MACZT level was met in 73% of the MTUs, thus reinforcing the idea that to meet the established objectives it will be essential to significantly reduce the number of times in which it is not possible to verify compliance with the minimum MACZT level because the limiting CNEC has not been identified.

**Table 3-1 – Results disaggregated by CNE identified as responsibility of the Portuguese electrical system**

CNE		No. CC MTU	% of total CC MTU	MACZT ≥ 70% Fmax	MACZT < 70% Fmax
<b>10T-ES-PT-000015</b>	Pocinho - Aldeadávila 2 220 kV	1	0.01%	100%	0%
<b>10T-ES-PT-000023</b>	Pocinho - Aldeadávila 1 220 kV	4	0.03%	100%	0%
<b>10T-ES-PT-000031</b>	Alqueva - Brovales 380 kV	26	0.19%	100%	0%
<b>10T-ES-PT-00005Y</b>	Alto Lindoso - Cartelle 2 380 kV	2353	16.83%	27%	73%
<b>10T-ES-PT-00006W</b>	Falagueira - Cedillo 400 kV	140	1.00%	17%	83%
<b>10T-ES-PT-00007U</b>	Pocinho - Saucelle 220 kv	15	0.11%	53%	47%
<b>10T-ES-PT-00008S</b>	Lagoaça - Aldeadávila 400kV	4600	32.91%	96%	4%
<b>10T-ES-PT-10004U</b>	Alto Lindoso - Cartelle 1 380 kV	4832	34.57%	72%	28%
<b>16TLAMMLGC-----S</b>	Armamar - Lagoaça 400 kV	1330	9.51%	90%	10%
<b>16TLPGFR-----9</b>	Pego - Falagueira 400 kV	38	0.27%	8%	92%
<b>16TLPNAMM1-----E</b>	Pocinho - Armamar 1 220 kV	160	1.14%	56%	44%
<b>16TLRARR2-----I</b>	Recarei - Riba d'Ave 2 400 kV	6	0.04%	0%	100%
<b>16TLRMAM-----E</b>	Rio Maior - Alto Mira 400 kV	7	0.05%	0%	100%

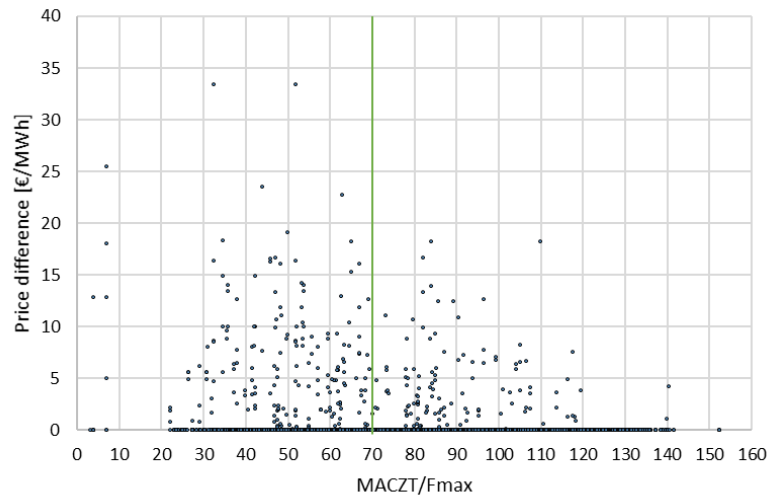
Finally, the figure below compares the hours when interconnection congestion occurred (price difference value, between Portugal and Spain, different from zero) with the MACZT values calculated for those hours (in each direction when possible).

Analysing the available data, it is possible to verify that in 61% of the MTUs where there was interconnection congestion, the MACZT values were lower than the defined minimum level. However,



regarding the values of the price difference between Portugal and Spain, it is not possible to find a relevant correlation between them and the MACZT values calculated for each MTU.

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



### 3.2.3 NTC VALUES REQUIRED TO MEET THE MINIMUM MACZT LEVEL

Using the available data and the MACZT calculation formulas, it is possible, assuming that the assumptions of identification of the limiting CNEC were maintained, to calculate the value of NTC necessary to verify the following condition for each MTU:

$$MACZT = 70\% Fmax$$

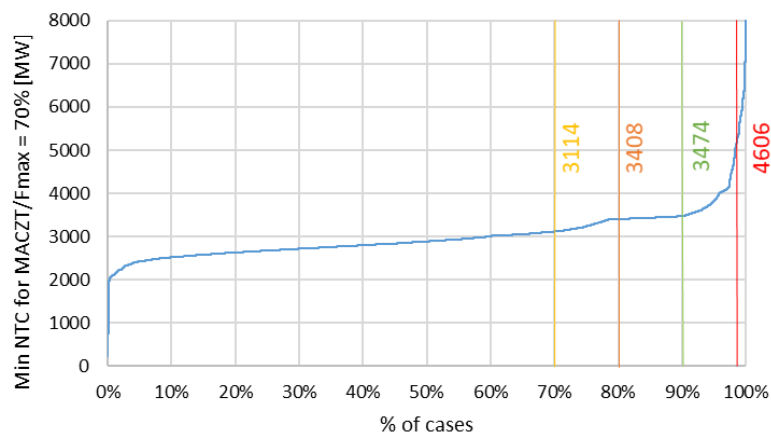
Thus ensuring compliance with the minimum MACZT level for all MTUs.

Figure 3-7 summarises the results obtained.

Notwithstanding the fact that there is no data for the total of MTUs of 2021, and excluding a small set of cases in which the results obtained were considered to be out of step with reality (in which the minimum necessary values obtained were above the maximum existing interconnection capacity), it was possible to conclude that:

- If the NTC had been equal to or greater than 3114 MW, at all times, both in the export and import directions, compliance with the MACZT minimum level would have been guaranteed in 70% of the MTUs;
- If the NTC had been equal to or greater than 3408 MW, at all times, both in the export and import directions, compliance with the MACZT minimum level would have been guaranteed in 80% of the MTUs;
- If the NTC had been equal to or greater than 3474 MW, at all times, both in the export and import directions, compliance with the MACZT minimum level would have been guaranteed in 90% of the MTUs;
- Finally, in order to determine the necessary value to guarantee compliance with the minimum MACZT level in 100% of the cases, it will be necessary to study in more depth the cases considered inadequate, however if the NTC had been equal to or greater than 4606 MW, at all times, both in the export and import directions, compliance with the MACZT minimum level would have been guaranteed in 98% of cases.

Figure 3-7 – Minimum NTC for MACZT = 70%Fmax



### **3.3 COMPLIANCE WITH THE DEROGATION FOR 2021**

As explained in point 3.1.2, upon approval of the derogation request, made by REN, for the compliance with the MACZT minimum level in 2021, a set of commitments to be fulfilled by REN was established.

Analysing the compliance with the commitments established in the approved derogation request, REN, together with Coreso and the remaining SWE TSOs:

1. Finalised the regional validation tool, which will allow the RCC to identify cases where the remedial actions available are sufficient to achieve the required capacity values while ensuring security of supply;
2. Finalised and put into service the regional monitoring of compliance with MACZT minimum level;
3. Is on the process of completing the development and put into service the intraday capacity calculation, as well as the implementations related to the data collection foreseen in the article 82 (4) of the CACM;
4. Developed an amendment proposal for the SWE capacity calculation methodology, in accordance with the provisions of Regulation (EU) 2019/943, which was approved by ERSE on 1 February 2022.

Regarding the fulfilment of the derogation objective related to the degree of compliance with the minimum MACZT level, and according to the results shown in the previous points, it is possible to conclude that it was below the established (compliance with the minimum MACZT level in 70% of MTUs), with the following distribution for all MTUs:

- Compliance with the minimum MACZT level in 55.9% of the MTUs;
- Non-compliance with the minimum MACZT level in 20.7% of the MTUs;
- In 3.2% of the MTUs the identified CNEC did not belong to the Portuguese electrical system;
- In 20.2% of the MTUs it was not possible to identify the limiting CNEC.

## 4 CONCLUSIONS

According to European Regulation, the assessment of the compliance with the minimum MACZT level is the responsibility of the regulatory authority of each Member State

After a first monitoring exercise for 2020, and taking into account the commitments assumed by REN in the derogation request for 2021, approved by ERSE, this report aims to assess the level of compliance with these commitments.

In this regard, the main conclusions of this report are:

- In 2021, the minimum MACZT level was observed in 55.9% of the MTUs in the Portugal-Spain border;
- In the export direction (PT->ES) the minimum MACZT level was observed in 52.4% of the MTUs;
- In the import direction (ES->PT) the minimum MACZT level was observed in 59.4% of the MTUs;
- In general, the objectives of the derogation related to the development of tools and methodologies for calculating and monitoring the available capacity for cross-zonal trade were fulfilled, with only one of these objectives remaining to be completed, the one related to the calculation of the intraday capacity;
- The degree of compliance with the minimum MACZT level was below the commitment assumed by REN in the derogation request for 2021 (compliance with the minimum MACZT level in 70% of the MTUs).



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