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ENTIDADE REGULADORA
DOS SERVIÇOS ENERGÉTICOS

REPORT

MONITORING OF THE COMPLIANCE WITH MACZT MINIMUM LEVELS

2020

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REPORT

Analysis of Portugal-Spain interconnection capacity and monitoring of compliance with the minimum level of margin available for cross-zonal trade in 2020

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1 INTRODUCTION

In the current context of energy transition, the objectives and targets imposed by the National Energy and Climate Plan 2021-2030 (PNEC 2030) and the Roadmap for Carbon Neutrality 2050 (RNC 2050), as well as the intention to implement the internal electricity market European Union, make interconnection capacity a key part of 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 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, which included Portugal. 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[2] 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;

[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

(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[3] 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 is intended, 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 limits 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 Code of Administrative Procedure, ERSE notified REN, the Portuguese TSO, so that, if it wanted, to 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 2020".

REN sent its comments to the draft report on 15 December 2021.

ERSE took good note of REN's comments, having made some clarifications in terms of the text, however they did not lead to any change in 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 THE INTERCONNECTION PORTUGAL - SPAIN

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 6 lines at 400 kV and 3 lines at 220 kV, in a total of 9 interconnection lines, identified below.

Figure 2-1 – Interconnection lines between Portugal and Spain

Lines
Lines at 400 kV:
Alto Lindoso – Cartelle 1
Alto Lindoso – Cartelle 2
Lagoaça – Aldeadávila
Falagueira – Cedillo
Alqueva – Brovales
Tavira – Puebla de Guzman
Lines at 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, whose 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

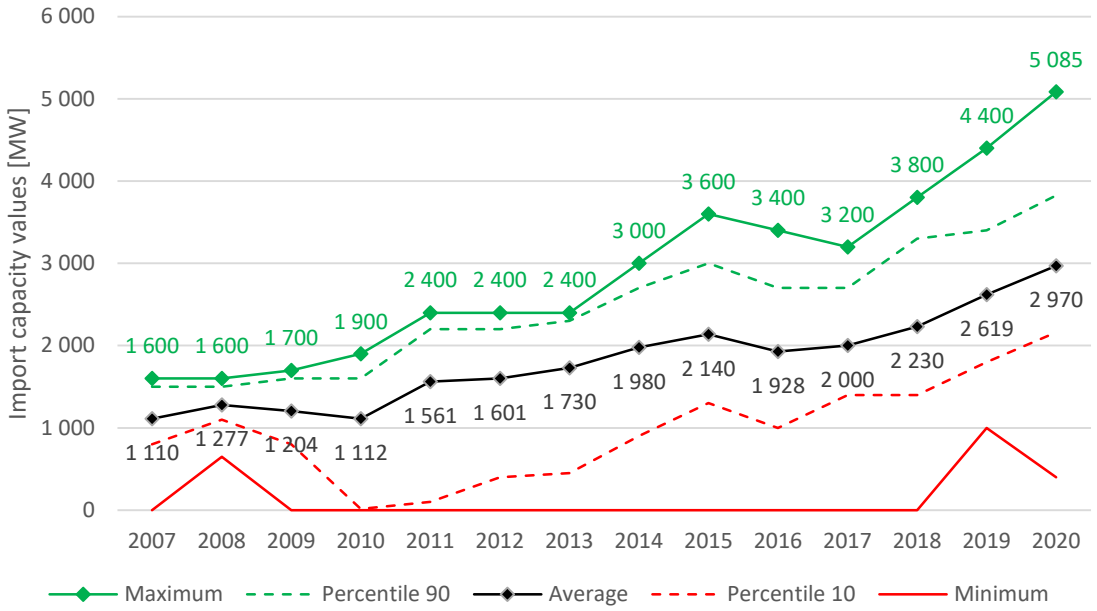
Lines	Minimum thermal capacity [MVA]
Lines at 400 kV:	
Alto Lindoso – Cartelle 1	1477
Alto Lindoso – Cartelle 2	1477
Lagoaça – Aldeadávila	1469
Falagueira – Cedillo	1386
Alqueva – Brovales	1280
Tavira – Puebla de Guzman	1386
Lines at 220 kV:	
Pocinho – Aldeadávila 1	374
Pocinho – Aldeadávila 2	374
Pocinho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

Source: REN - Characterization of Interconnections as at 31 December 2020

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 make up the interconnection is situated at 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 2020.

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

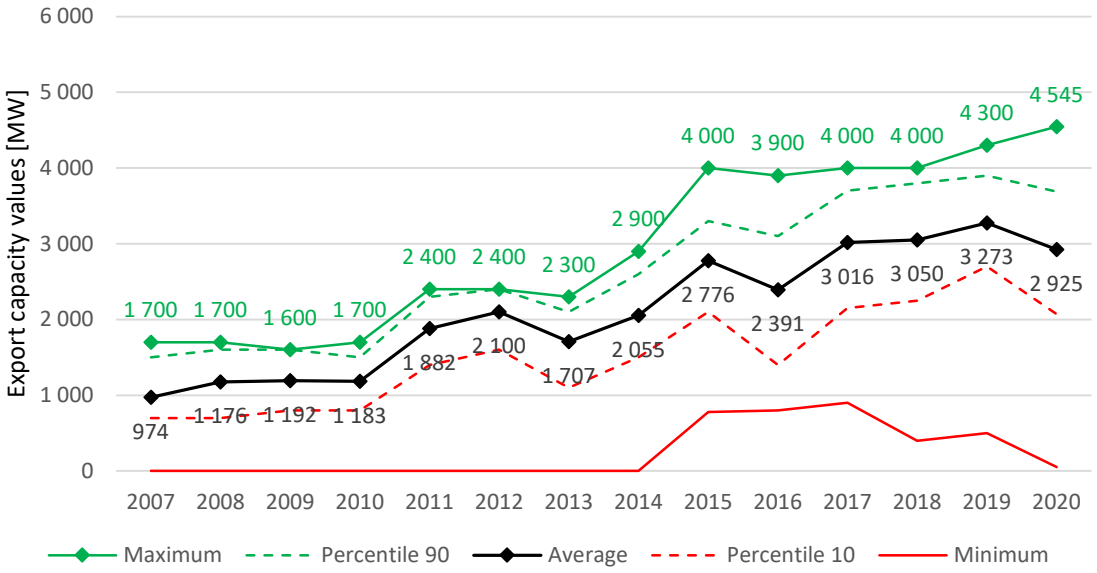


Source: REN and OMIE data

During the period under review, there was a regular increase in import capacity for commercial purposes, with particular emphasis on the increases observed in 2010, 2011, 2014, 2015 and from 2017 onwards, reaching a maximum value of 5085 MW in 2020, which practically triples the value of 1600 MW in 2007. In terms of average values, we observe an increase of 268% from 1110 MW in 2007 to 2970 MW in 2020. It should be noted that practically every year there is an occurrence of null values, despite the 1st decile[5] being close to the average value.

[5] The 1st decile is the cut-off point for the lowest 10% of the data, i.e. e., the 10th percentile.

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



Source: REN data

In terms of export capacity for commercial purposes, there was a less significant increase, with a slight reduction in the average value from 2019 to 2020. In the period under analysis, there was an increase in the maximum values from 1700 MW in 2007 to 4545 MW in 2020, an increase of 267%, and of the average values, an increase to 2925 MW, which tripled the value of 974 MW verified in 2007. In terms of the occurrence of null values, it is less frequent than that of imports, maintaining the 1st decile is close to the mean value.

2.3 EVOLUTION OF CONGESTION AND CONGESTION INCOME

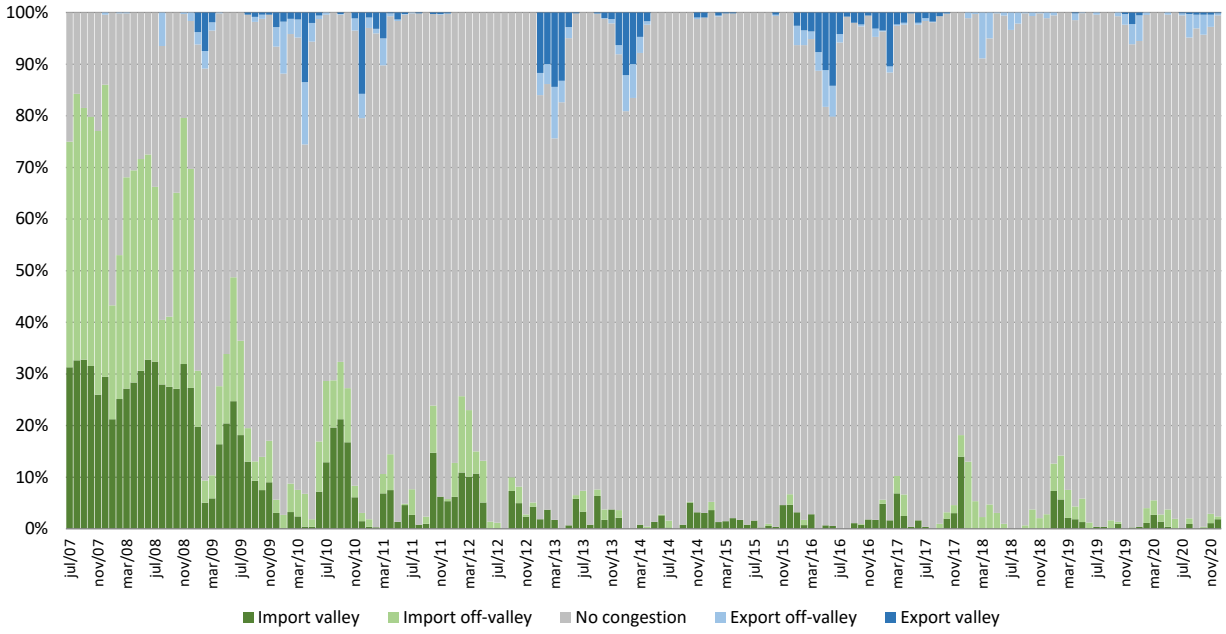
In 2020, congestion rents for the interconnections between Portugal and Spain, resulting from the difference in zonal prices after applying the market splitting, reached a total of 2.49 million euros, a value lower than that recorded in 2019 (4.07 million of euros). This evolution resulted from a reduction in the total number of hours in which the interconnection was congested, as well as the combination of the number of hours with the average value of the absolute price differential.

Translated into the total number of hours of congestion, the change went from 453 hours in 2019 to 358 hours in 2020 (in both directions of the interconnection) and reflects strong market integration.

In terms of the price differential, in 2020, there was a positive average spread of €0.03/MWh, in the import direction, below that recorded in 2019, also in the import direction, of €0.19/MWh. The values of the price differential remained reasonably low throughout the year, with a reversal 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 2020, making it possible to identify the reduction in the number of hours of congestion in both directions, but with the highest number of hours of congestion in the importing direction recorded in the 1st quarters of 2019 and 2020.

Figure 2-4 – Monthly percentage of congestion hours on the Portugal-Spain interconnection, 2007 to 2020

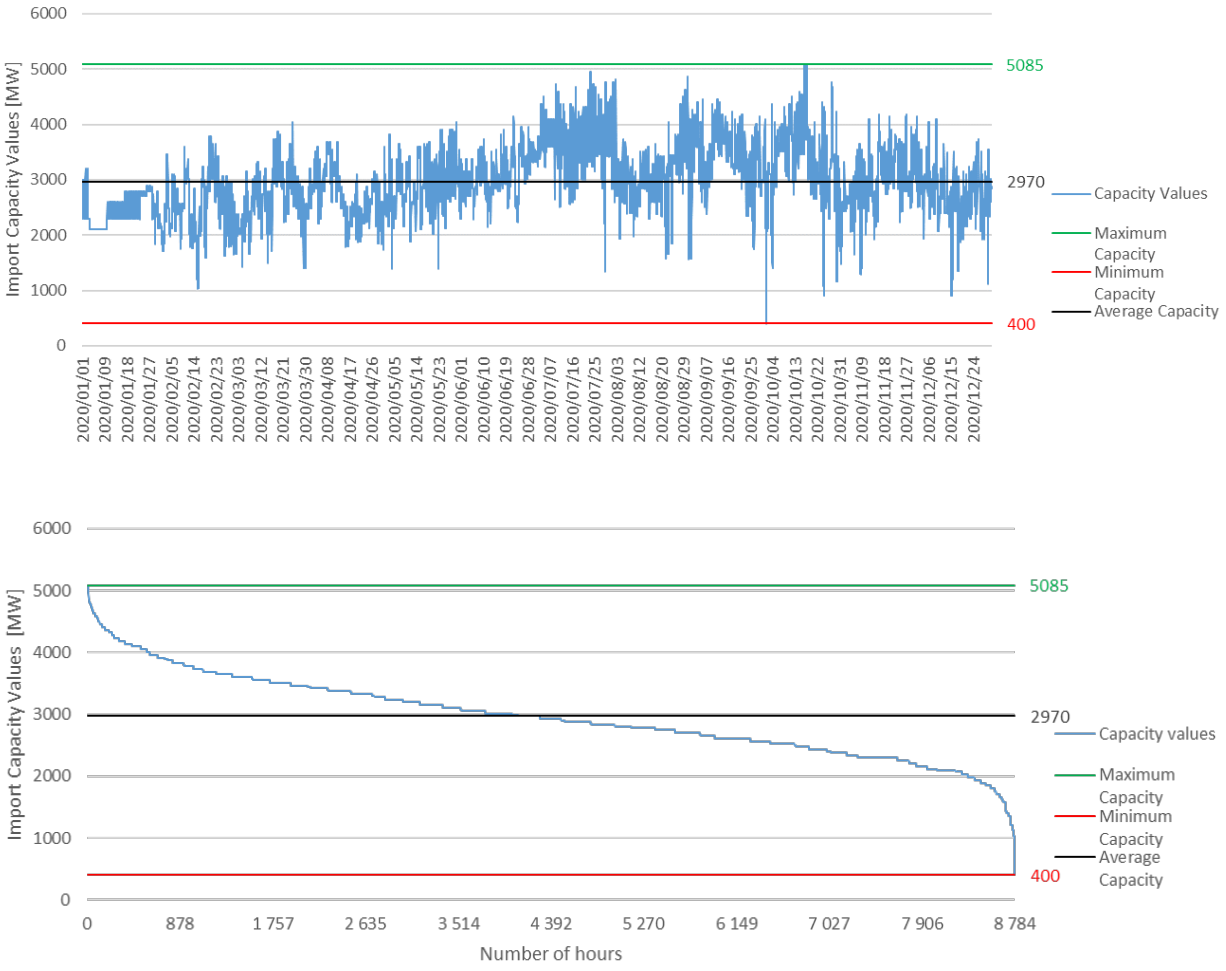


Source: REN and OMIE data

2.4 ANALYSIS OF YEAR 2020

In 2020, 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 2020 – Import



Source: REN

Figure 2-6 – Hourly values of interconnection capacity available for commercial purposes in 2020 – Export

Source: REN

Through the analysis of these values, it is possible to verify that they are naturally concentrated around their average value, which is around 3000 MW for import and 2900 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 400 MW in the import direction or values around 50 MW in the export direction.

2.4.1 INTERCONNECTION CAPACITY – MAXIMUM, MINIMUM AND AVERAGE VALUES

Analysing the available data[6] regarding the capacities made available to the market, in 2020, it was possible to verify that in the import direction the maximum capacity was 5085 MW, having been recorded between 4 pm and 6 pm on 17 October 2020 and at 1 pm and 3 pm on 18 October 2020. The minimum capacity value recorded was 400 MW, having been recorded at 6 am on 2 October 2020.

Regarding the export direction, the maximum capacity was 4545 MW, recorded between 5 am and 6 am on 14 December 2020 and the minimum was 50 MW, recorded at 10 pm on 27 February 2020.

In terms of average capacity values, they were of 2970 MW in the import direction and a of 2925 MW in the export direction.

2.4.2 INTERCONNECTION CONGESTION ANALYSIS

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

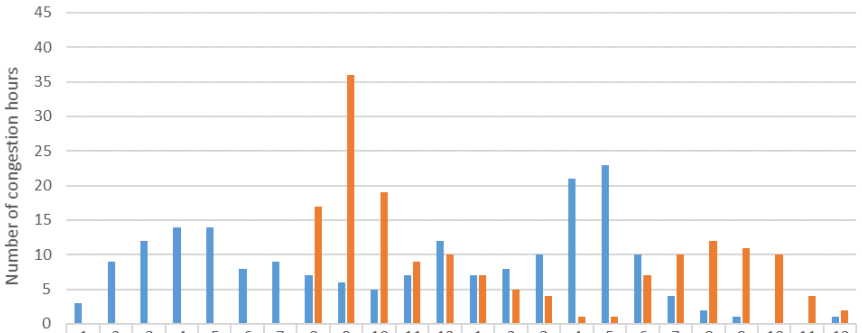
In 2020, there was interconnection congestion in 358 hours out of a total of 8784 hours, which represents only 4.1% of the total.

Analysing by period of the day, it was found that the highest number of interconnection congestion hours occurred between 8 am and 6 pm, with the highest incidence at 9 am (42 congested hours in 2020).

Carrying out the same analysis, but disaggregating the results by import and export direction, it was found that between 1 am and 7 am all congestion hours were in the import direction. Between 8 am and 11 am and between 7 pm and 12 am, there was congestion mainly in the export direction, and, finally, between 12 pm and 6 pm, the congestion was mainly in the import direction.

[6] Data available in: https://www.mercado.ren.pt/PT/Electr/InfoMercado/Interlig/CapProg/Paginas/Mercado.aspx

Figure 2-7 – Number of interconnection congestion hours, by hour of the day, in 2020

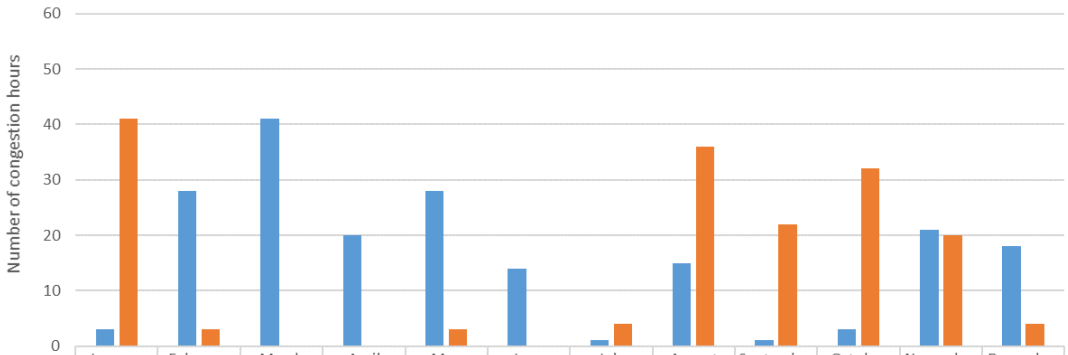


	1 AM	2 AM	3 AM	4 AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	12 PM	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	12 AM
Import [h]	3	9	12	14	14	8	9	7	6	5	7	12	7	8	10	21	23	10	4	2	1	0	0	1
Export [h]	0	0	0	0	0	0	0	17	36	19	9	10	7	5	4	1	1	7	10	12	11	10	4	2
Total [h]	3	9	12	14	14	8	9	24	42	24	16	22	14	13	14	22	24	17	14	14	12	10	4	3

Doing a similar analysis by month of the year it is not possible to identify a relevant pattern, with the lowest number of congestion hours recorded in July (5 hours) and June (14 hours) and the highest number of congestion hours in August (51 hours).

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

Figure 2-8 – Number of interconnection congestion hours, by month, in 2020



	January	February	March	April	May	June	July	August	September	October	November	December
Import [h]	3	28	41	20	28	14	1	15	1	3	21	18
Export [h]	41	3	0	0	3	0	4	36	22	32	20	4
Total [h]	44	31	41	20	31	14	5	51	23	35	41	22

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

Analysing the price differences between Portugal and Spain[7], 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 19.02 €/MWh, recorded at 17 pm on 16 February 2020. On the other hand, the biggest price difference in the export direction (price in Spain higher than the price in Portugal) was 10.62 €/MWh, recorded at 8 pm on 2 October 2020.

The price differences recorded for the majority of the congestion hours were very small, with the price difference being less than 5 €/MWh in 291 of the 358 interconnection congestion hours (81%).

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 1000 MW and 4000 MW.

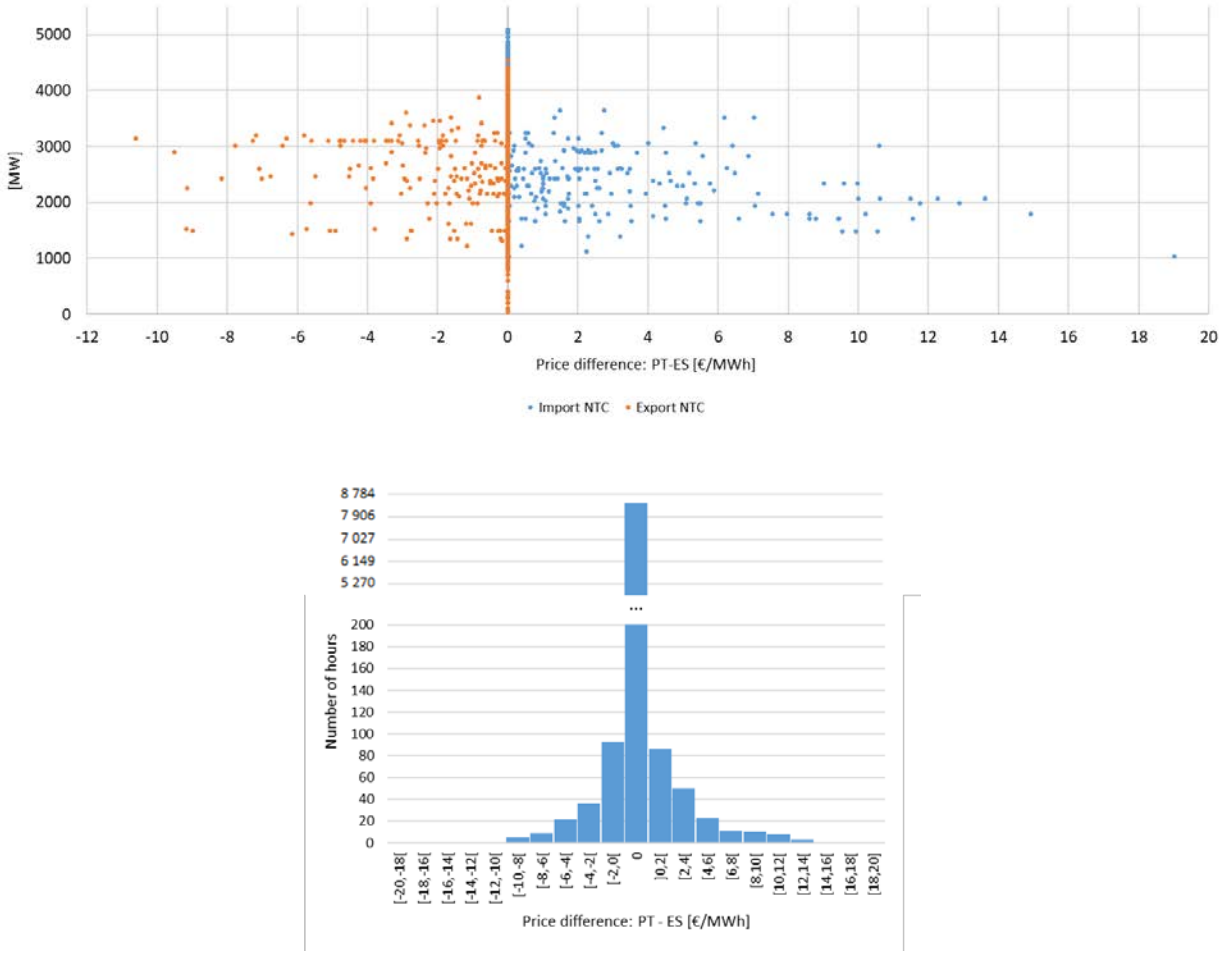
The highest price difference in the import direction (19.02 €/MWh) occurred for a NTC value of 1035 MW.

In the export direction the highest price difference (10.62 €/MWh) occurred for a NTC value of 3150 MW.

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

[7] https://www.mercado.ren.pt/PT/Electr/InfoMercado/InfOp/MercOmel/Paginas/Precos.aspx

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



Source: REN e OMIE

Knowing that during 95.9% of the 8784 hours in 2020 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.

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."

On 14 November 2019, REN – Rede Eléctrica Nacional, in its capacity as the Portuguese TSO, sent a request for a one-year derogation to comply with the requirement established in Article 16 of Regulation (EU) 2019/943, on the obligation of transmission system operators to make available, as of 1 January 2020, at least 70% of transmission capacity for cross-zonal trade respecting operational safety limits after deducting emergencies.

During this transition period, REN undertook to develop processes and tools that would allow to:

a) Monitor the margin made available for cross-zonal trades for all the Portuguese limiting network elements, as defined by ACER Recommendation n°01/2019 or with a future update of the regional capacity calculation methodology;

b) Validate the availability of corrective actions to ensure the minimum level defined by Regulation (EU) 2019/943;

REN would also use this period for its operators to acquire experience with these new processes and tools and to assess the possibility of implementing higher values of capacity margins for cross-zonal trade at the operation level.

There was also a commitment, by REN, to regularly report information on the implementation of these new processes, including, at the same time, data that allow monitoring the progress of compliance with the established minimum level of interconnection capacity.

This derogation request was approved by ERSE, and this approval was communicated to REN on 20 December 2019.

In this context, ERSE is responsible for following up and monitoring the evolution of the levels of interconnection capacity made available for cross-zonal trade and the compliance with the objectives established in the derogation.

3.1.3 ACER RECOMMENDATION NO. 01/2019

Pursuant to Article 6(2) of Regulation (EU) 2019/942[8], the European Union Agency for the Cooperation of Energy Regulators (ACER) may, on its own initiative, make recommendations to assist regulatory authorities and market participants in sharing best practices.

[8] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019R0942

In this sense, ACER published its Recommendation No. 01/2019[9], of 8 August 2019, on the implementation of the minimum margin available for cross-zonal trade pursuant to Article 16(8) of Regulation (EU) 2019/943, whit the objective to guide and advise TSOs in meeting the aforementioned minimum capacity objectives and regulatory authorities on best practices for harmonised and consistent monitoring of compliance with these objectives.

ERSE choses to follow in this report, to the extent applicable, the monitoring methodology expressed in ACER Recommendation No. 01/2019.

ACER Recommendation Nº 01/2019 definitions:

- CC MTU – Capacity calculation market time unit;
- CNE - Critical Network Element;
- CNEC (*Critical Network Element with Contingency*) – A CNE associated with a contingency used in capacity calculation. For the purpose Recommendation No. 01/2019, the term CNEC also covers the case where a CNE is used in capacity calculation without a specified contingency;
- Coordination Area – A set of bidding-zone borders within which capacity calculation is fully coordinated for the considered timeframe. A coordination area may also be a single bidding-zone border, or one side of a bidding-zone border in case two different NTC values are calculated by each TSO and the lower one is used for capacity allocation;
- Fmax – 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;

[9] https://documents.acer.europa.eu/Official_documents/Acts_of_the_Agency/Recommendations/ACER%20Recommendation%2001-2019.pdf

- MACZT – Margin Available for Cross-Zonal Trade, i.e. the portion of capacity of a CNEC available for cross-zonal trade;

- MCCC – Margin from Coordinated Capacity Calculation, i.e. the portion of capacity of a CNEC available for cross-zonal trade on bidding-zone borders within the considered coordination area;

- MNCC – Margin from Non-Coordinated Capacity Calculation, i.e. the portion of capacity of a CNEC available for cross-zonal trade on bidding-zone borders outside the considered coordination area;

- Oriented bidding-zone border – A given direction of a bidding-zone border (e.g. from Portugal to Spain);

- PTDF – Power Transfer Distribution Factor which describes the impact of a bidding-zone net position (the net sum of electricity exports and imports for each market time unit of a bidding-zone) or of a commercial exchange between two bidding-zones on a CNEC.

MACZT monitoring and application to the Portuguese case:

According to Recommendation No. 01/2019, the monitoring of MACZT values for a given MTU must comply with the following process. First, CNECs must be defined and assigned to a single TSO, Member State and to one or more coordination areas. The MCCC and MNCC must then be estimated for these CNECs.

The CNECs used to calculate the MACZT must be those that have been used to calculate the cross-zonal interconnection capacities for the time period and MTU considered[10].

As a principle, and to ensure transparency and consistency, the MACZT should be monitored in all CNECs used in the capacity calculation, regardless of whether the capacity calculation applies the flow-based or the coordinated NTC methodology. For the flow-based methodology, this principle implies monitoring all CNECs introduced by TSOs within the scope of the capacity calculation, including, for example, CNECs identified as redundant by the CCC (Coordinated Capacity Calculator) [11]. The same principle should be

[10] In the absence of a capacity calculation for the time period considered, the TSO on each side of the border must define the CNECs to be monitored, taking into account the capacity calculations made for other time periods.

[11] As defined in Article 2(11) of Regulation (EU) 2015/1222, of 24 July.

applied for the coordinated NTC methodology, however, taking into account that most of the capacity calculation methodologies currently applicable in this case, do not calculate the MCCC for CNECs that do not limit the capacity calculation, only the most limiting CNECs will be monitored until a MCCC calculation methodology that allows calculations for all CNECs is adopted, under the terms of the CACM regulation. Therefore, at least one limiting CNEC per oriented bidding-zone border must be defined.

For bidding-zones where the NTC coordinated methodology is applied (Portuguese case), the CNEC will be defined through the following data, to be provided by the TSOs:

- Identifier of the CNE and of the contingency;
- Name of the CNE and of the contingency;
- TSO which introduced the CNEC;
- Member State to which the CNEC is attributed;
- Fmax;
- The oriented bidding-zone borders for which the CNEC was limiting during the capacity calculation process;
- PTDF for all bidding-zones that have a non-null impact on this CNEC.

After defining the CNEC, the respective MCCC and MNCC are calculated.

As noted earlier, the MCCC describes the portion of a CNEC's capacity that is available for cross-zonal trade across borders within the considered coordination area. As established by ACER Recommendation No. 01/2019, the MCCC calculation method depends on the type of methodology used for calculating interconnection capacity. For cases where the coordinated NTC methodology is used, the following equation applies:

$$MCCC_{NTC}(CC\ MTU) = \sum_{b \in \text{área de coordenação}} p\,PTDF_{z2z,b}(CC\ MTU) \times\ NTC_b(CC\ MTU)$$

Where:

- ***b**, Oriented bidding-zone border which belongs to the considered coordination area;*
- $\boldsymbol{pPTDF_{z2z,b} = \max(0, PTDF_{z2z,b})}$, Positive zone-to-zone PTDF associated with the oriented bidding-zone border b (0 for a negative zone-to-zone PTDF);
- NTC_b, Net transfer capacity of the considered oriented bidding-zone border for the considered timeframe.

Thus, for example, for a given MTU, the MCCC for a Portuguese CNEC will be calculated as follows:

$$MCCC_{CNEC\ PT} = PTDF_{PT\rightarrow ES} \times NTC_{PT\rightarrow ES} + PTDF_{ES\rightarrow FR} \times NTC_{ES\rightarrow FR} + PTDF_{FR\rightarrow ES} \times NTC_{FR\rightarrow ES} + PTDF_{ES\rightarrow PT} \times NTC_{ES\rightarrow PT}$$

In the equation above negative PTDFs are, according to the methodology, considered null.

The MNCC describes the portion of a CNEC's capacity that is available for cross-zonal trade across bidding-zones borders outside the considered coordination area.

Bearing in mind that the only interconnection analysed in the Portuguese case is the interconnection with Spain, that belongs to the considered coordination area, the next step in the monitoring process, that is, the calculation of the MNCC, is not necessary.

Finally, the value of MACZT is given by:

$$MACZT\ (CC\ MTU) = MCCC\ (CC\ MTU) + MNCC\ (CC\ MTU)$$

Thus, in order for a Member State to be considered compliant with the provisions of Article 16(8) of Regulation (EU) 2019/943, the following condition must be verified, for all monitored CNECs, in all areas of coordination and for all MTUs:

$$MACZT\ (CC\ MTU) = MCCC\ (CC\ MTU) + MNCC\ (CC\ MTU) \geq 70\%\ Fmax\ (CC\ MTU)$$

3.2 MONITORING

3.2.1 ANALYSED PERIOD

The period of analysis considered in this report was the entire year of 2020.

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 levels of interconnection capacity made available for cross-zonal trade and the progress towards compliance with the established minimum level, as well as the assessment of the compliance with the objectives of the derogation.

3.2.2 DATA USED

As part of the process of monitoring compliance with the minimum MACZT level, carried out by ACER, REN, in its capacity as the Portuguese TSO, submitted to ACER, at two different times, a set of data relating to the first and second semesters of 2020.

This dataset included:

- MTU*;*
- The period considered in the capacity calculation (in this case only day-ahead);
- CNE and contingency identifiers and their respective orientation;
- Coordination area and TSO and Member State names associated with the CNEC;
- The reason for Fmax limitation;
- Fmax (MW).

These data allowed ACER to calculate the PTDF and MCCC for the CNECs identified by the Portuguese TSO. These values were then used in the preparation of ACER's two monitoring reports, already published[12,13].

In order to monitor and analyse the compliance with the MACZT minimum level, data made available later by REN, updated after clarification of some situations, were used in this report.

3.2.3 METHODOLOGY

ERSE has chosen to use the methodology recommended by ACER to monitor the performance of its TSO, this means that, for each identified CNEC and for each MTU, it is considered that the minimum MACZT level is being met if::

$$MACZT\ (CC\ MTU) = MCCC\ (CC\ MTU) + MNCC\ (CC\ MTU)\ \geq 70\%\ Fmax\ (CC\ MTU)$$

In the Portuguese case, as mentioned before, the equation is simplified:

$$MACZT\ (CC\ MTU) = MCCC\ (CC\ MTU)\ \geq 70\%\ Fmax\ (CC\ MTU)$$

Or,

$$\frac{MACZT\ (CC\ MTU)}{Fmax\ (CC\ MTU)} \geq 70\%$$

3.3 RESULTS

As mentioned in point 3.2.2, in order to monitor compliance with the MACZT minimum level, calculations made by ACER based on data provided by REN, in its capacity as the Portuguese TSO, were used.

[12] https://documents.acer.europa.eu/Official_documents/Acts_of_the_Agency/Publication/MACZT%20report%20-%20S1%202020.pdf

[13] https://documents.acer.europa.eu/Official_documents/Acts_of_the_Agency/Publication/ACER%20MACZT%20Report%20S2%202020.pdf

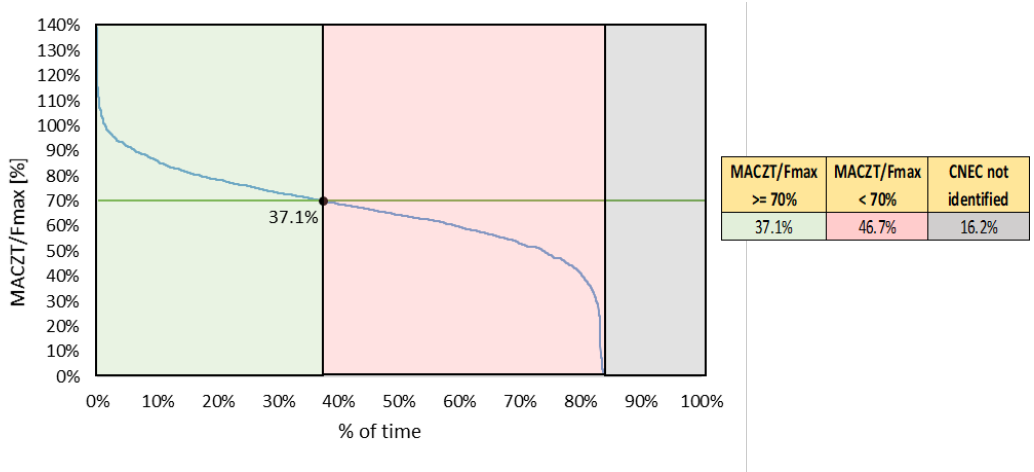
3.3.1 GLOBAL RESULTS

Figure 3-1 demonstrates the level of compliance with the minimum MACZT level throughout 2020, in both interconnection directions.

As can be seen, the minimum MACZT level was complied with only for 37.1% of the MTUs (green area in the figure) [14], a value well below the final objective, that is, compliance with the minimum limits in 100% of the MTUs.

It is also possible to confirm that for about 16% of the MTUs (grey area of the figure) it was not possible to identify the CNEC and as such it was also not possible to calculate the MACZT, which constitutes a reason for considering non-compliance with the established level. These 16% of cases in which it was not possible to identify the CNEC are justified by the TSO as cases in which IT problems or convergence problems in the capacity calculation tool occurred.

Figure 3-1 – Compliance with the minimum MACZT level, in 2020, for both directions of the PT <-> ES border

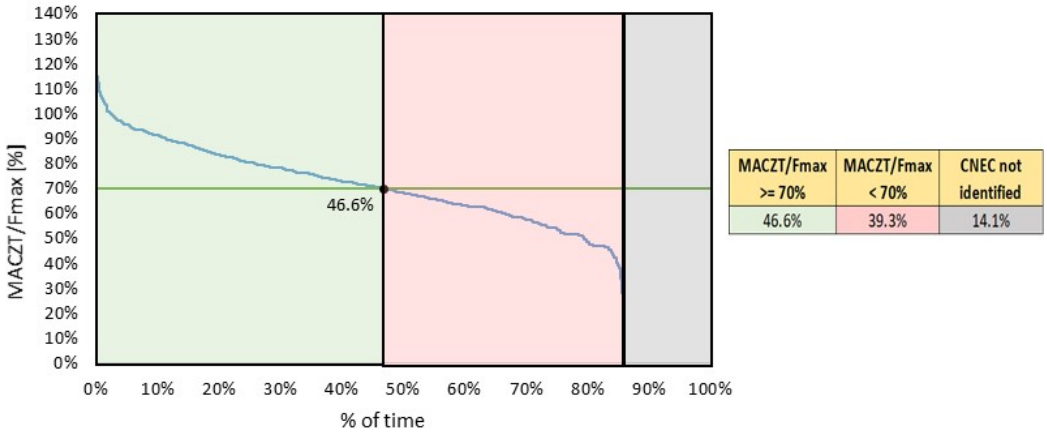


[14] The assessment of the compliance with the minimum MACZT level is carried out for each hour, separately in both directions of the considered border, meaning that, in reality, the number of cases expected to be evaluated is equal to 2 times the number of hours of the considered period.

Analysing separately the first and second semesters of 2020, it is possible to verify that, contrary to what was desired, there was a worsening of the results, both in terms of compliance with the minimum MACZT level and in terms of the number of MTUs in which it was not possible to identify the limiting CNEC.

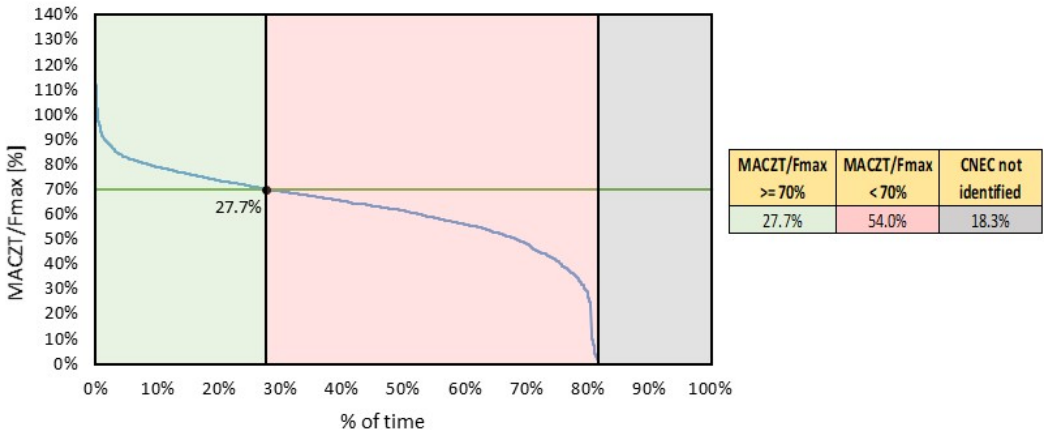
In the first half of the year, the MACZT minimum level was met in about 46.6% of the MTUs, and it was not possible to identify the limiting CNEC for about 14.1% of the cases.

Figure 3-2 – Compliance with the minimum MACZT level, in the first semester of 2020, for both directions of the PT <-> ES border



Regarding the second half of the year, the minimum MACZT level was met in around 27.7% of the MTUs, and it was not possible to identify the limiting CNEC for around 18.3% of the cases.

Figure 3-3 – Compliance with the minimum MACZT level, in the second semester of 2020, for both directions of the PT <-> ES border



The compliance with the MACZT minimum level is evaluated for each MTU, in each direction of the considered border. Analysing the two directions separately (PT -> ES and ES -> PT), for the total number of MTUs of 2020, it is possible to verify that the performance was better in the PT -> ES direction, with the minimum MACZT level being met in 41.5% of the MTUs (32.7% in the ES -> PT direction), although there was a higher number of MTUs in which it was not possible to identify the limiting CNEC, 17.1% of cases (15.4% in the ES -> PT direction).

Figure 3-4 – Compliance with the minimum MACZT level, in 2020, in the PT -> ES direction

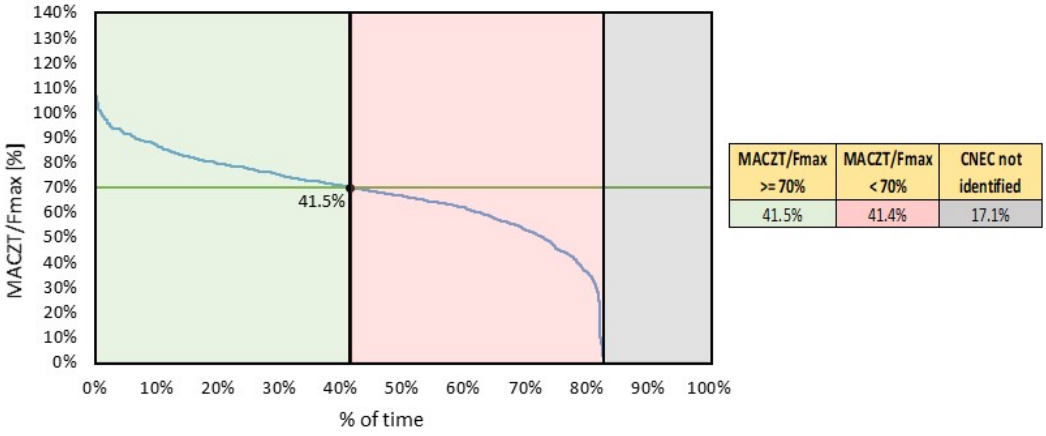


Figure 3-5 – Compliance with the minimum MACZT level, in 2020, in the ES -> PT direction

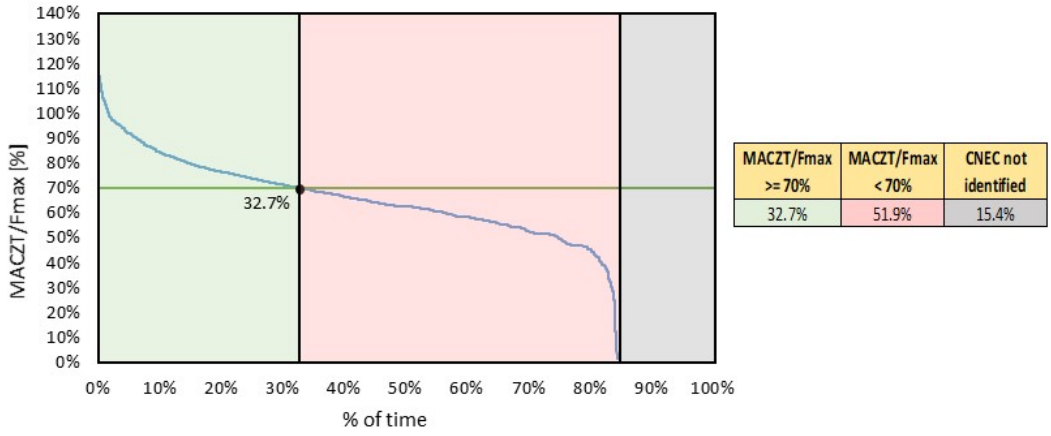
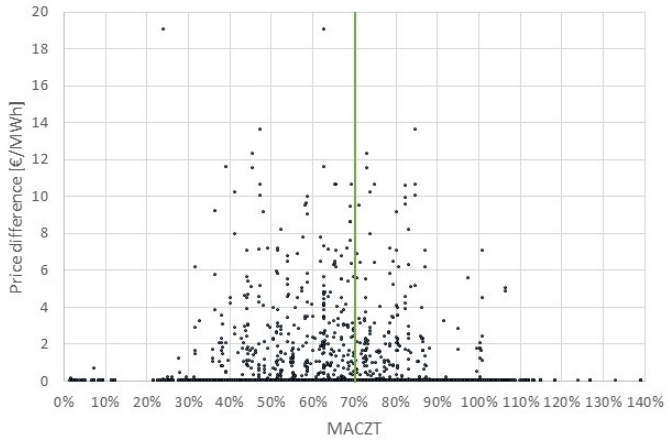


Figure 3-6 compares the hours when interconnection congestion occurred (price difference value between Portugal and Spain, different from zero) with the MACZT values calculated for those hours (in each direction when possible).

Analysing the available data, it is possible to verify that in 65% 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, which were always relatively low, 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 values and interconnection congestion situations

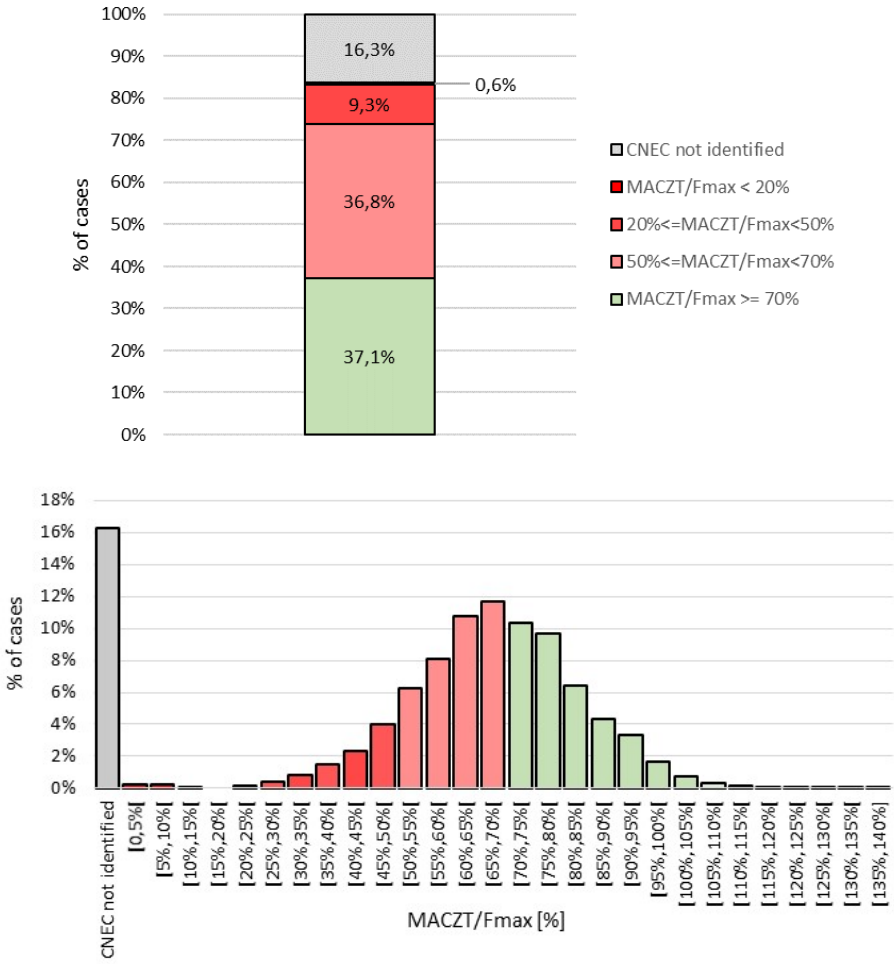


3.3.2 DETAILED ANALYSIS

Analysing the results presented above for 2020, the conclusion is that they were far from meeting the MACZT ≥ 70% Fmax target in 100% of the MTUs. In this sense, it is important to carry out a more detailed analysis of the results, in order to better understand their context and investigate possible causes for the high percentage of non-compliance observed.

Thus, starting again from the results for the total number of MTUs in 2020, and disaggregating them by MACZT tiers, it is possible to verify that, although the minimum level was only met in 37.1% of the cases, in 36.8 % of the cases the MACZT values were between 50% and 70% of the Fmax. 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 (16.3% of the cases) significantly contributes to non-compliance with the target. As can be seen from Figure 3-7, there were more cases in which it was not possible to identify the limiting CNEC than cases in which the calculated MACZT was below 50% of the Fmax.

Figure 3-7 – MACZT/Fmax tiers, in 2020, in the PT <-> ES border



Considering only the MTUs for which the limiting CNEC was identified, it is possible, through the available data, to make a distinction in terms of the type of CNEC between internal and interconnection. In the set of CNECs identified in 2020, only 5% concerned internal network elements, with the remainder referring to interconnections.

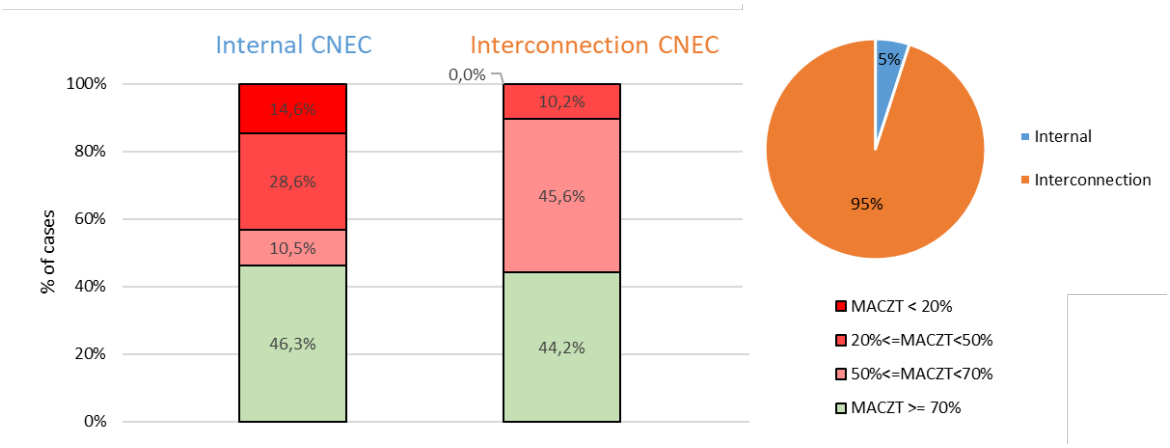
In the total of MTUs with internal CNECs, the minimum MACZT level was met in 46.3% of the cases, and the MACZT value was lower than 50% of the Fmax in 43.3% of the cases.

Regarding interconnections, compliance with the minimum MACZT level was verified in 44.2% of the cases, and in only 10.2% of the cases the MACZT was below 50% of the Fmax.

If, in terms of compliance with the minimum MACZT level, both analyses present similar values, for cases where the CNEC is internal, an improvement in performance seems to be more difficult. However, it is important to highlight the relatively small importance of these CNECs in the final results (5% of the identified CNECs).

Thus, one may conclude, notwithstanding the final objective of complying with the minimum MACZT level in 100% of the MTUs for all CNECs, that the focus for the progressive improvement of the results obtained should be the performance of the CNECs identified as interconnections.

Figure 3-8 – MACZT/Fmax tiers, in 2020, for Internal and interconnection CNECs



Finally, through the available data, it is possible to find the CNEs identified for each MTU and thus disaggregate the results by CNE.

In Table 3-1 it is possible to verify that in 14 of the 18 CNEs identified the minimum level of MACZT was never met, however, these 14 CNEs represent only about 2.7% of the MTUs considered.

In fact, two of the identified CNEs, 10T-ES-PT-00005Y and 10T-ES-PT-00008S, represented 94.6% of the MTUs, being, therefore, those that contributed the most to the overall result.

CNE 10T-ES-PT-00005Y, which concerns the Alto Lindoso – Cartelle interconnection, represented 71% of the cases, being the most representative. For these MTUs, the MACZT minimum level was only complied with in 34% of the cases, which, due to the relevance of this CNE, significantly contributes to the low level of overall compliance with the MACZT level target.

CNE 10T-ES-PT-00008S, which concerns the Lagoaça – Aldeadávila interconnection, represented around 24% of the cases, being the second most representative. For these MTUs, the minimum MACZT level was met in 76% of the cases, having performed much better than the previous one.

Table 3-1 - Results disaggregated by CNE

CNE		No. CC MTU	% of total CC MTU	MACZT ≥ 70% Fmax	MACZT < 70% Fmax
10T-ES-PT-000023	Pocinho - Aldeadávila 1 220 kV	14	0.10%	0%	100%
10T-ES-PT-000031	Alqueva - Brovales 380 kV	3	0.02%	0%	100%
10T-ES-PT-00005Y	Alto Lindoso - Cartelle 2 380 kV	10384	70.58%	34%	66%
10T-ES-PT-00006W	Falagueira - Cedillo 400 kV	75	0.51%	0%	100%
10T-ES-PT-00007U	Pocinho - Saucelle 220 kV	37	0.25%	8%	92%
10T-ES-PT-00008S	Lagoaça - Aldeadávila 400kV	3535	24.03%	76%	24%
16TAT4400150SFRA	Auto Transformador 4 400/150 kV SE Falagueira	6	0.04%	0%	100%
16TAT540015SFR-5	Auto Transformador 5 400/150 kV SE Falagueira	18	0.12%	0%	100%
16TLAMMLGC-----S	Armamar - Lagoaça 400 kV	187	1.27%	0%	100%
16TLPGFR-------9	Pego - Falagueira 400 kV	8	0.05%	0%	100%
16TLPNAMM1-----E	Pocinho - Armamar 1 220 kV	355	2.41%	87%	13%
16TLPNCF2------9	Pocinho - Chafariz 2 220 kV	7	0.05%	0%	100%
16TLPTMG-------6	Picote - Mogadouro 220 kV	16	0.11%	0%	100%
16TLRARR1------Q	Recarei - Riba d'Ave 1 400 kV	39	0.27%	0%	100%
16TLRARR2------I	Recarei - Riba d'Ave 2 400 kV	11	0.07%	0%	100%
16TLRRPI-------U	Recarei - Paraimo 400 kV	4	0.03%	0%	100%
16TLVRAMM2-----2	Valeira - Armamar 2 220 kV	7	0.05%	0%	100%
16TT1400150SPDV3	Auto Transformador 1 400/150 kV SE Pedralva	7	0.05%	0%	100%

3.3.3 NTC VALUES REQUIRED TO MEET MACZT MINIMUM LIMITS

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.

Starting from the equations identified in point 3.1.3 and considering negative PTDFs to be null (equal to 0), in accordance with ACER's recommendation, the minimum NTC are given by:

$$NTC_{ES\rightarrow PT_{min}} = \frac{70\%F_{max} - NTC_{FR\rightarrow ES} \times PTDF_{FR\rightarrow ES}}{PTDF_{ES\rightarrow PT}}$$

And

$$NTC_{PT\rightarrow ES_{min}} = \frac{70\%F_{max} - NTC_{ES\rightarrow FR} \times PTDF_{ES\rightarrow FR}}{PTDF_{PT\rightarrow ES}}$$

Figure 3-9 summarizes the results obtained.

Notwithstanding the fact that there isn't data available for the total MTUs expected for 2020, and excluding a small set of cases in which the results obtained were considered maladjusted with reality (108 cases, 0.7% of the total, were the minimum necessary NTC values obtained were higher than the maximum existing interconnection capacity), it was possible to conclude that:

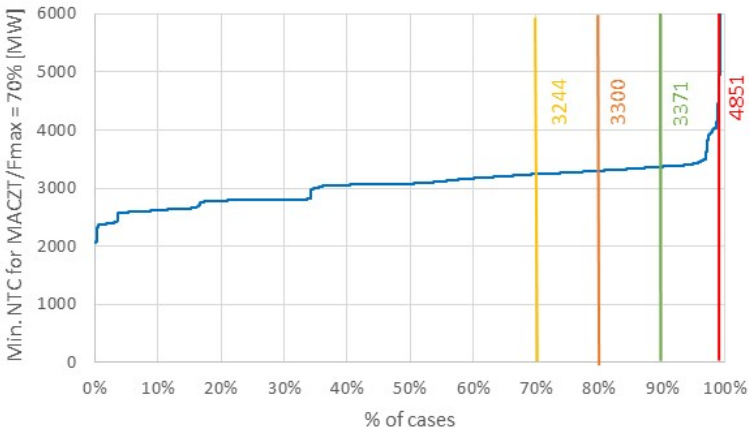
- If the NTC had been equal to or greater than 3244 MW, in all of the hours of the year, both in the export and import directions, compliance with the MACZT minimum level would have been guaranteed in 70% of the cases;

- If the NTC had been equal to or greater than 3300 MW, in all of the hours of the year, both in the export and import directions, compliance with the MACZT minimum level would have been guaranteed in 80% of the cases;

- If the NTC had been equal to or greater than 3371 MW, in all of the hours of the year, both in the export and import directions, compliance with the MACZT minimum level would have been guaranteed in 90% of the cases;

- To determine the value necessary to guarantee compliance with the MACZT minimum level in 100% of the cases, it would be necessary to study in greater depth the 0.7% of the cases considered maladjusted, however, if the NTC had been equal to or greater than 4851 MW, in all of the hours of the year, both in the export and import directions, compliance with the MACZT minimum level would have been guaranteed in 99% of the cases.

Figure 3-9 – Minimum NTC for MACZT = 70%Fmax



3.4 COMPLIANCE WITH THE DEROGATION FOR 2020

As explained in point 3.1.2, when the request for a derogation to comply with the MACZT minimum levels for the year 2020 was approved, a set of commitments to be fulfilled by REN were established.

The information provided by REN during 2020 and at the beginning of 2021 made it possible to conclude that the commitments assumed in the derogation request, approved for 2020, were fulfilled.

3.5 2021 PERSPECTIVE

As occurred for 2020, ERSE received from REN, on 16 October 2020, a second request for a one-year derogation to comply, in 2021, with the MACZT minimum levels.

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

According to REN, regarding the new processes, the difficulties were mainly related to the more frequent use of costly remedial actions, taking into account the lack of operational experience in the intensive use of this type of action, which could lead to risks of operational security.

Regarding the new tools to be developed and used REN identified that on 1 January 2021, the necessary tools to assess whether the minimum value of interconnection capacity had been reached and if that was not the case to calculate the additional capacity needed would still not be available.

The derogation request for the year 2021 included the following clauses:

a) REN has undertaken to offer, in 70% of the hours of the year covered by the derogation, at least the minimum interconnection capacity necessary to verify the compliance with the MACZT minimum levels;

b) During the derogation period, the RCC (Regional Coordination Centre) and the TSO of the SWE[15] (South-West Europe) Region should:

   i. Develop a 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;

   ii. Finalize and put into service the regional monitoring of compliance with MACZT minimum levels;

   iii. Finalize the developments and put into service the Intraday Capacity Calculation, as well as the implementations related to the data collection foreseen in Article 82(4) of the CACM and also start the Long Term Capacity Calculation developments;

   iv. Analyse the need to update the current SWE Capacity Calculation methodology taking into consideration the dispositions foreseen in Regulation (EU) 2019/943 and propose the new version if needed, under agreement with SWE NRAs;

   v. Study the technical and regulatory framework to enable, if necessary, the use of costly remedial actions, namely counter trading and coordinated redispatching.

[15] SWE Region: Southwest Europe Region that includes Portugal, Spain and France.

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

4 EUROPEAN CONTEXT ON THE MONITORING OF THE COMPLIANCE WITH MACZT MINIMUM LEVELS IN INTERNATIONAL INTERCONNECTIONS

This 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 2020, is part of an equivalent exercise that was developed by all the national energy regulators of the European Union, being the result of a coordination effort within ACER.

The monitoring results presented are the result of the joint work that was developed by ERSE and REN, in its capacity as Portuguese TSO and Global Manager of the National Electricity System, and with the team formed within ACER to support national regulatory authorities in this specific aspect.

Regarding 2020, ACER has published two reports[16],[17], that make it possible to give some context to the Portuguese national results in light of the broader set of realities of the different Member States of the European Union.

The following figures present some examples of national results, presented by ACER in the aforementioned reports, and more specifically from the one related to the second semester which was published in June 2021. The results presented in chapter 3 were obtained through data made available at a later time, after the clarification of some specific situations.

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

[17] ACER Report on the result of monitoring the margin available for cross-zonal electricity trade in the EU in the second semester of 2020

Figure 4-1 – ACER monitoring results – SWE Region – 2º semester 2020

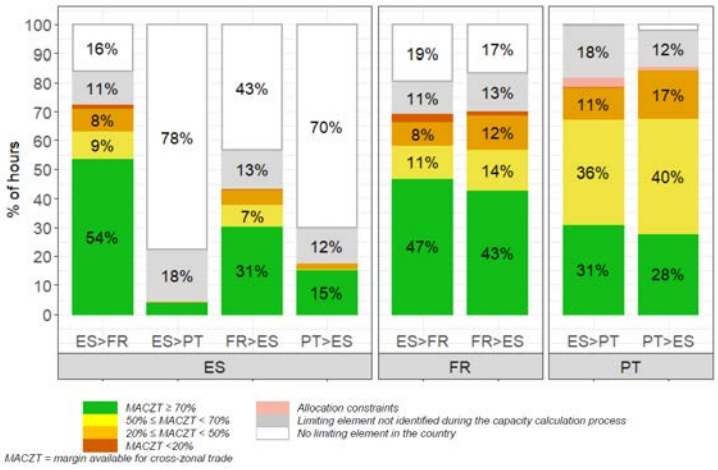


Figure 4-2 – ACER monitoring results – Italy North Region – 2º semester 2020

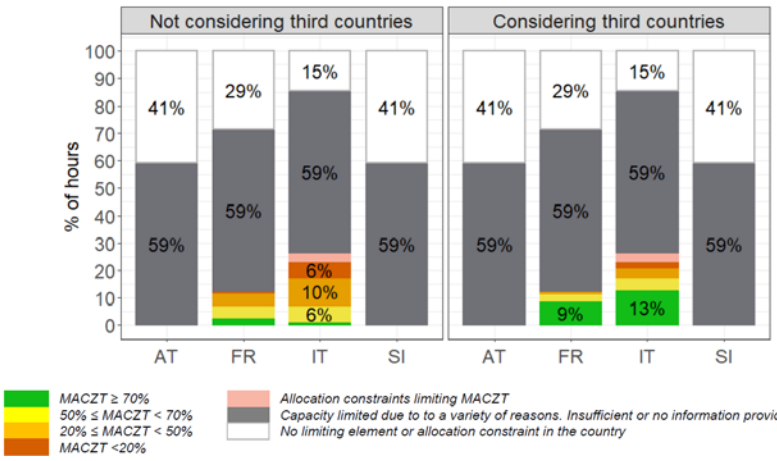


Figure 4-3 – ACER monitoring results – CWE Region[18] – 2º semester 2020

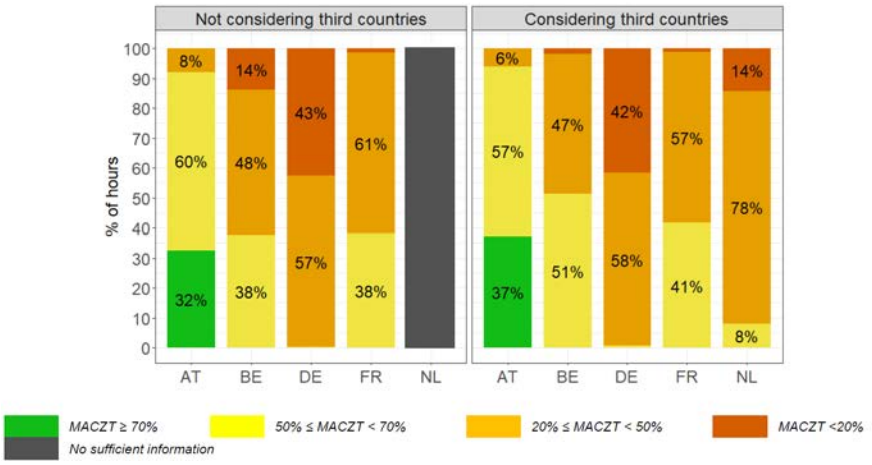
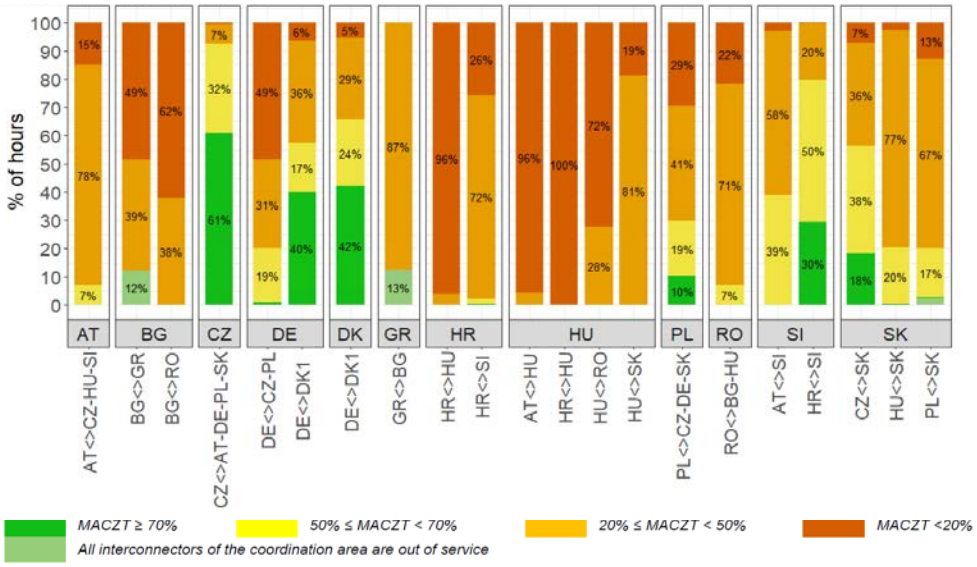
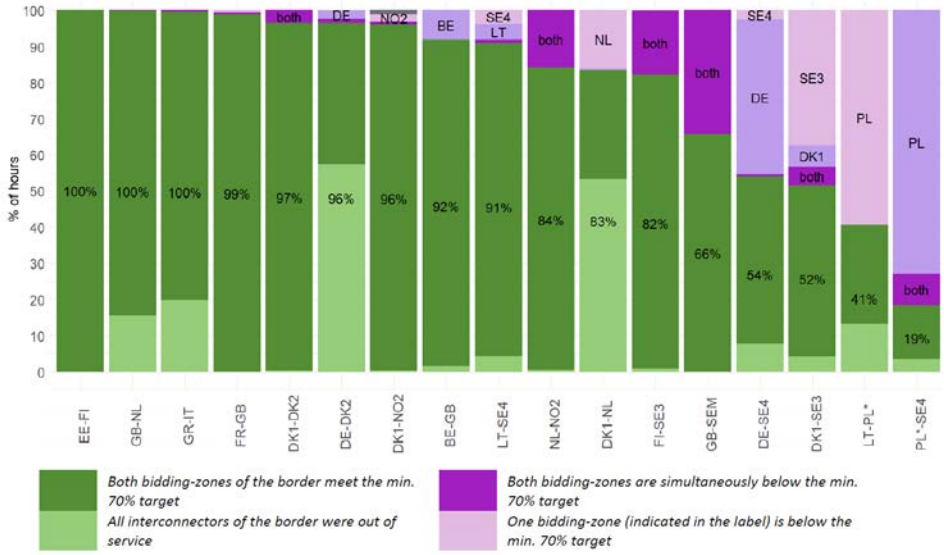


Figure 4-4 – ACER monitoring results - Continental Europe countries where a coordinated capacity calculations is not yet implemented – 2º semester 2020



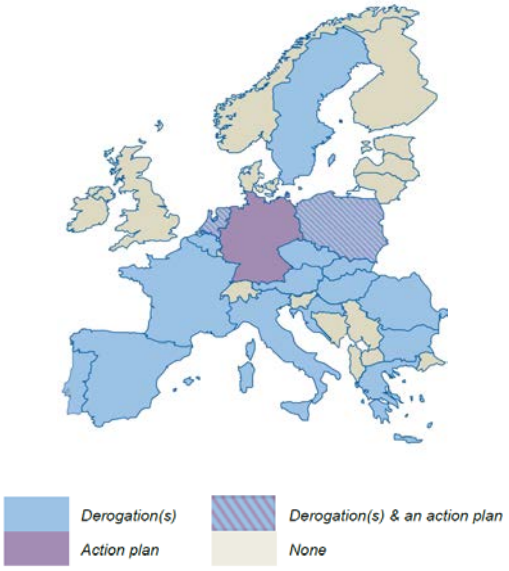
[18] CWE Region: Central Western European Region that includes Germany (DE), Austria (AT), Belgium (BE), France (FR) and the Netherlands (NL).

Figure 4-5 – ACER monitoring results – DC borders – 2º semester 2020



Published in the first of ACER reports, the following figure presents a view on the situation of the different Member States of the European Union, regarding requests for derogation from compliance with the aforementioned levels during 2020:

Figure 4-6 – Overview of derogation requests and action plans - 2020



In addition to the ACER reports, the national reports prepared for 2020 by the national regulatory authorities of the Netherlands[19], Belgium[20], France[21] and Italy[22] are also available.

[19] ACM NL 2020 Assessment of available cross-zonal capacity for the Netherlands

[20] CREG 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

[21] CRE Report on the implementation of the minimum threshold of 70% of interconnection capacity for cross-border trade at the French borders for 2020: assessment and outlook

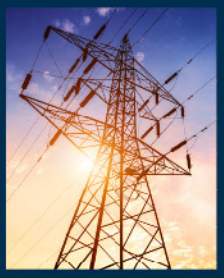
[22] ARERA REPORT ON THE IMPLEMENTATION OF THE MINIMUM LEVEL OF AVAILABLE CAPACITY FOR CROSS-ZONAL TRADE (70%) ON THE ITALIAN BORDERS

5 CONCLUSIONS

Notwithstanding the monitoring carried out by ACER, the assessment of compliance with the minimum MACZT levels is the responsibility of the regulatory authority of each Member State.

Thus, despite the existence of a derogation period approved for the year 2020, ERSE carried out the monitoring of the evolution of the compliance with these levels, having reached the following main conclusions:

- The minimum MACZT levels were met in 37.1% of the MTUs in the Portugal-Spain border;
- The results were worse in the second semester of 2020 (27.7%) than in the first semester of 2020 (46.6%);
- In the import direction (ES->PT) the minimum MACZT levels were met in 32.7% of the MTUs;
- In the export direction (PT->ES) the minimum MACZT levels were met in 41.5% of the MTUs;
- The commitments assumed by REN in the derogation request for 2020 were fulfilled;
- Achieving compliance with the aforementioned minimum levels, as defined by European Regulation, represents a major challenge that must be assumed at national level, since it is known that, by 2025, Portugal will have to be compliant during 100% of the hours of the year;
- Nevertheless, analysing the national results in a European context, it is possible to verify that the performance of the interconnections in the SWE region (namely the Portugal-Spain interconnection) was above average in terms of compliance with the minimum levels of available capacity for cross-zonal trade in 2020.



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