

REPORT

JULY 2023

Implementation of the minimum threshold of 70% of interconnection capacities for cross-border trade at France's borders: review of the year 2022 and highlights.

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SUMMARY

The electricity regulation (EU) 2019/943¹ revised as part of the Clean Energy Package adopted in 2019 introduces a minimum threshold of 70% of interconnection capacity to be available for cross-border exchanges. This threshold came into force on 1 January 2020 for all European transmission system operators. In application of the regulation, CRE must ensure that RTE (the French TSO) guarantees interconnection capacities in compliance with Electricity Regulation on French borders belonging to the calculation regions Central-Western Europe / Core (for borders with Belgium, Luxembourg and Germany), Italy North (for the Italian border) and South-West Europe (for the Spanish border).

As the minimum threshold of 70% is intended to increase cross-border exchanges, CRE analyses whether this threshold has been reached on the network elements considered in the capacity calculation, with regard to their ability to enable additional cross-border exchanges that bring value on a European scale. Within this framework, CRE pays particular attention to lines located in France that may restrict the interconnection capacity made available for cross-border exchanges (so-called "limiting networks elements"), as well as to timeframes for which the capacity made available by transmission system operators effectively limits exchanges and prevents price convergence in the capacity calculation region. Outside these situations, any additional capacity released does not actually increase cross-border exchanges. CRE therefore categorizes these situations, in which no gain would be possible on a European scale, as compliant. Indeed, the 70% criterion encourages TSOs to implement costly measures (operational measures or investments) to increase exchanges. This incentive should only apply to time steps that represent real added value for the European power system.

The year 2022 was marked by the go-live of the day-ahead coordinated capacity calculation in the Core region, which replaced the coordinated capacity calculation carried out in the Central-Western Europe region as of June 8, 2022. This report presents results for these two regions in 2022. The Core region comprises the 6 countries of the Central-Western Europe region (Germany, Austria, Belgium, France, Luxembourg and the Netherlands) plus 7 additional countries (Croatia, Hungary, Poland, Czech Republic, Romania, Slovakia and Slovenia).

For the year 2022, the levels of interconnection capacity made available to cross-border exchanges by RTE comply with the 70% criterion on 87% of time steps on average over the three regions evaluated. As a result, for the vast majority, RTE has achieved the targets set by the regulation for 2022. This high level of available capacity bears witness to France's commitment to the construction of Europe's internal electricity market, and confirmed the relevance of the French network's structuring to support cross-border exchanges. From 2022 onwards, for the first time, French borders will not be subject to any derogation under the 70% criterion, which is not the case for the majority of continental European countries in 2022, and will still not be the case for 2023.

In addition to implementing the minimum 70% threshold, RTE has finalized the development of tools to ensure high levels of exchange capacity without penalizing the network's operational security. These tools make it possible to provide more systematically levels of commercial capacity equal to or greater than 70% at French borders, by taking into account the corrective measures available in cases where the capacities required for commercial electricity exchanges turn out to be higher than what the physical network can absorb. In this respect, RTE uses costly remedial actions (*redispatching* and *countertrading*) like its European counterparts, but distinguishes itself by using non-costly remedial actions known as topological remedial actions, which consist of redirecting flows by modifying the network topology. These remedial actions make it possible to offer more capacity on interconnections, while limiting the costs associated with this increase in capacity.

Finally, taking into account the numerous exchanges with European and French stakeholders on the implementation of the minimum 70% threshold, RTE has made freely available² the data on available capacity on all the network elements considered in the capacity calculation for the Central-Western Europe, Italy North and South-West Europe regions. CRE fully supports this initiative, and believes that free access to data is a useful guarantee of transparency in developing a fuller understanding of the issues involved in implementing the 70% criterion.

¹ REGULATION (EU) 2019/943 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL - of June 5, 2019 - on the internal market for electricity ([europa.eu](https://eur-lex.europa.eu/eli/reg/2019/943/oj))

² <https://opendata.reseaux-energies.fr/pages/accueil/>

1. REMINDER ON THE CONTEXT OF THE IMPLEMENTATION OF 70% AT FRENCH BORDERS

Following the United Kingdom's exit from the European Union on 1 January, 2021, France is now integrated into only three capacity calculation regions: Europe Central-West/Core, Italy North and Europe South-West. In coordination within these regions, transmission system operators calculate for each time step the capacities that can be offered for cross-border exchanges between the different countries of the European electricity market.

In order to guarantee capacity for these exchanges, a minimum threshold of 70% of network capacity to be made available for cross-border exchanges ("70% criterion") was introduced when the electricity regulation was revised as part of the Clean Energy Package adopted in 2019 (hereinafter "electricity regulation")³. It came into force on 1 January, 2020.

Under the provisions of the Electricity Regulation, national regulatory authorities are responsible for ensuring that TSOs apply this minimum threshold. CRE is thus responsible for ensuring that RTE guarantees interconnection capacities that comply with electricity regulations on the various French borders. It uses this competency to systematically assess the conformity of interconnection capacities made available for cross-border exchanges by RTE, and to identify areas for further progress in optimizing these capacities, while seeking to ensure transparency for the benefit of all stakeholders.

CRE thus published two initial half-yearly reports for 2020, published in December 2020⁴ and June 2021⁵, as well as a report for 2021 published on 3 June, 2022⁶. It sets out CRE's approach to ensuring that the application of this minimum threshold actually leads to an increase in cross-border exchanges, where this can generate value on a European scale. As a reminder, CRE pays particular attention to French grid elements that may limit the interconnection capacities made available for cross-border exchanges (known as "limiting network elements" at the end of the capacity calculation), as well as to time steps for which the interconnection capacities made available for cross-border exchanges are fully utilized, resulting in a lack of convergence of electricity prices within the capacity calculation region. CRE's approach is detailed in the next section of the report with the results.

Although the electricity regulation does not specify the timeframe for which the criterion must be verified, the assessment of the 70% criterion carried out by CRE deals only with daily timeframes. In its recommendation, published in 2019 at the request of the European Commission, the Agency for the Cooperation of Energy Regulators ("ACER") considers that the 70% criterion should be assessed on a daily basis, but may be extended to an intraday basis. For example, ACER's annual report on interconnection capacity made available for cross-border exchanges in the European Union ("EU") deals only with the daily timeframe.

2. SUMMARY OF 2022 ON THE FRENCH BORDERS

The year 2022 was marked by the launch of the Core region on 8 June, 2022. On this date, the daily capacity calculation, previously carried out within the Central-West Europe region, was replaced by a daily capacity calculation within the 13-country Core region. Although the two capacity calculations are based on similar principles (flow-based calculation), the two processes need to be distinguished. To this end, the report assesses compliance with the 70% criterion at the France-Belgium and France-Germany borders from 1 January to 7 June, 2022 within the Central-Western Europe region, and from 8 June to 31 December, 2022 within the Core region.

The analyses presented in the rest of this section were carried out by CRE to assess the compliance of interconnection capacities provided by RTE on the various French borders with electricity regulations. These analyses were based on data supplied by RTE. In the interests of transparency, this data will be published by RTE on the "Open Data Réseau Énergies" (ODRE) platform⁷.

CRE's assessment is broken down into two successive phases of analysis. Firstly, based on a number of criteria, CRE determined the time steps and network elements for which offering additional capacity on the French network elements considered in the coordinated capacity calculation would provide added value for the European market, and assessed the percentage of cases where the capacity offered by RTE exceeded 70% of the capacity of the network elements. CRE then analyzes the capacity offered to the European market on the relevant time steps.

³ Article 16(8) of Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity (revised), <https://eur-lex.europa.eu/legal-content/FR/TXT/HTML/?uri=CELEX:32019R0943&from=EN>

⁴ <https://www.cre.fr/Documents/Publications/Rapports-thematiques/mise-en-oeuvre-du-seuil-minimal-de-70-des-capacites-d-interconnexion-pour-les-echanges-aux-frontieres-francaises-point-d-etape-et-perspectives>

⁵ Implementation of the minimum threshold of 70% of interconnection capacity for exchanges at French borders: progress report at the end of 2020 and perspectives - CRE

⁶ CRE publishes the 2021 edition of the report on the implementation of the 70% interconnection capacity threshold for electricity exchanges at French borders - CRE

⁷ <https://opendata.reseaux-energies.fr/pages/accueil/>

2.1 Analysis of compliance with the "70% criterion" on the French network lines considered in the coordinated capacity calculation

Under Article 16 of the Electricity Regulation, RTE is required to maximize, for each capacity calculation region to which France belongs, the capacity made available for cross-border exchanges on the French network elements considered in the coordinated capacity calculation. The parameter to be maximized corresponds to the ratio between the capacity made available for cross-border exchanges and the operational limit of each network element (also known as "*maximum flow*" or "Fmax").

This margin ("MACZT") is determined by estimating the distribution of market flows internal and external to the capacity calculation region⁸ on each network element of the French network considered in the coordinated capacity calculation.

When analyzing compliance with the 70% criterion, CRE considers that, in certain configurations, an increase in the capacity available for cross-border exchanges would not generate any value for the European power system, while at the same time generating unnecessary costs.

CRE thus determines the share of time steps and network elements for which guaranteeing the 70% was useful at the European scale by excluding time steps and network elements corresponding to the following criteria:

1. **Unsaturated interconnection:** in situations where the optimal allocated capacity is less than the total interconnection capacity available for cross-border exchanges, there is no value in increasing cross-border capacity. This corresponds to price convergence in the capacity calculation region⁹.
2. **Absence of limiting French network elements:** non-limiting network elements, i.e. those which do not limit the domain available for capacity allocation¹⁰, have no direct influence on the interconnection capacities made available to the market. Increasing their margins would not increase cross-border trade.

CRE considers that the timeframes covered by these two criteria comply with the provisions of the revised Electricity Regulation, since an increase in the margins available on the TSO's network elements would not have enabled an increase in the capacity made available for cross-border exchanges within these time steps. CRE is convinced of the need to encourage TSOs to maximize the cross-border capacity offered to market parties when this can generate a gain for the community. Through this report, CRE would therefore like to reiterate the importance of considering the time steps and network elements that can bring value to the European power system. This position was reaffirmed by CRE during the work carried out by ACER in early 2022 on harmonizing the reports published by European regulators.

Figure 1 categorizes, for each capacity calculation region of which France is a part, the time steps for the year 2022 according to the criteria presented above.

⁸ The *Margin Available for Cross-Zonal Trade* ("MACZT"), the sum of the *Margin from Coordinated Capacity Calculation* ("MCCC") and the *Margin from Non-coordinated Capacity Calculation* ("MNCC"), is defined in ACER Recommendation 01/2019.

⁹ For the 2022 report, and to enable a comparison between the results for the CWE region and those for the Core region, price convergence is calculated over the whole year on the basis of SPOT prices for the CWE region's price zones. We have thus maintained the same calculation reference throughout the year.

¹⁰ Here we use the convention that "limiting elements" refers to the elements that limits the range of possible configurations for exchanges, and "active elements" refers to the branch that actually limits exchanges during allocation.

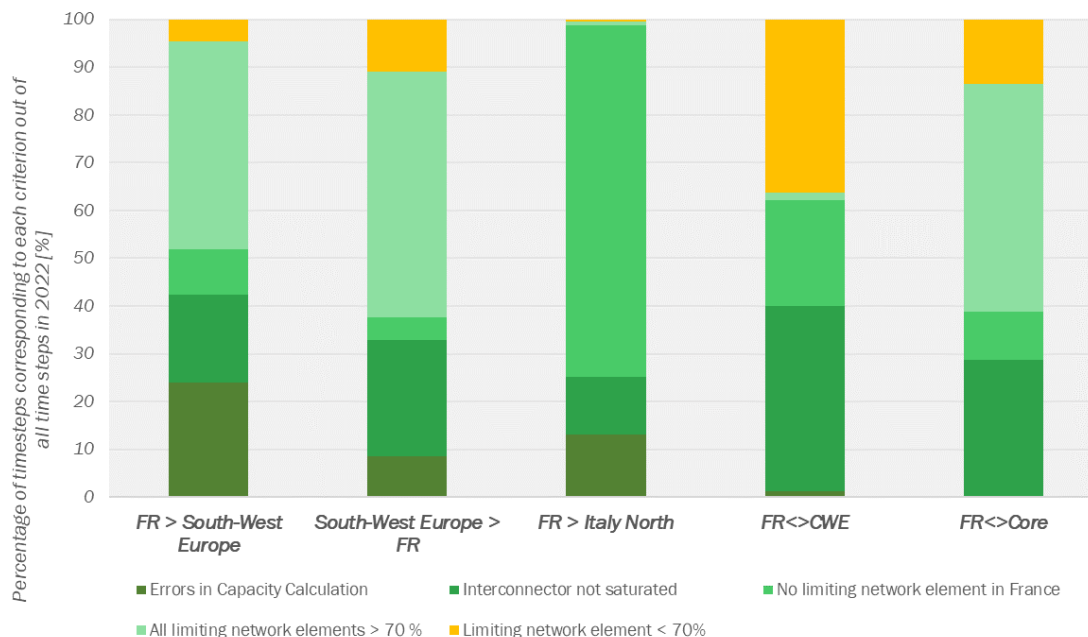


Figure 1 - Categorisation of time steps by criteria in 2022 in the three capacity calculation regions to which France belongs

Source: RTE data, CRE analysis

Notes:

(1) In the Italy North region, only the direction of Italy's imports from France is currently calculated in a coordinated manner by the TSOs. A calculation in the export direction should be implemented by the end of 2023.

Interpretation: At the France-Spain border, in the import direction (South-West Europe > FR), around 24% of the time steps in 2022 corresponded to a price convergence situation (unsaturated interconnection), 5% to a situation where the capacity calculation was not limited by a French network element, and 8% to errors in the capacity calculation. These time steps are considered to comply with the provisions of the revised Electricity Regulations. As a result, in 89% of cases, RTE met the 70% criterion, and in the remaining 11% of cases, the limiting lines of the French network provided less than 70% margin for cross-border exchanges.

A similar reading can be applied to other borders.

For the Italy North region, more than 90% of time steps are covered by the two criteria presented above, corresponding to the time steps for which additional capacity from RTE would not bring any value to the market. This is also the case to a lesser extent in other regions. In this way, for the vast majority, RTE has met its obligations for 2022. This demonstrates the relevance of CRE's decision to pay particular attention to the remaining time steps.

Based on these criteria, Table 1 shows the average monthly percentage of time steps during which RTE has guaranteed capacity in compliance with the revised electricity regulations.

	January 2022	February 2022	March 2022	April 2022	May 2022	June 2022	July 2022	August 2022	September 2022	October 2022	November 2022	December 2022	2022
CWE/Central Western Europe	71%	39%	59%	57%	86%	75%							63%
Core						70%	75%	95%	88%	89%	87%	97%	86%
Italy North	100%	99%	100%	98%	99%	99%	100%	100%	100%	100%	100%	100%	99.5%
South-West Europe	89%	97%	96%	90%	96%	85%	67%	89%	98%	94%	99%	90%	91%

Table 1 - Average monthly percentage of time steps during which RTE has guaranteed capacity in accordance with the revised Electricity Regulation in the four capacity calculation regions of which France belongs

Source: RTE data, CRE analysis

Notes:

(1) Time steps with errors in Figure 1 are excluded.

Results for the 2022 year are high in all three calculation regions evaluated.

- In the **Italy-North** region, almost all relevant time steps comply with the revised Electricity Regulations (99.5% of time steps).
- In the **South-West Europe** region, compliance is assured 91% of the time. The time steps indicating a calculation error are linked to a data uplift issues in the months of January to March. This was corrected in April. In these cases, however, the calculation process did allow the maximum capacity available for cross-border exchanges to be defined. However, these occurrences must be kept to a strict minimum, and are closely monitored by CRE and its regional counterparts.
- Results for the **Central-Western Europe** region were penalized by a deterioration in compliance in February, March and April 2022. Over these months, the French network was more often limited, while capacity in France and in the region was more stretched. This mixed result calls for closer monitoring of results in the new Core region.
- In the **Core** region, **compliance was achieved in 86% of time steps**, a very good result given the complexity of network management in this region. **This confirms the relevance of the new tools and coordinated processes introduced in this new region.**
- Today, all the capacity calculation regions, to which the French borders belong, are equipped with so-called "validation" tools, which study the possibility of increasing the capacity made available for cross-border exchanges in order to ensure margin levels of 70% without leading to operational limits being exceeded on the network elements concerned. These tools enable costly remedial actions to be taken into account more systematically, in addition to the non-costly remedial actions already supplied to the capacity calculation. The last "validation" tool was deployed at the beginning of 2022 in the Southwest Europe region, where a minimum level of *countertrading* to be made available to cross-border exchanges was introduced at the same time. In this region, TSOs are committed to using costly remedial actions to offer more capacity to the market.

CRE salutes RTE's work, which has enabled the operational deployment of the "validation" tool in the South-West Europe capacity calculation region. In 2022, for the first time, French borders will not be subject to any derogation under the 70% criterion, which is not the case for the majority of continental European countries.

2.2 Analysis of capacities offered to cross-border exchanges for relevant time steps

CRE considers that while compliance with the 70% threshold is a regulatory objective, it is essential to offer the maximum amount of capacity available for cross-border exchanges on the relevant time steps, regardless of whether this threshold is met. Respecting the 70% threshold is not an end in itself, but a tool for cross-border exchanges and the overall efficiency of the European electricity system.

Figure 2 shows a breakdown of all relevant time steps by margin level.

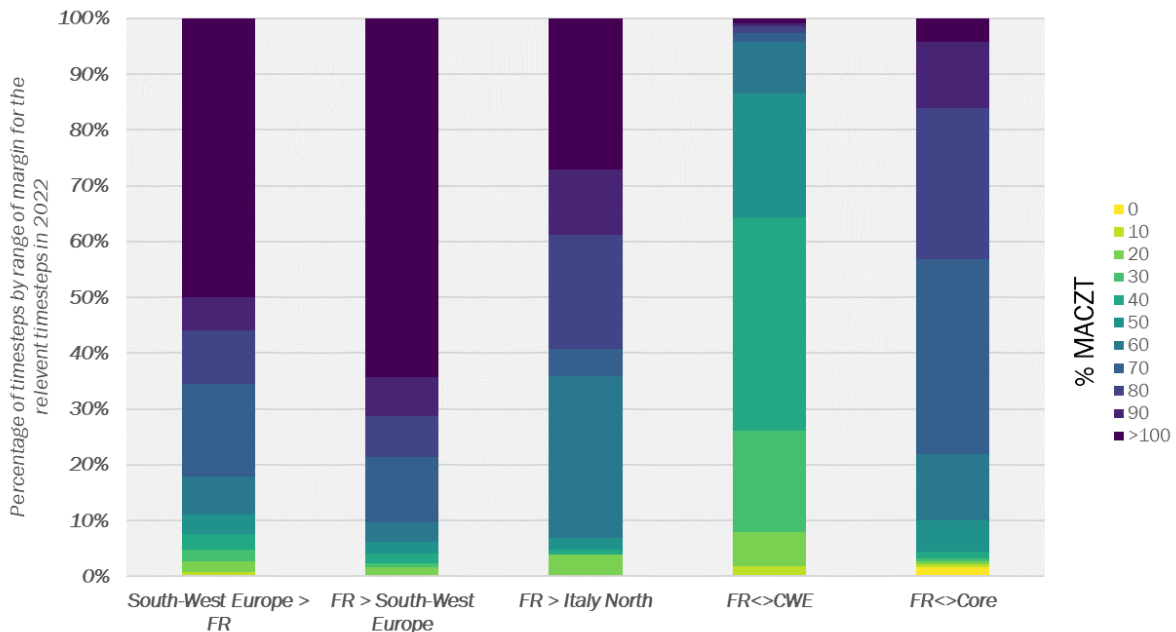


Figure 2 - Categorisation of time steps by decile rank of margin levels, for relevant time steps (two limiting network elements categories in figure 1)

Source: RTE data, CRE analysis

Notes:

(1) In the Italy North region, only the direction of Italy's imports from France is currently calculated in a coordinated manner by the TSOs.

Interpretation: At the France-Spain border, in the import direction (FR > South-West Europe), among the relevant time steps, around 64% of time steps have a margin level above 100%, which is mainly due to an initial configuration expected in the opposite direction and which therefore generates more margin than the line's total capacity. The next decile comprises time steps with these margins between 90 and 100%, corresponding to around 7% of time steps. Looking at the four highest categories, it can be seen that around 90% of the relevant time steps exceed the 70% margin criterion.

A similar reading can be applied to other borders.

The margins available for cross-border exchanges are, for most time steps, very high. In the South-West Europe and Italy North regions, these margins very often far exceed the 70% threshold. With the exception of the CWE region, there are very few time steps where the capacity available for cross-border exchanges is truly low. This is confirmed by Figure 3, which assesses the average margin offered when the 70% threshold is not reached. In this case, the average level of available capacity is over 45% in all three regions. Even though the 70% threshold has not been reached, the capacity made available by RTE at the French borders remains high, enabling an important contribution to cross-border exchanges.

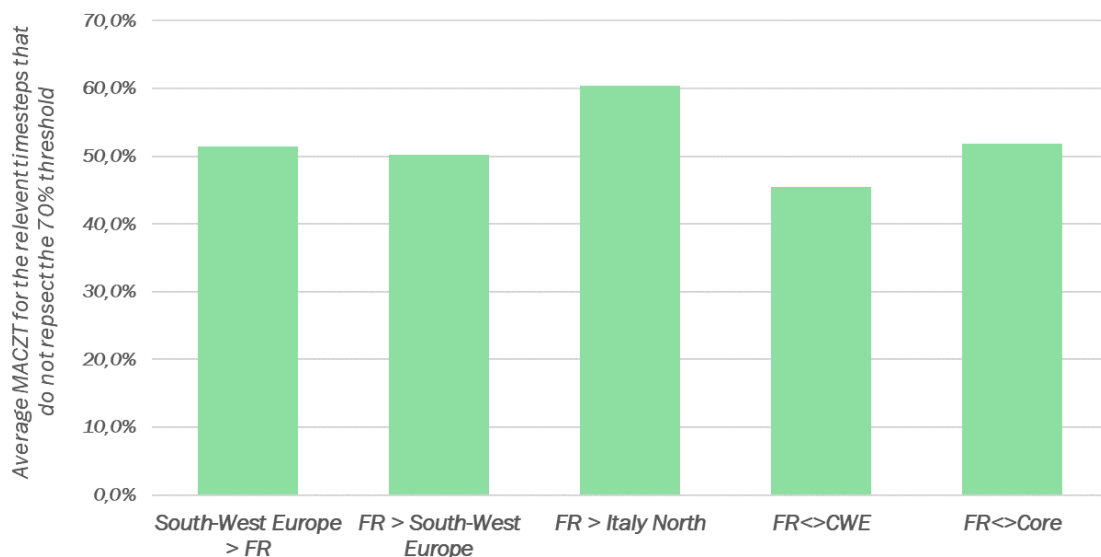


Figure 3 - Average margin offered for relevant time steps not reaching the 70% threshold (limiting network elements category < 70% of figure 1)

Source: RTE data, CRE analysis

Notes:

(1) In the Italy North region, only the direction of Italy's imports from France is currently calculated in a coordinated manner by the TSOs.

Interpretation: At the France-Spain border, in the export direction (FR > South-West Europe), among the relevant time steps (not covered by the two criteria described above), the average level of margins offered was 50% when it did not reach the 70% threshold.

A similar reading can be applied to other borders.

APPENDIX

The graphs below show the distribution of the margin level on the French network elements considered in the coordinated interconnection capacity calculation, for the capacity calculation regions Central-Western Europe, Italy North, South-West Europe and Core.

They take the form of "box-plots", which read as follows:

- 50% of the values are included in the box, whose low and high ends represent the 25th and 75th percentile of the statistical distribution, respectively;
- The middle line corresponds to the median of the values; and
- The lower and upper extremities ("the whiskers") correspond to 150% of the difference between the 25th and 75th percentiles starting at respectively the maximum and minimum of the box defined above, for each month. Consequently, data exceeding these whiskers correspond to extreme values.

Values above 100% correspond to situations where network lines are considered to accommodate physical flows in the opposite direction to the market direction, and can therefore accommodate market flows at levels exceeding their maximum capacity.

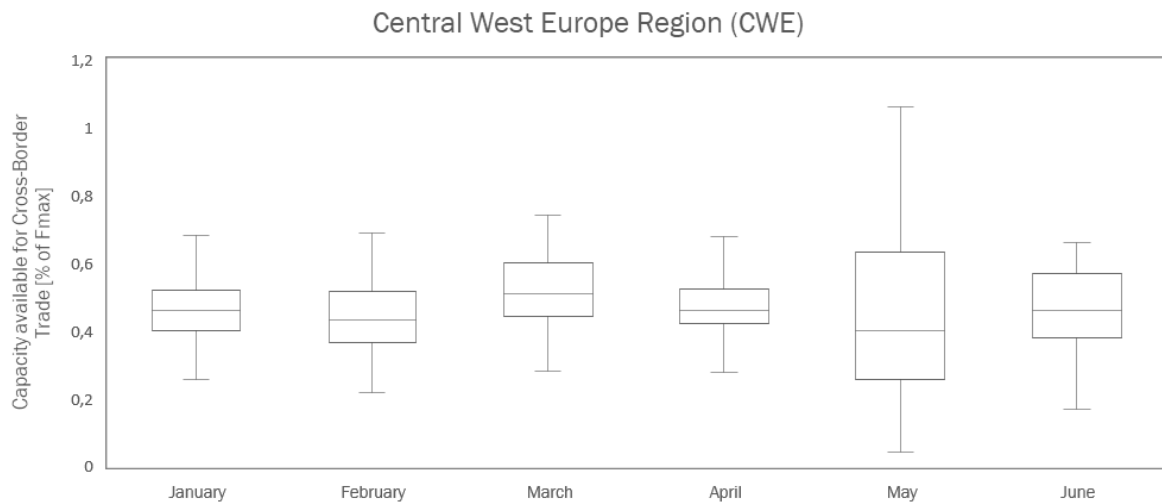


Figure 4 - Distribution of margin levels on French network elements considered in the calculation of interconnection capacities for the Central-Western Europe region

Source: RTE data, CRE analysis

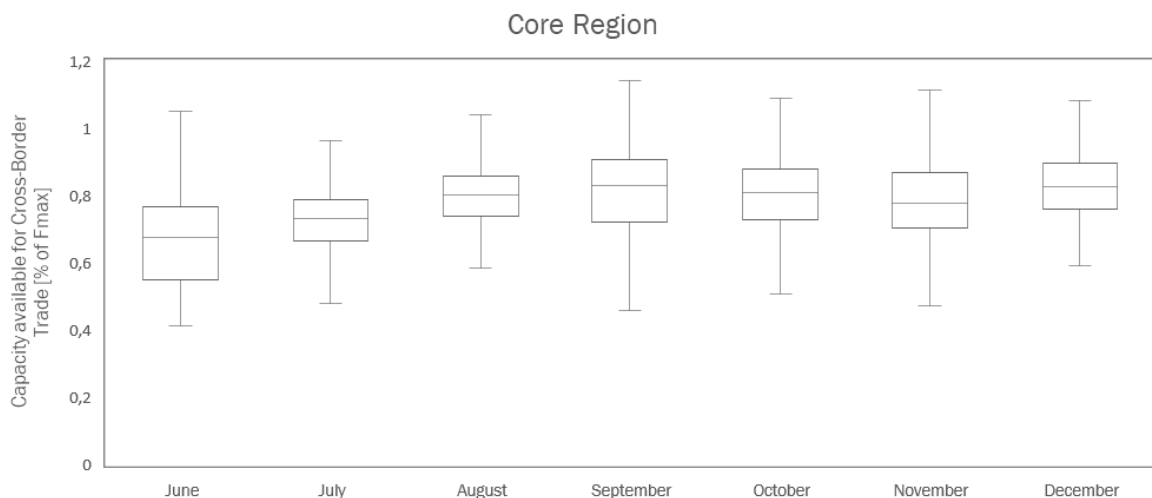


Figure 5 - Distribution of margin levels on French network elements considered in the calculation of interconnection capacities for the Core region

Source: RTE data, CRE analysis

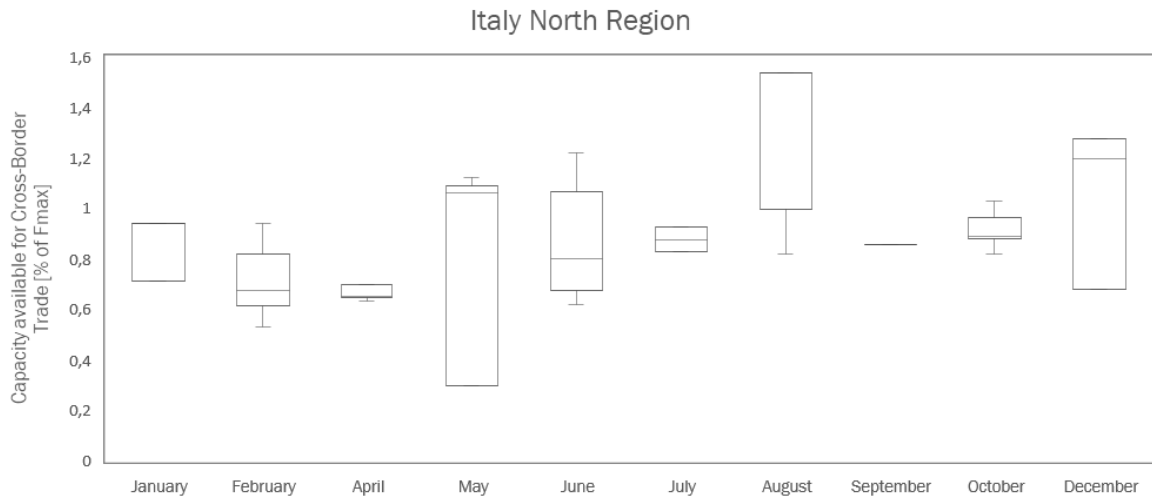
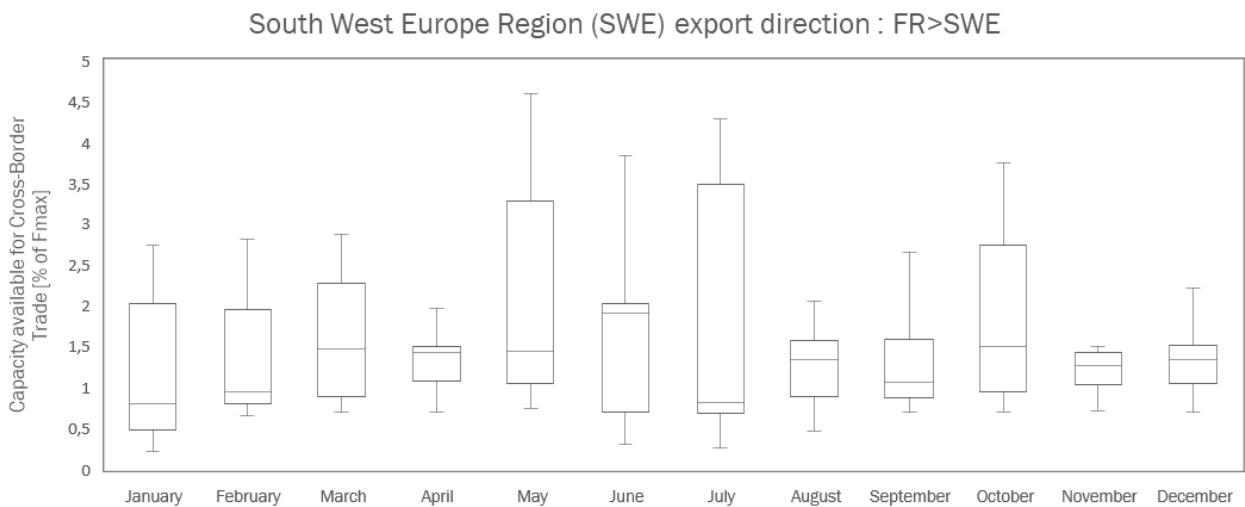


Figure 6 - Distribution of margin levels on the French network elements considered in the calculation of interconnection capacities for the Italy North region

Source: RTE data, CRE analysis



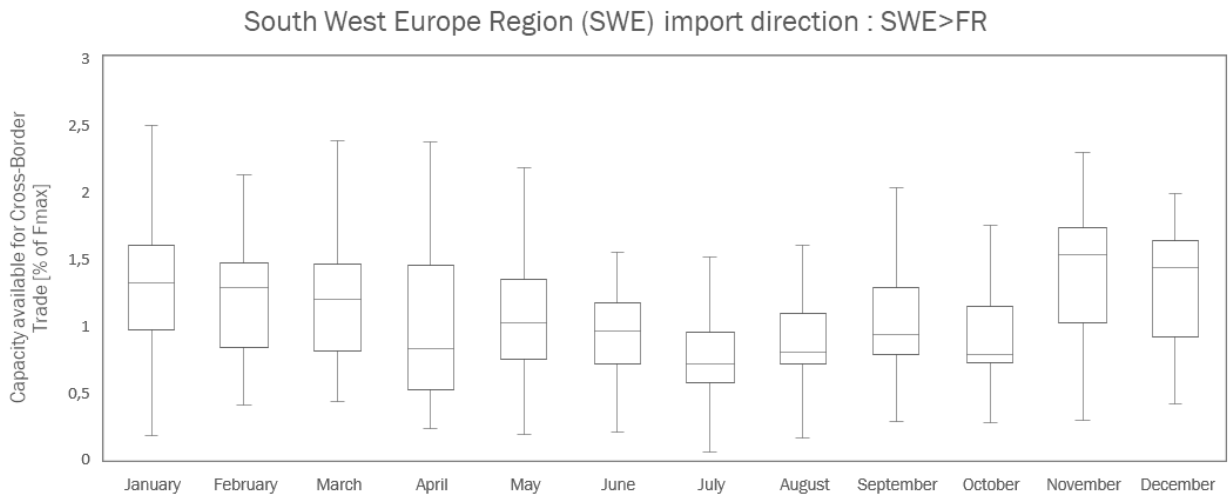


Figure 7 - Distribution of the margin level on the French network elements considered in the calculation of interconnection capacities for the South-West Europe region in the export and import directions.

Source: RTE data, CRE analysis