ARERA
Autorità di Regolazione per Energia Reti e Ambiente

Allegato A

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

12 October 2021

SUMMARY

1 Premise

1.1 According to Article 16(8) of Regulation (EU) 2019/943[1], starting from 1 January 2020 Transmission System Operators (in the following: TSOs) are required to make available a minimum level of capacity for cross-zonal trade (so called 70% rule).

1.2 Upon request of the TSOs, the National Regulatory Authorities (hereinafter: the NRAs) may grant a derogation from the provision of the minimum level of capacity, on foreseeable grounds where necessary for maintaining operational security. Moreover, Member States may adopt action plan to cope with structural congestions: when an action plan is in place, the minimum level of capacity (70%) shall be reached by 31 December 2025, in the meanwhile a linear trajectory shall be matched.

1.3 On the verge of the entry into force of the 70% rule, in July 2019 ACER issued Recommendation 01/2019[2] (hereinafter: the ACER Recommendation) giving some criteria on how to compute the level of cross-zonal capacity to be made available for cross-zonal trade. The proposal is self-standing for the regions implementing a flow based capacity calculation, while for the regions implementing a coordinated net transmission capacity, ACER proposed a calculation for the limiting elements[3] only, mandating the TSOs to develop a proper methodology to compute the level of cross-zonal capacity on all the other network elements.

1.4 Based on the criteria reported in the Recommendation, ACER published two reports for the year 2020 (one on the first semester and one on the second semester), presenting the level of cross-zonal capacity offered on each border and pointing out whether this level is consistent with the 70% requirement.

1.5 ACER reports have nonetheless only a monitoring scope, since assessing the effective compliance of each TSO with the 70% rule is the responsibility of the competent national regulatory authority.

1.6 With this report, ARERA intends presenting its assessment of the status of the 70% rule in 2020 on the borders with France, Switzerland, Austria, Slovenia and Greece and to provide some preliminary findings on the Italian internal bidding zone borders. Chapter 2 describes how compliance with the 70% rule may be assessed in a coordinated net transmission capacity (hereinafter: cNTC) environment, complementing what is already included in ACER Recommendation. Chapter 3 is devoted to the Northern borders, while Chapter 4 focuses on the Greek border. Chapter 5 gives a quick overview of the status of the Italian internal bidding zone borders, and finally, Chapter 6 reports some conclusions.

[1] Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the Internal Market for Electricity (recast)

[2] Recommendation No 01/2019 of the European Union Agency for the Cooperation of Energy Regulators of 08 August 2019 on the implementation of the minimum margin available for cross-zonal trade pursuant to Article 16(8) of Regulation (EU) 2019/943

[3] A limiting element is a transmission element that effectively limits the cross-zonal capacity, i.e. that is loaded at its thermal rate when the full net transmission capacity is used.

2 Assessment of compliance with the 70% rule in a cNTC environment

2.a ***ACER Recommendation***

2.1 ACER recommends computing the Margin Available for Cross-Zonal Trade ($MACZT_i$) for each critical network element and contingency (CNEC)[4] *i* based on the following criteria:

$$MACZT_i = MCCC_i + MNCC_i$$

where:

- $MCCC_i$is the Margin from Coordinated Capacity Calculation on CNEC *i*;
- $MNCC_i$ is the Margin from Non-Coordinated Capacity Calculation on CNEC *i*.

2.2 $MCCC_i$ is computed for each coordination area, i.e. for each set of borders on which the cross-zonal capacity is computed in a coordinated manner. For flow based areas, is equal to the Remaining Available Margin RAM_i resulting from the capacity calculation process as increased to take into account previously allocated and nominated capacities. For cNTC areas, instead, the following formula should be used:

$$MCCC_i = \sum_b pPTDF_i^b \cdot NTC_b$$

where:

- $pPTDF_i^b$ is the positive PTDF[5] of CNEC *i* in the direction associated to border *b*
- NTC_b is the net transmission capacity computed in the capacity calculation process for border *b*;
- the sum is extended to all the borders within the coordination area.

2.3 ACER points out that the formula for $MCCC_i$ in cNTC areas provides a reliable estimation only for the limiting CNECs, while for all the other CNECs the formula underestimates the $MCCC_i$ since it doesn't consider the quota of the capacity that remains unused because of the law of physics in a meshed system.

2.4 In both flow based and cNTC areas, $MNCC_i$ is computed by multiplying the corresponding zone related PTDF with the net position associated to the bidding zones in the common grid model used for the relevant capacity calculation; before the computation the net position is adjusted in order to filter out the exchanges within the coordination area that are taken into account in the MCCC.

2.5 In case of borders only consisting of HVDC, the computation can be simplified: since the flows on HVDC are usually fully controllable, $MNCC_i$is equal to zero (i.e. no flows on the HVDC due to exchange outside the coordination area) and $MCCC_i$ is equal to the NTC_b on the considered border.

[4] A CNEC is the pair of network element and associated contingency that is monitored during the capacity calculation process to take into account the N-1 security. For N security, CNECs are considered without any contingenciesattached.

[5] PTDF (Power Transfer Distribution Factor) can be border related or zone related; a border related PTDF measures the flow on a given network element induced by 1 MW exchange on the considered border; a zone related PTDF measures the flow on a given network element induced by 1 MW net position on the considered zone (there is an opposite net position in the slack zone).

2.b ***Assessment of compliance with the 70% rule in cNTC areas***

2.6 The analysis focuses on cNTC areas with borders consisting of AC and/or DC interconnectors. NTC is usually computed by an iteration process increasing the injections on the exporting bidding zones, reducing the injections in the importing ones[6] and evaluating the exchange across the border in this new situation by means of a full AC load flow (i.e., taking into account the transmission losses and the voltage profile): the process ends when a constraint is detected. The maximum exchange without hitting any constraints is assumed as the NTC on the considered border.

2.7 Let F_i^{last} be the flow on the CNEC *i* at the very last step of the cNTC process, i.e. in the iteration when the gross cross-zonal capacity TTC_b is identified on each border *b*. Let $PTDF_i^b$ be the PTDF associated to CNEC *i* because of flows induced by an exchange on a border *b* within the coordination area.

2.8 Mimicking the flow based approach, the flow F_i^0 on the CNEC *i* with no exchanges within the coordinated area can be computed as:

$$F_i^0 = F_i^{last} - \sum_b PTDF_i^b \cdot TTC_b$$

2.9 Then, keeping mimicking the flow based approach

$$MCCC_i = RAM_i = F_i^{max} - F_i^0 - FRM_i = F_i^{max} - F_i^{last} + \sum_b PTDF_i^b \cdot TTC_b - FRM_i$$

where

- FRM_i is the flow reliability margin on the CNEC *i*.

2.10 FRM_i can be deducted from the transmission reliability margin for each border *b* TRM_b as:

$$FRM_i = \sum_b PTDF_i^b \cdot TRM_b$$

hence

$$\begin{aligned} MCCC_i &= F_i^{max} - F_i^{last} + \sum_b PTDF_i^b \cdot TTC_b - FRM_i \\ &= F_i^{max} - F_i^{last} + \sum_b PTDF_i^b \cdot (TTC_b - TRM_b) \\ &= F_i^{max} - F_i^{last} + \sum_b PTDF_i^b \cdot NTC_b \end{aligned}$$

2.11 In case of limiting CNECs, $F_i^{last} = F_i^{max}$ (the CNEC is fully loaded at the last iteration step), hence

[6] Theoretically it's possible to increase the load in the importing bidding zones as well as decrease it in the exporting ones. This is nonetheless not relevant for the purpose of this report.

$$MCCC_i = F_i^{max} - F_i^{max} + \sum_b PTDF_i^b \cdot NTC_b = \sum_b PTDF_i^b \cdot NTC_b$$

The result is identical to the formula suggested in ACER Recommendation[7], thus confirming the reliability of the Recommendation in estimating the margin for limiting CNECs.

2.12 Continuing with the flow based approach and neglecting the previously allocated and nominated capacities[8], the Adjusted Margin AMR_i and the final margin RAM_i^{adj} on the CNEC *i* can be computed as:

$$AMR_i = \max(0{,}7 - MACZT_i; 0)$$

$$RAM_i^{adj} = RAM_i + AMR_i = F_i^{max} - F_i^{last} + \sum_b PTDF_i^b \cdot NTC_b + AMR_i$$

2.13 For sake of simplicity, let's assume the coordination area composed by a single border[9]. The assumption adequately represents the condition of the Italian borders: in Italy North CCR, in fact, the cNTC computation process identifies the overall capacity jointly on the four borders (France, Switzerland, Austria and Slovenia), then the calculated value is split by predetermined factors; in GRIT CCR all the borders can be considered as independent from each other in terms of capacity calculation.

2.14 Given the above, the computation of the final margin is simplified as follows:

$$RAM_i^{adj} = RAM_i + AMR_i = F_i^{max} - F_i^{last} + PTDF_i^b \cdot NTC_b + AMR_i$$

2.15 For each CNEC *i* it's then possible to compute the equivalent $NTC_{b,i}^{eq}$ that would allow to match the 70% rule

$$NTC_{b,i}^{eq} = \frac{RAM_i^{adj}}{PTDF_i^b} = \frac{F_i^{max} - F_i^{last} + PTDF_i^b \cdot NTC_b + AMR_i}{PTDF_i^b}$$
$$= NTC_b + \frac{F_i^{max} - F_i^{last} + AMR_i}{PTDF_i^b} = NTC_b + \Delta NTC_{b,i}^{nused} + \Delta NTC_{b,i}^{AMR}$$

where:

- $\Delta NTC_{b,i}^{nused} = \frac{F_i^{max} - F_i^{last}}{PTDF_i^b}$ is the increase of the cross-zonal capacity associated to the exploitation of the entire thermal capacity on the CNEC *i*;
- $\Delta NTC_{b,i}^{AMR} = \frac{AMR_i}{PTDF_i^b}$ is the increase of the cross-zonal capacity associated to the adjusted margin on the CNEC *i*

2.16 Eventually, the adjusted cross-zonal capacity NTC_b^{adj} can be computed as:

$$NTC_b^{adj} = \min\left(NTC_{b,i}^{eq}\right) = NTC_b + \min\left(\Delta NTC_{b,i}^{nused} + \Delta NTC_{b,i}^{AMR}\right) = NTC_b + \Delta NTC_b$$

[7] For limiting CNECs $PTDF_i^b$ is positive, otherwise the element would not limit the cross-zonal capacity.

[8] In a cNTC environment, the NTC can be computed neglecting the previously allocated capacities: this means that the NTC represents the whole capacity available on the considered border. The effective capacity offered to the market is then computed deducting the previously allocated one.

[9] It can be either an effective single border or a set of interdependent borders on which the overall capacity is computed and then split.

where:

- $\Delta NTC_b = \min\left(\Delta NTC_{b,i}^{nused} + \Delta NTC_{b,i}^{AMR}\right)$ is the final increase of the cross-zonal capacity with respect to the original value coming out from the cNTC computation process.

2.17 Higher NTC values than the minimum one cannot be reached by increasing margins of non-limiting CNECs towards 70%, because this would lead to an overload on the limiting element fulfilling the 70% rule. NTC_b^{adj} therefore represents the most efficient NTC value. Obviously with this value only some CNECs are fully exploited (or slightly overloaded to comply with the 70% rule, provided that enough remedial actions are available to solve the overload in the subsequent timeframes), while many others remain not fully used, but this also happens in the flow based environment when the allocation phase optimizes the social welfare by identifying the most efficient solution (i.e., the CNECs to fully exploit) within the flow based domain.

2.18 When ΔNTC_b is zero, the original NTC_b already represents the most efficient NTC value: this only occurs when at least one CNEC i has $\Delta NTC_{b,i}^{nused} = \Delta NTC_{b,i}^{AMR} = 0$. This is the case of limiting CNECs (no adjustment associated to full exploitation since the network element is already fully loaded in the original computation) already matching the 70% rule (no need to any adjusted margin). This means that if a limiting CNEC matches the 70% rule in the original computation process, the resulting NTC_b already represents the most efficient NTC value, i.e., the value that would have been resulted assuming a 70% margin on all the other CNECs.

2.19 In case no limiting CNECs match the 70% rule in the original computation, NTC_b shall be adjusted and the ΔNTC_b computed. Theoretically the computation should evaluate the contribution of all the CNECs, since one cannot exclude a priori that the most efficient NTC value is limited by the full exploitation of a CNEC not originally limiting the cross-zonal capacity rather than by the adjustment of the margin to comply with the 70%. Nonetheless for sake of simplicity attention may be focused exclusively on the limiting CNECs, hence assuming $\Delta NTC_b^* = \min \Delta NTC_{b,i}^{AMR}$

2.20 In this case the final value of the cross-zonal capacity can be computed by evaluating the minimum increase of the cross-zonal capacity associated to the adjusted margins on the limiting CNECs. This value is either the most efficient NTC value (in case $\Delta NTC_b = \Delta NTC_b^* = \min \Delta NTC_{b,i}^{AMR}$) or above the most efficient one (in case $\Delta NTC_b^* > \Delta NTC_b = \min \Delta NTC_{b,i}^{nused}$): in both cases the value can be considered compliant with the 70% rule.

2.21 Given the above, the following conclusions can be drawn:

i) in order to be consistent within the 70% rule, the cross-zonal capacity in a cNTC environment shall be assumed equal to the most efficient NTC value; in a single border coordination area the most efficient value is the one leading to the minimum increase of cross-zonal capacity with respect to the original value; with more borders an equivalent set of NTC values shall be identified;

ii) if a limiting CNEC matches the 70% rule at the end of the cNTC computation process, the associated value of cross-zonal capacity originating from the cNTC computation process is already the most efficient NTC values, i.e. it already complies with the 70% rule on all CNECs;

iii) if no limiting CNECs match the 70% rule at the end of the cNTC computation process, it's enough to evaluate the minimum increase of cross-zonal capacity looking at the limiting CNECs only: the resulting value would be compliant with the 70% rule since it would either be the most efficient NTC value or above it.

2.22 The cNTC compliance with the 70% rule can thus be assessed by ensuring that **at least one CNECs has a margin equal or greater than 70%** in the original computation or by an adjustment of the original value of cross-zonal capacity. **There is thus no need to evaluate the margins on all CNECs.**

3 Assessment for Italy North CCR

3.a Capacity calculation process

3.1 Italy North CCR encompasses the borders with France, Austria and Slovenia; the border with Switzerland is not formally included in the region, but due to its strict interdependency with the other ones, this border has always been considered in the capacity calculation process.

3.2 Italy North TSOs chose to adopt a cNTC approach: the cross-zonal capacity in the import direction has been computed for years on the entire Northern borders (i.e. considering an equivalent border across all the Alps) by increasing injections in France, Switzerland, Austria and Slovenia and by decreasing injections in Italy. The original methodology, developed on a voluntary basis, was modified to make it compliant with the CACM Regulation[10] and it has been into force in the day-ahead timeframe since 2020 and in the intraday timeframe since late 2019. The export capacity is not currently estimated: TSOs are working at the so called export corner concept that will allow to evaluate the cross-zonal capacity in the export direction on the specific borders on which export is likely to occur[11].

3.3 The overall import capacity may also be limited by specific allocation constraints introduced by the Italian TSO Terna to take into account the voltage and stability issues of the whole Italian system. The system needs a certain amount of regulating resources to be dispatched to ensure voltage regulation and a proper inertia. In standard conditions, when the sum of these resources with non-dispatchable production and full import capacity is lower than the load, all the regulating resources can be effectively dispatched[12]. On the contrary with low load and significant non-dispatchable production, dispatching all the regulating resources with a full import capacity would lead to overgeneration: in these situations (typical in spring months) the solution is to limit the import capacity in order to leave enough space for the regulating resources to be dispatched.

3.4 Allocation constraints are currently implemented as an ex-ante reduction to the cross-zonal capacity available on each border; the TSOs are working to have these constraints directly dealt with in the allocation phase within the single day-ahead coupling algorithm: the shift is expected to be completed by the end of 2021.

3.5 Following the entry into force of Regulation (EU) 2019/943, the TSOs further modified the capacity calculation methodology to incorporate a monitoring of the level of cross-zonal capacity made available to the market, as well as an automatic adjustment of its value to comply with the 70% rule. The proposal was approved by the competent NRAs in July 2020 and it's expected to be implemented in Q4 2021.

[10] Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management

[11] If no export is likely, the export corner is not run and the overall import capacity is computed. In this case the market is provided with a standard export capacity based on yearly estimation.

[12] Either from the energy market or in the ancillary service market.

3.b 2020 status

3.6 For the year 2020 the cross-zonal capacity in the import direction was computed based on a CACM-compliant methodology with allocation constraints (modelled as an ex-ante reduction of the cross-zonal capacity), but without any monitoring of the 70% requirement.

3.7 For this reason, a derogation from the 70% requirement was requested for the entire year by French, Austrian and Italian TSOs, claiming that it wouldn't have been possible to comply with the 70% rule without a proper coordinated tool to provide the minimum level of transmission capacity to be offered to the market. Moreover, the TSOs pointed out that the regulatory framework didn't allow them to take into account the exchanges with Switzerland towards the 70% rule: according to a letter by the European Commission to ACER and ENTSO-E dated 16 July 2019 this inclusion is possible only if a specific agreement is signed between the EU TSOs and the Swiss TSO, provided that this agreement is deemed acceptable by the competent NRAs. Terna underlined that the application of the allocation constraints may lead to a final cross-zonal capacity lower than the 70% threshold.

3.8 All derogations were granted, in particular ARERA approved Terna's request in December 2019 with Decision 561/2019/R/eel[13]. Terna could thus avoid complying with the 70% requirement in all the 2020 market time units; however it was required to provide ARERA with a quarterly report monitoring the level of cross-zonal capacity offered on the Italian Northern borders.

3.c ACER monitoring

3.9 ACER ran a monitoring based on the information provided by the TSOs. ACER requested data about limiting CNECs, NTC values, allocation constraints and, where available, about PTDFs and margin available on each CNEC[14], computed pursuant to the ACER Recommendation. Where no data on PTDF and margin were provided, ACER estimated the margin by adopting the PTDF computed on some reference common grid models.

3.10 For Italy North CCR the TSOs agreed to only send the data computed in a coordinated manner within the capacity calculation process: for 2020 this meant only NTC values and the indication of the limiting CNECs, since information on PTDF or on possible margin estimation are dependent on the 70% adjustment tool that will not be available before Q4 2021. Moreover the TSOs were not able to provide any information on the limiting CNECs every time the cross-zonal capacity was limited because of an allocation constraints (in these cases the computation used to stop when hitting the maximum import capacity allowed because of the constraint, without identifying a proper limiting CNEC; some further information were nonetheless provided starting from July 2020) or because of a validation requested by the TSOs (in these cases the TSOs didn't always report the exact location of the expected congestions; also, even if reported, this information was not given in a standard network format to be shared with ACER). Hence ACER was able to rely only on a limited set of data: this significantly affected the overall results.

3.11 ACER monitored the 70% rule on a country basis: for each market time unit, the limiting CNECs are assigned to their specific country (based on their geographical location) and then the MACZT on each of them is computed; the compliance with the 70% rule is deemed reached

[13] Deliberazione 19 dicembre 2019, 561/2019/R/eel, "Approvazione della richiesta di deroga per il rispetto del livello minimo di capacità da rendere disponibile per gli scambi tra zone di mercato presentata da Terna S.p.A. con riferimento alla Regione Italy North"

[14] Computed according to ACER Recommendation.

when the 70% is matched on all the limiting CNECs (green area in the Figures). ACER also highlights the situation when the margin is within 50-70% (yellow area) or within 20-50% (orange area).

3.12 Figure 1 summarizes the main outcome of the assessment run by ACER for the first semester 2020: the graph on the left doesn't consider the contribution of third countries exchanges (i.e. flows with Switzerland), while the one on the right takes it into account. The limiting effect of the allocation constraints is evident: they limit the cross-zonal capacity in 38% of the market time units (pink area). The effect was mainly concentrated in the spring months, usually featuring a low load compared with winter and summer months and a favourable climate for renewable production. In 2020 the situation was made even worse (i.e. more market time units limited by allocation constraints) by the combination of the lockdown (furtherly depressing the load) with very mild weather conditions.

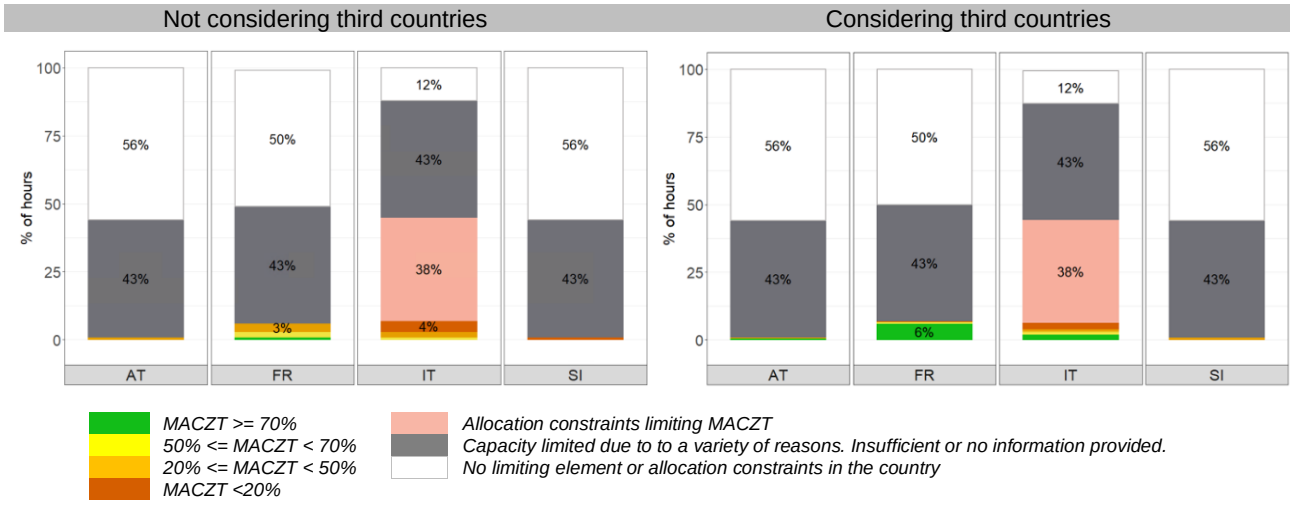

Figure 1 – ACER assessment S1 2020 – Source: ACER report

3.13 For 43% of the market time units (grey area) no monitoring could be carried out because of the lack or insufficiency of information from the TSOs: these are mainly cases of reduction of the cross-zonal capacity upon request upon request from a TSO in the validation phase, and of failures in the the capacity calculation processes.

3.14 Focusing attention on the remaining 19% of market time units, the limiting CNECs were located within the Italian territory[15] only in around 7% of the cases with a margin that was higher than 70% in around 1% of the cases provided that the third country contribution was taken into account.

3.15 Even considering that the usage of PTDFs coming from reference common grid models may lead to underestimate the level of capacity made available for cross-zonal trade, the overall picture emerging from ACER monitoring still seems quite gloomy.

3.16 The situation didn't improve much in the second semester. As depicted in Figure 2[16], despite a significant reduction of the allocation constraints (occurring in about 3% of the market time

[15] Including also the interconnectors.

[16] Figure 2 format is different from Figure 1, because for the second semester, upon insistent requests by the NRAs, it was decided to group graphs both with and without third countries in a single Figure. For the first semesterthe combination was instead performed by ARERA since ACER provided two separate Figures (one, related to the situation without third countries, in the main body of the report, and the other with third countries on board in the annex).

units, as usually occurs in fall and winter months), data were available only for 41% of the market time units, while for all the others no information was given[17].

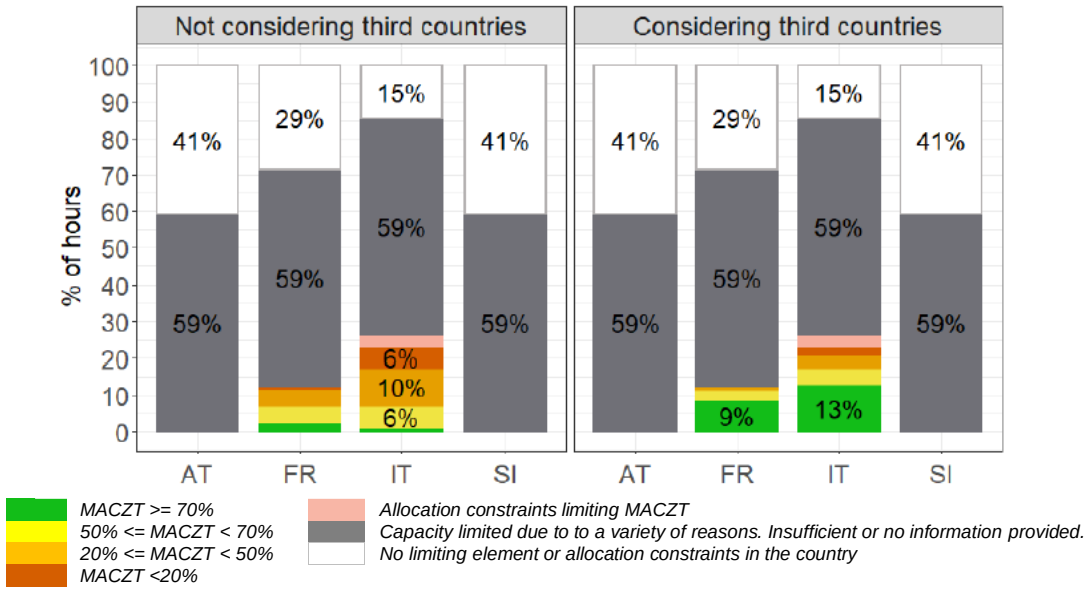

Figure 2 – ACER assessment S2 2020 – Source: ACER report

3.17 Among the available data, the market time units with margins greater than 70% reached the 13% of the total[18], while in 15% of cases no limiting CNECs were located within Italy.

3.d ***ARERA analysis***

3.18 While requesting a derogation for 2020, Terna committed to regularly provide ARERA with an estimation of the level of capacity available for cross-zonal trade and information on the limiting CNECs. The data were gathered in a dedicated report that was sent on a quarterly basis to the regulator.

3.19 This report is based on unilateral estimation run by Terna by means of off-line processes, using the outcome of the coordinated capacity calculation process and the associated common grid model as a starting point. In particular:

- Terna monitored all the CNECs resulting to be loaded at least at 99% at the end of the capacity calculation processes; this set is wider than the set of limiting CNECs sent to ACER, because it also includes CNECs that are already significantly loaded in the starting common grid model and are not considered by the TSOs as effectively limiting the cross-zonal capacity and hence are not sent to ACER;
- Terna estimated the margins on the monitored CNECs by evaluating the PTDF at the end of the capacity calculation process, based on the associated common grid model; this avoids any potential underestimation due to the adoption of reference scenarios; ACER was instead forced to adopt use reference scenarios not being provided with these data since they didn't result from a coordinated process;

[17] A significant number of validation requests were submitted. One of the reasons may be that a non reliable input data was used for the capacity calculation process; Italy North NRAs are conducting further investigations.

[18] The data is referred to the situation where third countries contribution is on board. Looking at the situation without third countries, the situation is obviously worse, but, differently from the previous semester, ACER highlighted some market time units in the green area even in this situation.

- Terna was able to provide information on limiting CNECs also for some of the market time units with an allocation constraint: the information relies on the last step of the capacity calculation process, before hitting the constraint; the resulting limiting CNECs are estimated through an ad hoc, non-coordinated, calculation; for this reason this information was not shared with ACER, but sent only to ARERA;
- Terna was able as well to provide information on limiting CNECs for most of the market time units with a validation request by at least one TSO; this information derived from the capacity calculation process, but it wasn't shared with ACER because the TSOs were not able to filter out the CNECs effectively limiting the cross-zonal capacity[19].

3.20 Based on Terna reports, ARERA assessed the 70% rule on two different sets of data:

i) looking only at the CNECs shared with ACER, but using unilateral information on margins provided by Terna (hereinafter: the ACER perimeter);

ii) looking at all the CNECs monitored by Terna (hereinafter: the Terna perimeter).

3.21 Moreover, ARERA looked simultaneously at all the Northern borders, without allocating each CNEC to its country: this allows to also monitor the CNECs located within Switzerland (which are excluded from ACER reports since Switzerland is a non-EU Member State).

3.22 Figure 3 shows the situation for the first semester for the ACER perimeter: the frequency of allocation constraints and validation phase were the same as in ACER report[20], while the frequency of margins being all over 70% increased dramatically. The case "at least one over 70%" (yellow) includes the cases where at least one CNEC is over 70% but not all CNECs are; this case is not explicitly represented in the figure because of the low value (0.25%).

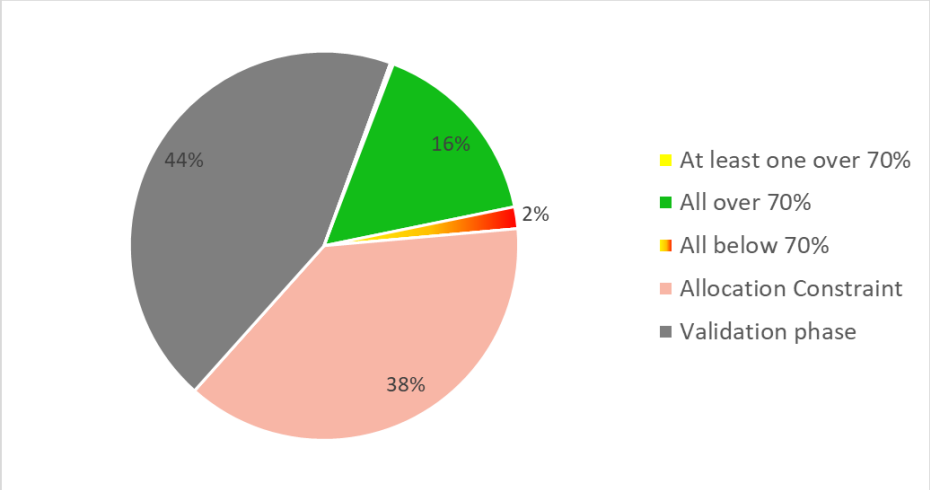

Figure 3 – ARERA assessment S1 2020 ACER perimeter – Source: ARERA elaborations on ACER and Terna data

3.23 For a proper comparison with ACER results, nonetheless, the green area in Figure 3 shall be compared with the sum of the white and green areas in graph on the right in Figure 1: the white

[19] When validation request occurs, the CNECs effectively limiting the cross-zonal capacity are the ones marked by the TSOs requesting the validation as critical because of congestion. Due to a non-standard format in the reasons behind the validation, the TSOs were not able to automate the identification of the limiting CNECs in those cases and, thus, decided to not send ACER any relevant data. Terna monitoring is independent of this situation, since it looks at all the CNECs loaded at more than 99% and not to the ones effectively limiting the cross-zonal capacity.

[20] Here ARERA prefers labelling the grey area as validation phase, since the absence of data which ACER complained was mainly due to this situation. In reality the area also includes market time units when the computation process fails, but the frequency of this event is anyhow quite rare. The slight difference between 44% (ARERA) and 43% (ACER) is due to roundings.

area can be mainly associated to CNECs located in Switzerland (not explicitly monitored by ACER), which usually shows margins higher than 70%, and, hence it would have turned green if an overall monitoring on the entire borders had been performed. This comparison makes the positive effect of the usage of the PTDFs coming from the proper grid model immediately evident: from 13% (12% white plus 1% green) to 16%, confirming how the reference scenarios are likely to underestimate the effective level of capacity made available for cross-zonal trade[21].

3.24 Figure 4 summarizes the assessment for the first semester for the Terna perimeter: it's immediately evident how almost half of the market time units fall in the yellow area with at least one CNEC over 70%, but not all of them.

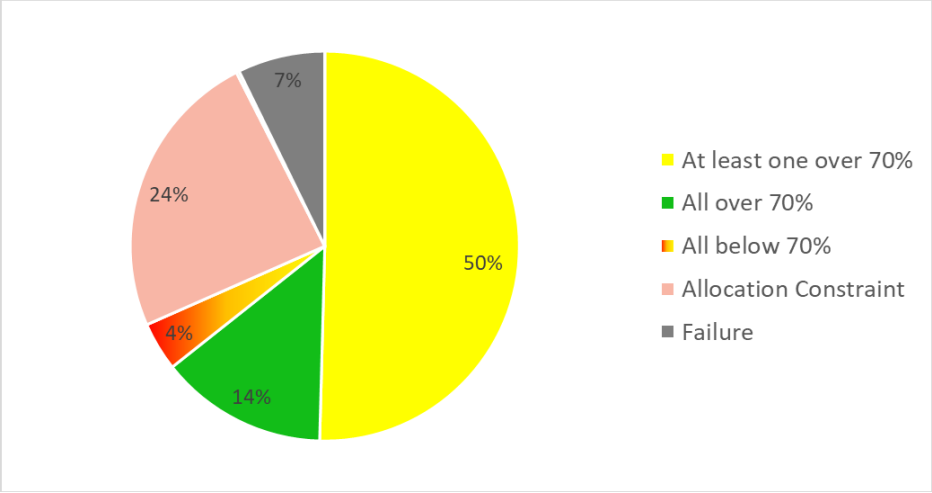

Figure 4 – ARERA assessment S1 2020 Terna perimeter – Source: ARERA elaborations on Terna data

3.25 It's worth comparing the cases between the two perimeters to understand how the situation may change based on the set of CNECs that is effectively monitored. The results can be found in Table I:where the columns refer to the cases in the ACER perimeter and the rows to the cases in the Terna perimeter: each cell indicates how many cases fall in the considered combination, e.g. the first row indicates how many cases classified as "allocation constraint" case according to Terna perimeter fall according to ACER perimeter in "allocation constraint" case (first cell on the left), in "all below 70%" case (second cell on the left), "all over 70%" case (third cell on the left), "at least one over 70%" case (fourth cell on the left) and "validation phase" case (fifth cell on the left).

TABLE I – COMPARISON BETWEEN THE PERIMETERS IN THE FIRST SEMESTER

		ACER perimeter				
		Allocation Constraint	All below 70%	All over 70%	At least one over 70%	Validation phase
Terna perimeter	Allocation Constraint	1000	0	0	0	52
	All below 70%	123	8	0	0	46
	All over 70%	315	0	106	0	187
	At least one over 70%	148	71	592	11	1380
	Smoothing ramp	9	0	0	0	2
	Failure	65	0	0	0	252

3.26 There is a good correlation between the two perimeters (i.e. both perimeters lead to the same classification) only for the case at least one over 70% (592 cases) while:

[21] This drawback is explicitly mentioned by ACER in its reports. The findings in this report simply confirm it.

- most of the market time units falling in the case “all below 70%” in the ACER perimeter show a better situation (at least one over 70%) if looking at the wider Terna perimeter; this is because a higher number of CNECs are monitored in the Terna perimeter, and therefore, the likelihood is higher of having at least one of them with a margin higher than 70%;
- most of the market time units falling in the case “all over 70%” in the ACER perimeter show a worse situation (at least one over 70%) compared to Terna perimeter; this is because in Terna perimeter also CNECs already heavy loaded in the common grid model are monitored and they usually have quite a low margin.

3.27 Further information provided by Terna on some of the market time units characterized by an allocation constraint shows that some of them are indeed in a favourable situation with respect to 70% rule: around 450 market time units (around 10% of the total of the semester) have all or at least one CNEC over 70%.

3.28 The situation is even better when looking at the validation phase: more than 1500 market time units (around 35% of the total of the semester) have all or at least one CNEC over 70% and only in few cases all CNECs remain below 70%.

3.29 Terna cases also show two other peculiar situations:

- failure (around 7% of the market time units in the first semester) where the capacity calculation process fails and a fallback value is used;
- smoothing ramp (so few cases that they are not shown in the pie chart in figure 4), where the capacity is limited to avoid huge steps between the market time units.

3.30 Figure 5 (ACER perimeter) and 6 (Terna perimeter) depict the assessment for the second semester.

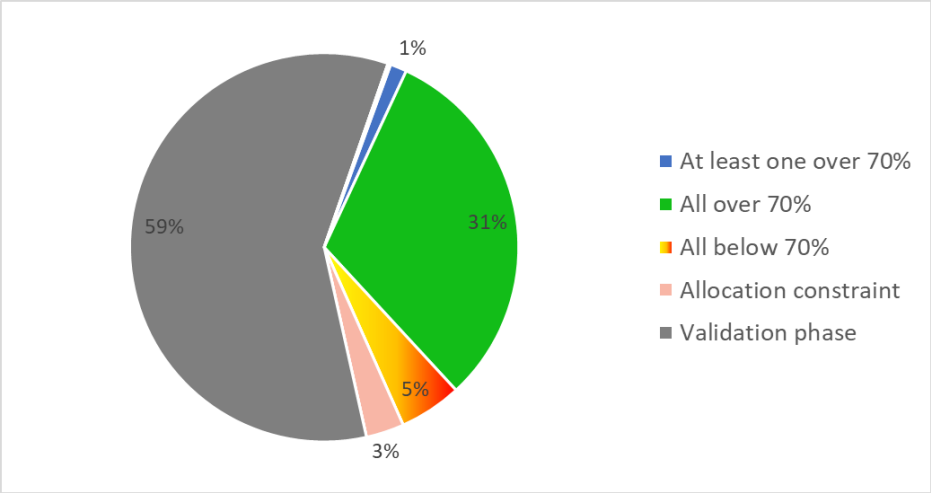

Figure 5 – ARERA assessment S2 2020 ACER perimeter – Source: ARERA elaborations on ACER and Terna data

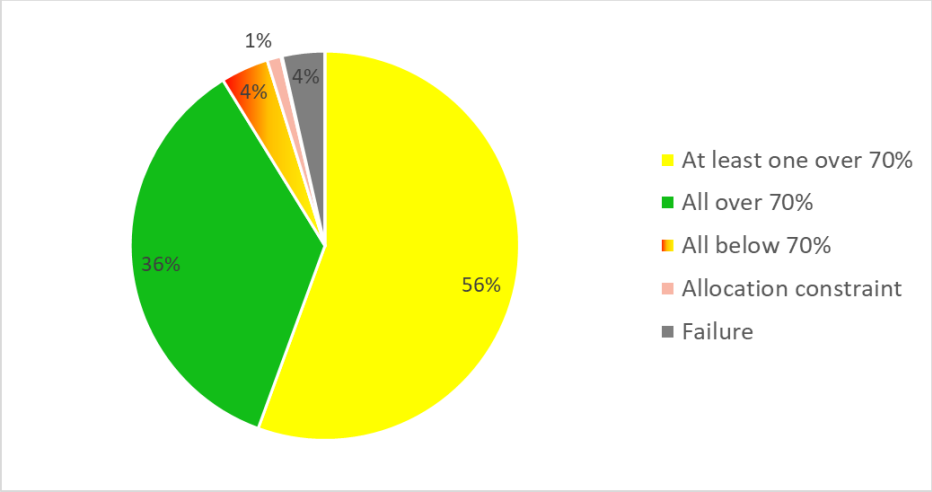

Figure 6 – ARERA assessment S2 2020 Terna perimeter – source: ARERA elaborations on Terna data

3.31 The underestimation due to the usage of reference scenarios is confirmed in this semester too: the green area in Figure 5 (31%) is a bit higher than the sum of the white and green areas in the graph on the right in Figure 2 (28%).

3.32 The comparison between the two perimeters reported in Table II leads to similar results with respect to the previous semester: good correlation (i.e. both perimeters leading to the same classification in most cases) is confirmed only for the case with at least one CNEC over 70%, while with Terna perimeter most of the cases classified in the ACER perimeter as "all below 70" or "all over 70" fall in the case "at least one over 70%".

TABLE II – COMPARISON BETWEEN THE PERIMETERS IN THE SECOND SEMESTER

		ACER perimeter				
		Allocation Constraint	All below 70%	All over 70%	At least one over 70%	Validation phase
Terna perimeter	Allocation Constraint	51	0	0	0	0
	All below 70%	14	50	0	0	112
	All over 70%	14	0	654	0	906
	At least one over 70%	60	180	724	61	1430
	Smoothing ramp	5	0	0	0	0
	Failure	6	0	0	0	150

3.33 Also in this case the wider set of information provided by Terna for the market time units characterized by allocation constraints or reductions in the validation phase leads to a better result (more than 2300 hours, around 53% of the total of the semester, with all or at least one CNEC over 70% for the validation phase and around 74 hours for the allocation constraints).

3.e ***Final assessment***

3.34 The data provided by Terna, even if derived by unilateral estimations and not from complete computations (as in the case of the allocation constraints), allows a more comprehensive assessment of the situation of the Italy North CCR with respect to the 70% rule.

3.35 As illustrated in chapter 2, implementing Italy North CCR a cNTC approach, if at least one CNEC shows a margin greater than 70%, then the resulting NTC value already represents the most efficient one and no higher value would result if the margin were checked on all the CNECs. To this extent in this case the TSO can be deemed compliant with the 70% rule.

3.36 Given the above, Figure 7 summarizes the final assessment for the year 2020: apart from the derogation, the region performed quite well with positive assessment (i.e., at least one CNEC

over 70%) in 78% of the market time units, while in the remaining 22%, the computation either failed (5%) or ended up because of allocation constraints (13%), or showed all CNECs below 70% (4%).

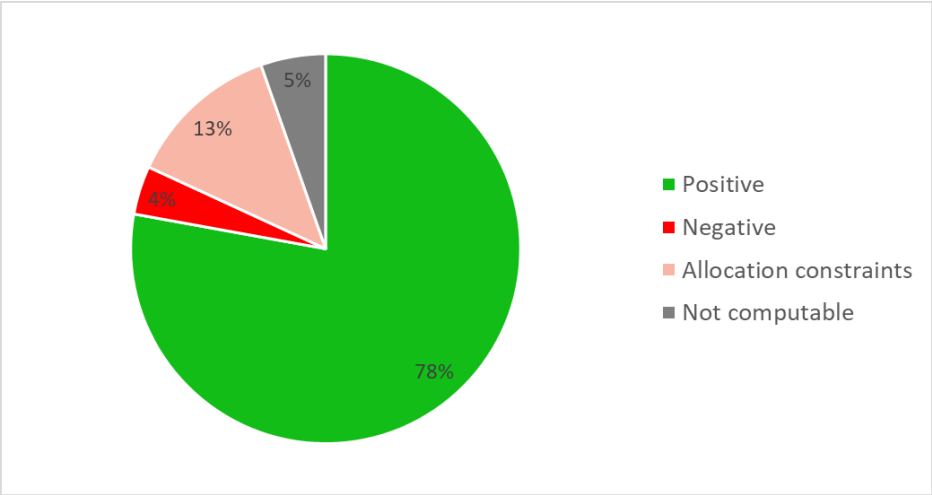

Figure 7 – Overall assessment for Italy North CCR

3.37 It's worth recalling that the assessment looks at the performances of the entire Northern borders section, without pairing each CNEC with the corresponding TSO. The cross-zonal capacity is computed in a coordinated manner and, in ARERA's view Terna's performance shall thus be assessed based on all the limiting CNECs of the region and not only based on the limiting CNECs within Italy.

3.38 In case, instead, the 70% rule is not matched because of a unilateral request by a TSO in the validation phase, the requesting TSO performance should be assessed based on the reduced NTC, while the performance of the remaining TSOs performance should be assessed based on the pre-validated value coming out from the coordinated computation process. This kind of differentiation couldn't be run for 2020 by ARERA, due to a lack of data since Terna only provided an estimation of the margin with respect to the final validated cross-zonal capacity. However, this differentiation would have probably led to an improvement in the assessment results[22].

[22] It's worth noticing that:

- Figure 7 encompasses the worst case in each market time unit, since the margins are computed on the reduced NTC value and not on the potentially higher pre-validated ones;
- in case Terna is not the TSO requesting the reduction, its performances should be assessed based on the pre-validated values, thus resulting in higher level of capacity made available for cross-zonal trade and, therefore, in a potentially better assessment;
- the difference would regard only the market time units falling in the negative red sector, since the application of higher pre-validated NTC values instead than the final reduced ones, might lead to some CNECs going over 70% and then moving the market time units into the green positive sector;
- in all the other cases no difference would occur since the pink and grey areas include market time units where margin cannot be computed (independently of the validation phase) and the green area is already compliant and any improvements would only increase the mean margin without changing the overall judgement.

4 Italy – Greece border

4.a Capacity calculation process and 2020 status

4.1 Italy – Greece border belongs to GRIT CCR that implements a capacity calculation process based on a cNTC approach.

4.2 Being the Italy – Greece border a pure DC interconnection[23], the computation is simplified and the full thermal capacity (500 MW) is usually offered to the market, except when there is the need to reduce the flows because of congestions in the AC networks in Italy and/or in Greece.

4.3 In 2020 the thermal capacity of the cable was always offered to the market whenever the cable was available for operation[24] without any reduction requested by the TSOs. Congestions, if any, in the AC network were solved locally.

4.b ACER monitoring

4.4 As for the Italy North CCR, ACER ran a separate monitoring for the first and the second semester. Due to similarities, the reports group all the DC borders in the same figure, in order to easily point out differences. Figure 8 shows data for the first semester, while Figure 9 refers to the second semester

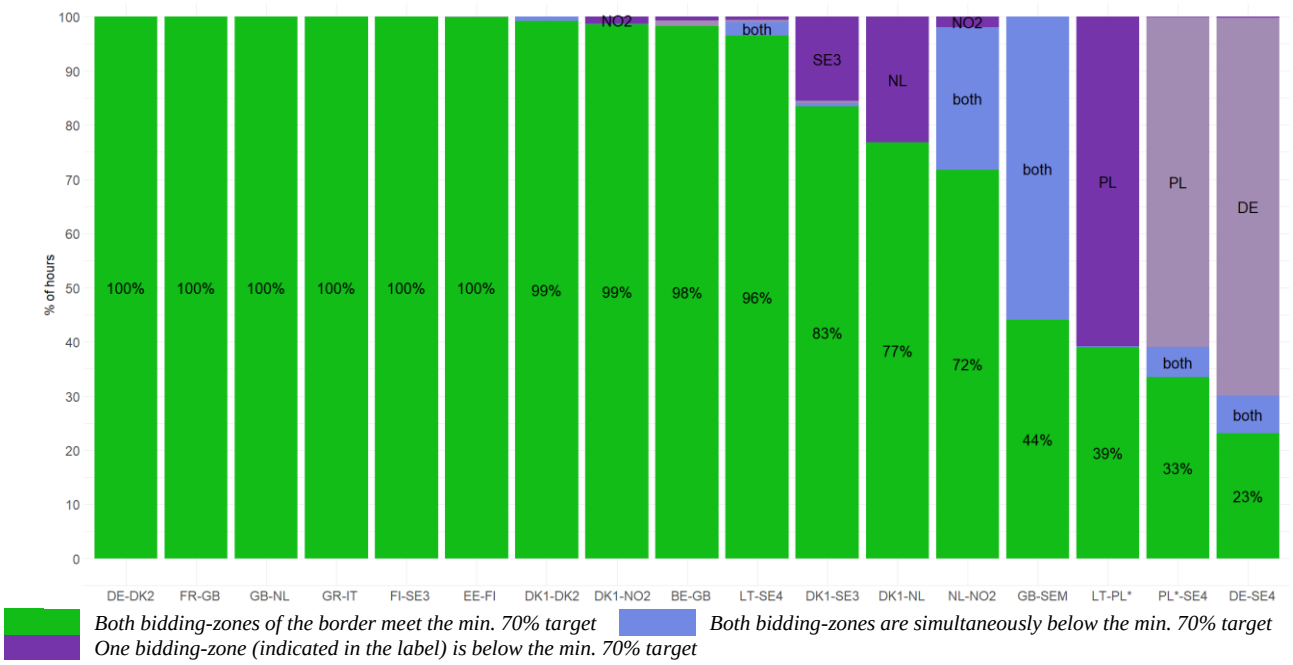

Figure 8 – ACER assessment for DC borders S1 2020 – Source: ACER report

[23] There is one DC cable from Galatina in Italy to Arachthos in Greece.

[24] The cable is usually out of service for 4 weeks for ordinary maintenance. In 2020 only few other out of service events were registered.

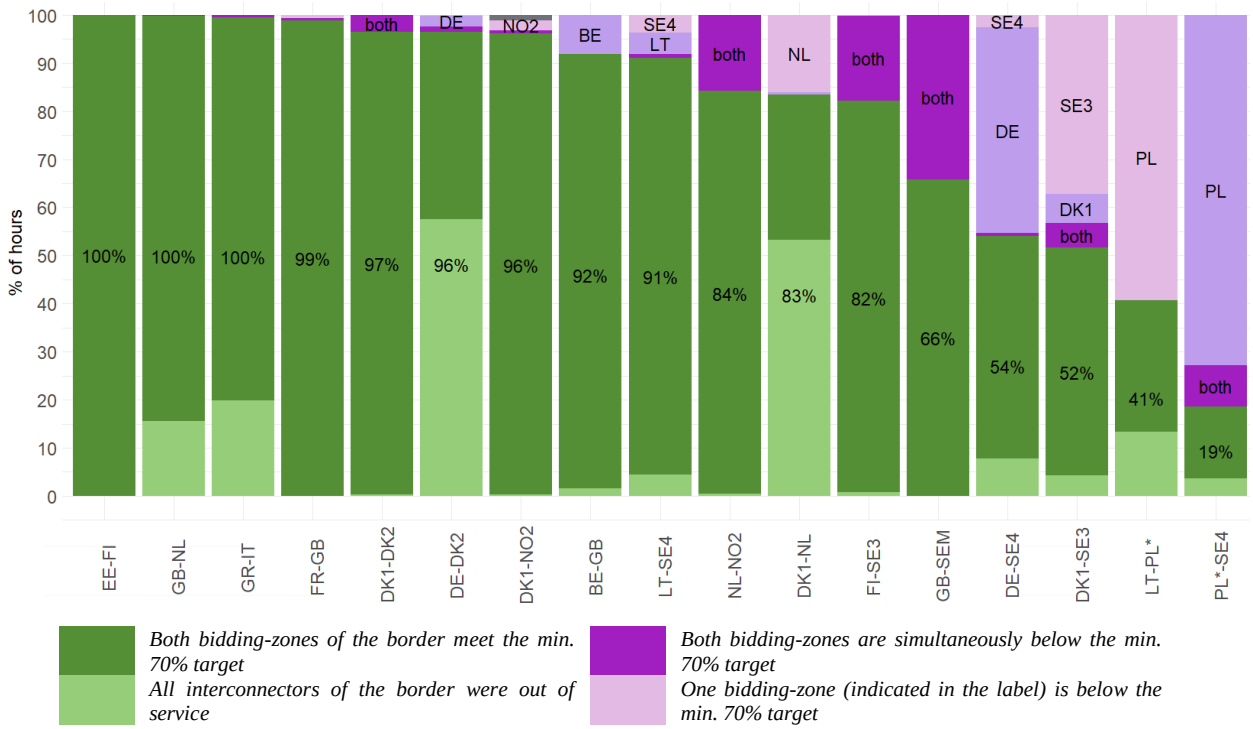

Figure 9 – ACER assessment for DC borders S2 2020 – Source: ACER report

4.5 In both cases the Italy – Greece border (fourth column in Figure 8 and third column in Figure 9) offered 100% of the available capacity. For the second semester ACER complemented the analysis by pointing out the frequency of full unavailability of the interconnection: for the Italy – Greece border this occurred for around one month between September and October[25] with an additional small outage in July.

4.c ***ARERA assessment***

4.6 ARERA didn't ask for any further information with respect to the Italy – Greece border. In this case the monitoring performed by ACER is already complete, since for a DC border what is important is to compare the NTC offered to the market (equal to the margin available for cross-border trade as per ACER Recommendation) with the thermal rate and the Agency was provided with both sets of data.

4.7 ARERA thus fully shares the conclusion reached by ACER on this border which can be deemed compliant with the 70% rule in all the market time units.

4.8 It's also worth noticing that no derogations were requested by Terna on this border, since the positive outcome of the 70% assessment was widely expected, due to the level of cross-zonal capacity usually offered to the market.

[25] In this period the TSOs ran the ordinary maintenance that in 2020 was shifted after the summer. The ordinary maintenance is usually planned to be performed around May and June.

5 Italian internal bidding zones

5.a Capacity calculation process and 2020 status

5.1 Italian internal bidding zones belong to GRIT CCR as well. The cross-zonal capacity has been computed since the very beginning in 2004 using a cNTC approach, monitoring both the current and the voltage constraints. In specific sections (e.g., the Sicily – Rossano one) dynamic stability is considered as well. NTC values were estimated on a yearly basis and adjusted on a daily basis in case of significant outages or in case the NTC values included specific sensitivity to the load or renewable production level.

5.2 With the entry into force of the CACM Regulation, the process was adjusted for compliancewith the new regulatory framework (first version of the capacity calculation methodology approved in July 2018) and then further amended to take into account the 70% rule (second version of the methodology approved in December 2020).

5.3 The final process entered into force in August 2021, with a daily capacity calculation based on the common grid model: the 70% rule is checked indirectly, by modifying the CNECs set at each iteration by filtering out all the elements that have a margin lower than 70%. This means that the final capacity can only be limited by network elements with a proper margin and that no limiting CNECs may show a margin lower than 70%. The resulting value thus either represents the most efficient one or exceeds it and, according to what reported in Chapter 2, there is no need to monitor the margins on all the other elements.

5.4 For 2020 the simplified approach based on yearly estimation and daily adjustments was in place. Due to the absence of a proper method to take into account the 70% requirement, Terna requested a derogation that was granted by ARERA with Decision 20/2020/R/eel[26] on the following grounds:

- the derogation is strictly limited to the market time units and the borders for which the cross-zonal capacity is limited by current constraints; in these cases the absence of a proper 70% adjustment made it impossible to comply with the 70% rule;
- for the market time units and borders for which the cross-zonal capacity is limited by voltage or stability constraints, the derogation is not applicable since in this case the constraints are due to the lack of proper voltage or stability resources (i.e. lack of proper remedial actions) and thus the cross-zonal capacity may be limited in accordance with Article 16(3) of Regulation (EU) 2019/943 without the need to issue a derogation;
- Terna is required to monitor the level of capacity made available for cross-zonal trade and to send a dedicated report to ARERA.

5.b Preliminary findings

5.5 ACER didn't monitor the Italian internal bidding zone borders in its reports, thus the only information is that provided by Terna in the dedicated report. Terna estimated the margin using a reference common grid model developed for other purposes than the capacity calculation on the Italian internal borders (because the day-ahead and intraday capacity calculation processes were not yet in place in 2020), thus the results are not fully reliable and may lead to abnormal values.

[26] Deliberazione 28 gennaio 2020, 20/2020/R/eel, "Approvazione della richiesta di deroga per il rispetto del livello minimo di capacità (70% rule) presentata da Terna S.p.A con riferimento alla Regione GRIT"

5.6 Anyhow it's worth reporting some preliminary findings in Table III: the analysis is limited to the sections where current constraints play a role (at least in some market time units) and for which the cross-zonal capacity was effectively limited[27].

TABLE III – PRELIMINARY FINDINGS FOR ITALIAN INTERNAL BIDDING ZONE BORDERS

	NORD→CNOR	CNOR→NORD	CNOR→CSUD	CSUD→CNOR	SUD→CSUD	ROSN→SUD
Failure	1%	1%	1%	1%	3%	12%
N/A	0%	0%	10%	10%	1%	0%
Positive	93%	35%	71%	78%	80%	88%
Negative	5%	64%	17%	11%	16%	0%

5.7 The N/A row refers to market time units where the cross-zonal capacity was limited only by constraints not correlated to the current: this occurs quite often in CNOR – CSUD section in both direction (10% of the market time units, associated to voltage constraints), while the Failure row refers to errors in the monitoring process (computation couldn't be run).

5.8 The results seem adequate for most of the borders, but the CNOR-->NORD direction was strongly impacted by the specific zonal configuration adopted in 2020 that included Umbria in the CNOR bidding zone: in particular the cross-zonal capacity on this border showed a strong sensitivity with respect to the residual load[28] of the bidding zone CNOR and the inclusion of Umbria significantly affected this value.

5.9 The situation is expected to improve in 2021 because of the application of the new zonal configuration with Umbria shifted to CSUD and the application of a different sensitivity (residual load in both importing and exporting zones) until July[29]. Moreover, since August 2021 the limit has been computed using a proper 70% adjustment.

6 Conclusions

6.1 From a pure legal perspective, the granting of a derogation for Italy North CCR and Italian internal bidding zones exempted Terna from any obligation stemming from the application of the 70% rule. Terna legal compliance is thus guaranteed by definition in all market time units covered by the derogation, i.e., all market time units for Italy North CCR and all the market time units with current constraints for Italian internal bidding zone border. In all the other cases (Italy – Greece border and internal borders with voltage and stability constraints) the 70% compliance shall be properly assessed.

6.2 Anyhow, from a technical perspective, a proper monitoring of the level of capacity made available for cross-zonal trade is of utmost importance also with a derogation in place, in order to check in which situation each border is and to identify the sections where improvements will be needed in the future.

6.3 Despite the lack of tools to assess the 70% rule in an automated manner, Terna performed well in almost all the borders characterized by current constraints, reaching 100% compliance on the

[27] The borders CSUD-->SUD and SUD-->ROSN were never limited in 2020, thus it can be assumed that they matched the 70% rule by definition. The border with Sicily and Sardinia are not considered since limited by stability issues.

[28] Global load netted by photovoltaic and production

[29] In 2021, already the yearly estimated cross-zonal capacity shows significant higher values.

Italy – Greece border and showing a positive assessment in at least 70% of the market time units in all the other borders, except for CNOR-->NORD.

6.4 For borders with voltage and stability constraints ARERA deems that no assessment is needed: in this case the 70% rule is not applicable, because the reduction is motivated by lack of remedial actions to cope with such constraints and is therefore legally justified by the provisions of Article 16(3) of the Regulation (EU) 2019/943.

6.5 The 2021 performances are likely to be better: 70% margins have been calculated in an automated manner for the Italian internal bidding zones since August 2021, and an automatic adjustment for 70% rule will be implemented on the Northern borders in Q4 2021.

6.6 Coming to the most critical section, CNOR-->NORD, the performance was in fact significantly low: these results weren't unexpected, since in 2017 Terna had already reported the need to review the bidding zone configuration by reshaping the CNOR bidding zone for better representing the flows in the area. The review was run in 2018, the final configuration was approved in 2019 and its implementation planned for 2021, in order to allow stakeholders adequate time to adjust their systems and distribution system operators to reassess the historical data based on the new setup. The 2020 results were thus distorted by this situation that it's hoped to be solved in 2021 with the new bidding zone configuration in place.

6.7 ARERA also regrets that the ACER monitoring for Italy North CCR hasn't proven to be successful. This was mostly due to the insufficient set of data sent by the TSOs of the region. ARERA agrees that only coordinated data can be sent and that, as such, no PTDF or margin estimation could be made available[30], but it is concerned by the fact that no information on the validation phase was provided: in this case the computation process indeed got to a result that was not accepted by at least that one TSO that asked for a reduction; the TSOs should have been able to provide the information on the limiting CNECs in this case, allowing ACER to run a more complete monitoring. ARERA hopes that the situation might improve for the 2021 ACER monitoring. In any case, the entry into force of the automated tool is expected to further improve the performances for the whole Italy North CCR.

6.8 Moreover it's worth remarking some key differences between the checks carried out by ARERA and those made by ACER.

6.9 First ARERA monitored the entire Northern borders, assessing the 70% compliance with respect to the limiting CNECs in the coordinated capacity calculation process. ACER, instead, looked at each single border and neglected the Swiss elements.

6.10 Second, for ACER all CNECs shall have a margin greater than 70% for a positive evaluation, while for ARERA in a cNTC approach what is important is to achieve the most efficient NTC value, i.e. the value that would have been obtained also in case all the CNECs had had a 70% margin available. This report demonstrates that this value is achieved when at least one limiting CNECs has a margin higher than 70%: this led to a completely different judgement with respect to ACER. ARERA hopes that ACER may accept the demonstration provided in this report and take it into account for the upcoming editions of the 70% reports.

[30] However as pointed out in Chapter 3, the underestimation effect due to employment by ACER of reference scenarios to compute PTDF is not significant.