Annex II – Core TSOs general measures and action plan to avoid future cross-zonal capacity reductions

Q4 2024

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# Introduction

According to Articles 20(14)(b) and 20(15) of the DA CCM, Core TSOs have the obligation to provide general measures and/or action plans in order to avoid cross-zonal capacity reductions in the future, as follows:

* As per Article 20(14)(b): *General measures to avoid cross-zonal capacity reductions in the future*
* As per Article 20(15): *When a given Core TSO reduces capacity for its CNECs in more than 1% of DA CC MTUs of the analysed quarter, the concerned TSO shall provide to the CCC a detailed report and action plan describing how such deviations are expected to be alleviated and solved in the future.*

This annex contains the required information described above for each Core TSO that has applied capacity reductions for at least 1 DA CC MTU of the analysed quarter.

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# CEPS

**1.1 General measures to avoid cross-zonal capacity reductions in the future, as per Art. 20(14)(b) of DA CCM**

ČEPS has implemented the following measures to avoid cross-zonal capacity reduction. Firstly, in its individual validation, only technically feasible scenarios (set of Core NPs) are tested. These scenarios reflect know-how about max/min generation capabilities of BZs, and popular flow directions. As a result, the tested MCP (NPs vector) is not only an extreme utilization of the domain (vertex) but also a realistic grid situation. This leads to highly efficient IVA applications. Secondly, a wide variety of remedial actions are considered in the ČEPS optimization algorithm. This helps ČEPS to efficiently eliminate majority of the operational security threats without cross-zonal capacity reduction. Finally, by applying IVA directly for the over-congested element, the minimal value of IVA required is guaranteed.

**1.2 Detailed report and action plan describing how such deviations are expected to be alleviated and solved in the future**

ČEPS reduced capacity for its CNECs in less than 1 % of DA CC MTUs of the analysed quarter, detailed report and action plan are not provided hence.

# DAVinCy TSOs

In order to provide a better understanding of the results and the processes applied among DAVinCy TSOs, following are some introductory explanations:

* APG, Tennet NL and the German TSOs (DAVinCy TSOs) use a common tool for individual validation called DAVinCy (Day Ahead Validation of Capacity). In case an overload cannot be solved with the available remedial actions, DAVinCy determines the necessary Individual Validation Adjustments (IVAs) on relevant CNECs with the objective to minimise the overall capacity reduction among the six DAVinCy TSOs. This can lead to situations where an overload occurs in one control area of TSO A whereas the IVA(s) is/are applied within other control areas, e.g., of TSOs B and C.
* The application of an IVA prevents a network element from being overloaded and does not necessarily lead to a deviation from the minimum cross-zonal capacity according to Article 16(8) of regulation (EU) 2019/943 on the internal market of electricity.

In the opinion of the DAVinCy TSOs, the cooperation of six TSOs within the DAVinCy consortium leads to a very effective result when relieving potential overloads within the grid in order to secure operational security. This is caused by the fact that remedial actions within six control areas can be used. Moreover, IVAs having a minimal impact on cross-zonal capacities offered to the market can be applied to solve congestions. Furthermore, the DAVinCy TSOs acknowledge, that this report has to be based on the amount of capacity reductions, i.e. IVAs applied by DAVinCy. Nevertheless, it should be noted, that measures to reduce the application of IVAs need to address the cause of IVAs, respectively the reduction of congestions and fallbacks.

The DAVinCy TSOs plan to apply the following measures in order to minimize the application of IVAs and, as required by Article 20(14)(b) and Article 20(15) DA CCM, avoid cross-zonal capacity reductions in the future:

* Further improvement of process robustness through the use of redundant IT systems, plausibility checks and replacement strategies for input data, separate systems for test and productive environment and implementation of security management.
* Improvement of automated topology optimization

## APG

The application of an IVA prevents a network element from being overloaded and does not necessarily lead to a deviation from the minimum cross-zonal capacity according to Article 16(8) of regulation (EU) 2019/943 on the internal market of electricity. Deviations from the minimum cross-zonal capacity according to the Austrian action plan, will be reported and reflected accordingly in the Austrian action plan report submitted to the Austrian NRA E-Control.

In Q4/2024, the following could be observed:

* In 15 hours or 0,68% of all MTUs in Q4/2024 an IVA was applied on a network element of APG.
* In 6 of those 15 MTUs (or 0,27% of MTUs in Q4) , IVAs were applied on Austrian CNECs to prevent potential overloads in the Austrian control area.

Several improvements implemented by the DAVinCy TSOs in the recent past already decreased the amount of IVAs applied on Austrian CNECs. APG wants to highlight that it fully supports the innovative functioning of DAVinCy since it increases the overall benefit of the Core region compared to a purely national individual validation and could be used as blueprint for an effective coordinated validation approach among all Core TSOs.

In addition to improvements of the individual validation process and DAVinCy itself, APG plans to implement further measures according to the Austrian Action Plan. Those measures include, but are not limited to:

* Network reinforcement and optimisation, e.g. dynamic line rating to relieve grid elements with overloads in the future.
* Network expansion and planned infrastructure projects according to the Network Development Plan.

## German TSOs

The application of an IVA prevents a network element from being overloaded and does not necessarily lead to a deviation from the minimum cross-zonal capacity according to Article 16(8) of regulation (EU) 2019/943 on the internal market of electricity. In case of a deviation from the minimum cross-zonal capacity, the compliance with the minimum cross-zonal capacity targets of the German action plan according to the monitoring methodology approved by the German NRA Bundesnetzagentur is subject to the regulatory scrutiny. This is done by an approval of the report of German TSOs on available cross-zonal capacity for the year 2023[[1]](#footnote-2).

Several improvements implemented by the DAVinCy TSOs in the recent past already decreased the amount of IVAs applied on their CNECs. German TSOs want to highlight that they fully support the innovative functioning of DAVinCy since it increases the overall benefit of the Core region compared to a purely national individual validation and could be used as blueprint for an effective coordinated validation approach among all Core TSOs.

Please note, that none of the German TSOs exceeded the 1-%-IVA threshold in Q4/2024 and are thus obligated to provide more details in this annex.In addition to the measures mentioned in the general section for all DAVinCy TSOs, the planned grid enforcements within the control areas of the German TSOs will relieve grid elements with overloads in the future (cf. Action Plan of Germany[[2]](#footnote-3) and Network Development plan[[3]](#footnote-4)) will minimize the application of IVAs and, as required by Article 20(14)(b) and Article 20(15) DA CCM, avoid cross-zonal capacity reductions in the future.

## TENNET TSO BV

During the fourth quarter of 2024 TTN applied IVAs to avoid situations for which no measures in real time would be available. Although IVAs reduce the RAM on a CNEC, it does not necessarily end up in a violation of the minimum RAM available for cross zonal trade. Specifically, for the fourth quarter of 2024 the application of IVAs can be summarized as follows:

* For 0.59% of MTUs (13 hours) IVA was applied on pre-solved Dutch CNECs of the final FB domain
* For 5 MTUs IVA was applied on CNECs that were active constraints during the market coupling.
* The average IVA as % of Fmax over all 31 affected MTUs was 12.72%.

General measures to avoid cross-zonal capacity reductions in the future (Art. 20(14)(b) of DA CCM) are for TTN the following:

* In the DAVinCy tool the available redispatch potential for the Dutch biddingzone was expanded in Q3 2024 by the addition of offshore wind generation. The primary benefit of this is the availability of additional downward regulating redispatch potential which is often missing during hours/days where >90% of all electricity generation originates from renewable energy sources.
* Grid reinforcement projects will increase thermal capacities in the long term.

# ELES

**General measures to avoid cross-zonal capacity reductions in the future, as per Art. 20(14)(b) of DA CCM**

* Improvement in congestion management – we will continue to improve the quality of our inputs for CORE DA CC in order to avoid unnecessary IVA application in case of errors in inputs files.
* Network development and optimisation

**Detailed report and action plan describing how such deviations are expected to be alleviated and solved in the future**

In the fourth quarter of 2024, ELES applied reduction for **31,9** %of MTU. There are three main reasons for this:

* Presence of two CCR: The main reason for reduction at ELES is the fact, that we are in the cross-road of two CCR, which both aim to maximise capacities in order to fulfil 70% criteria. Often, maximisation of the capacities in Italy North CCR have negative effect on the RAM of Slovenian elements in CORE CCR. This is mostly due to the fact, that we have a PST on the Slovenian – Italian border, that is used to maximise Italy North NTC values.
* Network weaknesses – there are some weaknesses on our network, most critical are the lines Podlog – Obersielach (SI-AT) and Divaca – Pehlin (SI - HR) - for both, the most reductions were applied.

Our plan to improve the situation consists of the following:

* Additional training of operators and improvement of the local validation tool in order to improve the process and improve stability and reliability of the tool
* Analysis will be performed on accuracy of validation tool (e.g. comparing the flows considered during the validation and realised flows). Based on the result of the analysis, the validation tool reliability margin will be adjusted in order to decrease the level of IVA application.
* Network development and optimisation - For the Podlog – Obersielach line, we are in the process to obtain and install a static serous synchronous compensator (SSSC) in order to be able to relieve the flow on the element. For the Divaca – Pehlin line, we are still investigation different possibilities to increase capacities (SSSC or high temperature lines).

# ELIA

General measures to avoid cross-zonal capacity reductions in the future, as per Art. 20(14)(b) of DA CCM include, but are not limited to:

* A daily follow up plus short-term mitigations and long-term local validation of the tool has been set up to improve the tool aiming to:
* reduce the number of occurrences of fallbacks,
* reduce the number of occurrences of spanning by switching to DCLF when no ACLF converges,
* reduce the number of occurrences of excessive IVA application due to failure in the derogation step.
* Congestion management through the shifting of overloads from the congested element to other CNECs via PST optimization to reduce the overall overloads, this action is already in place.
* Common Core action ongoing to correct the DCimbalance corrected and the CGM used in the FB DA CC process to make the flowbased calculations more correct.

**Temporary structural situation:**

* The nuclear phase out planned in Belgium is going to decrease the congestion around Doel and Mercator which are the most congested area. There is no additional action plan concerning these IVAs.

**Situation linked to short outages:**

* There are no extra investments foreseen to cover N-2 situations like for temporary short outages.

# HOPS

* General measures to avoid cross-zonal capacity reductions in the future, as per Art. 20(14)(b) of DA CCM

General measures include, but are not limited to:

* Network development and optimisation

The goal is to increase the transmission capacity and reduce grid congestion. The measures to achieve these goals include strengthening the optimising the existing network and the development of new infrastructure.

* Improvements concerning congestion management

Core CCR coordinated improvements based on shared forecasts and aligned assumptions in capacity calculations with coordinated actions to increase cross-zonal capacities and reduce uncertainties (CGM improvements, Coordinated validation, etc.). Also, inclusion of third countries could open further opportunities for HOPS (with planning process and implementation of remedial measures). Unscheduled allocated flows coming from commercial exchanges outside the Core CCR (Fuaf) has a strong impact on HOPS grid.

* Detailed report and action plan describing how such deviations are expected to be alleviated and solved in the future

In the analysed quarter (Q4 2024), HOPS applied reduction to around 17,5% MTUs. For most MTUs, the reductions are applied to:

* TL 220 kV Pehlin – Divača (16,98% MTUs, or around 95% of times of all applied reductions) with an associated contingency case TL 400 kV Melina - Divača.
* TL 220 kV Zakučac - Mostar (0,36% MTUs, or around 2% of times of all applied reductions) without an associated contingency case.
* TL 400 kV Ernestinovo – Pecs 1 (0,13% MTUs, or around 0,75% of times of all applied reductions) with an associated contingency case TL 400 kV Ernestinovo – Pecs 2.
* TL 400 kV Ernestinovo – Pecs 2 (0,13% MTUs, or around 0,75% of times of all applied reductions) with an associated contingency case TL 400 kV Ernestinovo – Pecs 1.

Applied reductions on network element are mostly low (less than 7% of Fmax), while for several MTUs during mid-November (BD20241119) higher values are applied on TL 220kV Pehlin - Divača due to unsolvable overloads in the relevant grid area caused by unavaliability of grid elements, additionally under the influence of high exchanges between Core and non-Core countries (impact of uncoordinated flows coming from third countries, mainly from the direction of RS and BA). Such reductions are planned to be solved by developing and optimising the transmission network.

For the 2025, we plan to install HTLS conductors on TL 220 kV Brinje – VE Pađene and on TL 220kV Konjsko – VE Pađene which will increase its maximum admissible power flow and improve available capacities. Also, there is ongoing investigation of various possibilities to increase capacities for the TL 220 kV Pehlin – Divača.

Since HOPS is surrounded by two non-Core countries with a strong influence of non-coordinated flows, any deviation from the target NP can create an overloadings with potential security risks. These flows are taken into account within the CGM with an influence on the final available margin (RAM), while during validation HOPS should guarantee available capacities of the internal grid affected by the exchanges between Core (Central) Europe and Western Balkan and/or SEE region. Since RCCs create CGMs with the net postion forecast (NPF) modelling, we expect that with NPF evolution and the increase of the quality of the D2CF CGMs deviations and uncertainties between forecast and realised power flows will be minimized, especially deviations of non-Core countries that are currently based on D-1 NPs.

Improvements are also expected with upcoming important processes such as coordinated validation capacities and Regional Operational Security Coordination.

# MAVIR

1. **Explanation for the reductions applied by MAVIR in Q4, 2024**

MAVIR performs the individual validation with the basic principle of determining CBCOs that can be potentially overloaded by a realistic market outcome. In case a CBCO which cannot be solved by available remedial actions from contingency analysis but selected to be potentially overloaded is identified, IVA with the objective of minimizing the loss of the flow-based domain volume is optimized and calculated in order to relieve the potential overload. In Q4, there were 33 business days with IVA applied to CBCOs by MAVIR due to two different factors. One is the pattern of significant power flows from import direction over the northern HU borders due to strong import energy need in combination with planned special grid outage situation most of the time for which there is no other solution but IVA application and the other one is the application of IVA fallback due technical failure. There were 233 distinct hours (or 10.55% of the 2209 MTUs) with IVA application. There were 37 distinct hours with operational fallback IVA application which contributed to the amount of IVA in Q4. In total, 225 distinct hours, the CBCOs with IVAs were a domain limiting constraint. In total, there were 189 hours with active HU constraints, out of which there were 86 hours with non-zero IVA with the highest shadow price equal to 452 EUR/MW. There were 6 hours which did not fulfil the 20% minimum RAM requirement.

MAVIR aims to apply the following measures in order to minimize the application of IVAs and, as required by article 20(14)(b) and 20(15) DA CCM, avoid cross-zonal capacity reductions in the future:

* Consideration of effective topological remedial actions even for those hours in which the NRAO did not select them due to loopflow constraint violation, but the selection of RA would have mitigated the application of IVA amount.

Based on growing operational experience, methodological improvement in the IVA calculation by excluding areas of the domain in which the concerned overloaded element to the amount of IVA is less sensitive. Note that the operational experience also shows better judgement of IVA applications as to the trade-off between operational security and offered capacities.

# PSE

**7.1 General measures to avoid cross-zonal capacity reductions in the future, as per Art. 20(14)(b) of DA CCM**:

* PSE is taken under consideration: long-, medium- and short-term measures to prevent capacity reduction.
* Generally, the main source of improvements will be grid developments, as prescribed in the Action Plan and as foreseen in the Grid Development Plan.
* In medium PSE is investigating dynamic monitoring of the lines, which increase the line rating.
* As the short-term measures, PSE implemented parametrization of the validation tool, which potentially leading to avoiding application of low IVA values (so that IVAs will be less frequent). Additional propose was to include in individual validation topological remedial actions. In its individual validation, PSE also plan to test only technically feasible scenarios (set of Core NPs) - tool improvement planned for Q1 2025.
* In some cases the IVA was implemented in specific maintenance situation, this will be only temporary and additional investigation are not foreseen,

**7.2 Detailed report and action plan describing how such deviations are expected to be alleviated and solved in the future.**

PSE reduced capacity for its CNECs in less than 1 % of DA CC MTUs of the analysed quarter, detailed report and action plan are not provided hence.

# RTE

RTE is currently improving his validation tool by integrating RAO function.

Release is plan Q4 2025

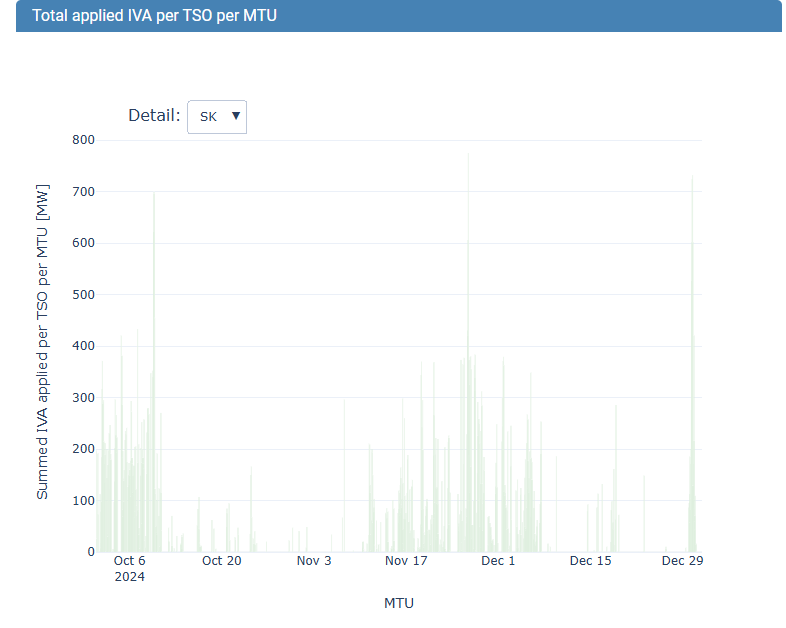
# SEPS

The application of IVA was in Q4 for 7.37% of the hours. The reductions were mainly applied in the June due to the high forecasted transit flows and IVA is most frequently applied for the following elements:

[SK-HU] Levice - God [DIR] [SK]/ N-1 R.Sobota - Sajoivanka

[SK-HU] Levice - God [DIR] [SK]/ N-1 R.Sobota - Levice

[SK-SK] V.Dur - Levice 1 [DIR]/ N-1 V.Dur - Levice 2



The IVA application for Q4/24

The main portion of the IVA application was done on the CNEC [SK-SK] V.Dur - Levice 2 [DIR] + N-1 V.Dur - Levice 1 SK\_CBCO\_00079 on which significant volume of the virtual margin was assigned. There are two solutions that are planned:

* Short-term solution: Introduction of new topological measure in that are that should help to relieve the congestion and therefore allows to reduce the number of IVA application.
* Long-term solution: There is a plan to change configuration of the critical elements in the substation V. Dur, which should significantly decrease the flows on CNEC NEC [SK-SK] V.Dur - Levice 2 [DIR] + N-1 V.Dur - Levice. The current estimation is that this shall be accomplished in Q2 2028.

For the tie-line Nosovice – Varin there is also planned reinforcement that shall increase Imax from 1740A to 2000A in 2026. We assume that this step should lead to decrease of the IVA volume on this element.

# Transelectrica

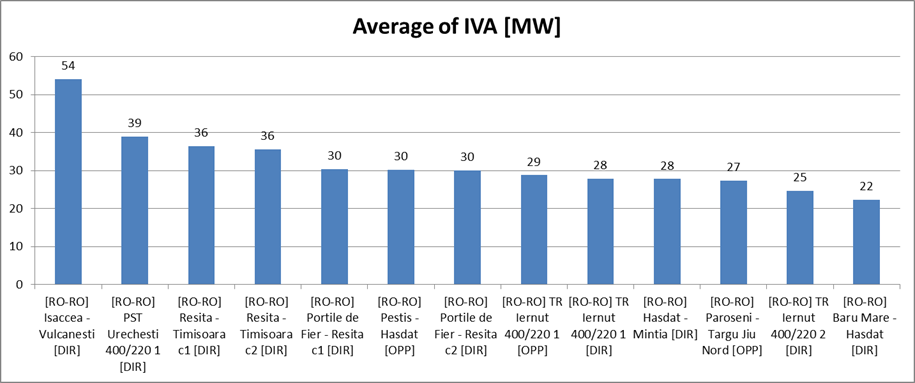
In 2021, the Romanian Government decided to adopt an Action Plan pursuant to Article 15 of the Regulation (EU) 2019/943, including a linear trajectory for the yearly increase of the minimum capacity made available for cross-zonal trade until 31 December 2025.

For year 2024 the minimum capacity made available for cross-zonal trade on Romania – Hungary border (part of Core CCR) has been 55% from the transmission capacity) according to the Action Plan. For this year though, Transelectrica was granted a derogation on foreseeable grounds for maintaining operational security, thus the minimum capacity for cross-border trade remains at 33% from the transmission capacity, the same target provided in the Action Plan for the year of 2021.

In addition to being part of the Core CCR, Transelectrica is also part of SEE CCR with RO – BG border having operational processes for Day-ahead capacity calculation since June 2021 and first Intraday capacity calculation since October 2021. Moreover, there are three non-EU borders for which there is no coordinated capacity calculation.

Regarding the capacity calculation process, the Core DA CCM allows TSOs to correct cross-zonal capacity for reasons of operational security during the validation process individually and in a coordinated way according to Article 20 (1). Article 20(5) states that “each Core TSO shall validate and have the right to decrease the RAM for reasons of operational security during the individual validation. The adjustment due to individual validation is called ‘individual validation adjustment’ (IVA) and it shall have a positive value, i.e. it may only reduce the RAM. IVA may reduce the RAM only to the minimum degree that is needed to ensure operational security considering all expected available costly and non-costly RAs”.

For the period 20241001 – 20241231, Transelectrica applied an Individual Validation Adjustment (IVA) on the CNEs mentioned in Figure 1. In this graph the average IVA per CNE is represented for the timestamps where reductions were applied for more than 1% of the total reductions.



*Figure 1. Average IVA applied per CNE during the reported period*

Moreover, the percentage of total applications shows that reductions were applied for the same CNEs, located mainly in the western part of the grid.

* General measures to avoid cross-zonal capacity reductions in the future, as per Art. 20(14)(b) of DA CCM;

Detailed report and action plan describing how such deviations are expected to be alleviated and solved in the future.

* Development of the transmission grid

Most of the cases with IVA applications are related to 220 kV critical network elements located in the southwest part of the country. The following measures are foreseen according to the National Action plan in order to increase the remaining available margin of these elements:

* New 400 kV OHL Porțile de Fier – Reșița was commissioned in mid November 2024. This new OHL leads to decreasing the loading on the double circuit OHL 220 kV Porțile de Fier – Reșița and thus leading to a lower need of reductions in the future on these two CNEs.
* New 400 kV OHL Reșița – Pancevo circuit 2 was commissioned in mid November 2024. 400 kV OHL Reșița – Pancevo circuit 1 will be commissioned in the beginning of 2025. This investment project leads to increasing transfer capacity and improving the system security in the region. Moreover the loading of the critical network element 400 kV OHL Porțile de Fier – Djerdap is expected to decrease enough so that it is not treated as structural congestion anymore;
* OHL 400 kV Reșița – Timișoara – Săcălaz d.c. planned for 2026;
* OHL 400 kV Timișoara – Arad d.c. planned for 2027;
* Increase the transmission capacity for the OHL in the 220 kV axis Urechești – Târgu Jiu Nord – Paroșeni – Baru Mare – Hășdat planned for 2028;
* New 400 kV Tieline Suceava – Bălți (RO-MD) planned for 2030;
* New 400/220 kV Autotransformer in Roșiori substation planned for 2027.

* Increase the quality of the D2CF CGMs at CCR level

At this moment there is no common D2CF CGMs process to be used for DA CC in all CCRs. Each CCR has its own rules on the IGMs (e.g. D2CF for Core TSOs and DACF for the rest of Continental Europe) and a net position forecast to be used when CGMs are created. As there is no common, harmonized and reliable net position or exchange forecast yet implemented in Europe, the assumptions taken by each CCR will lead to large uncertainties, potentially high overloads and operational situations where the available remedial action potential (including redispatching) is insufficient, thus leading to applying reductions on CNECs. This situation affects the power flow on the 220 kV critical network elements located especially in the southwest part of the country, heavily influenced by the exchanges in the SEE region where DACF files are used for the purpose of D2CF CGMs in Core CCR. A common D2CF CGM process is required for all CCRs in Continental Europe as soon as possible.

* Implementation of the coordinated validation in the Core CCR

Coordinated validation would allow TSOs to use commonly the remedial actions available throughout Core CCR, making use of the most suitable remedial action in order to secure a minimum capacity and reduce the IVA applications.

* Implementation of regional coordinated processes for security analysis

The Articles 16(4) and 16(8) of the Regulation (EU) 2019/943 refers to the implementation of the coordinated capacity calculation and security analysis at regional level to ensure a minimum capacity available for cross-zonal trade. Though the capacity calculation using flow-based method in Core CCR is now an operational process, it is not enough to comply with the minimum available capacity requirements. The results of the day-ahead capacity calculation come with a lot of uncertainties without a coordinated security analysis implemented at a regional level before real-time. Not always the internal measures and remedial actions estimated as available for day-ahead capacity calculation are available and enough to maintain the system security in real-time.

* Implementation of redispatching and countertrading processes implemented at regional level pursuant to Article 35 and 74 of Regulation (EU) 2015/1222.

The Article 16(4) of the Regulation (EU) 2019/943 stated that the redispatching and countertrading shall be used to maximize the available capacity to reach the minimum capacity provided for in Article 16(8) of the Regulation (EU) 2019/943. This process shall be coordinated and follow the implementation of cost-sharing methodology. At Core CCR level these processes are under implementation. Because of this Transelectrica applies an individual redispatching process aimed at achieving the minimum level of cross-zonal capacity as per national Action Plan. This is not always feasible due to the lack of sufficient remedial actions.

* Coordination between capacity calculation regions

Besides Core CCR, Transelectrica SA is also part of SEE CCR with RO – BG border. Furthermore, for the three non-EU borders there is no coordinated capacity calculation. The exchanges on the borders with Bulgaria, Serbia, Ukraine and Republic of Moldova are considered as fixed in coordinated capacity calculation from Core CCR. Any deviation from these values forecasted two days ahead will create a different loading on the critical network element with risks for the operational security of the system. Because of this, lack of cross-CCR coordination becomes critical for Romania in cases with high export from the southeast part of Continental Europe towards the central area. These uncoordinated transits through Romania correlated with high generation in the wind and hydro power plants from the south part of Romania lead to increasing the power flows on the 220 kV network in the southwest part of the country. These transits create (N-1) violations in the transmission grid which cannot be addressed without coordinated remedial actions for redispatching and countertrading.

1. [*REPORT OF THE GERMAN TRANSMISSION SYSTEM OPERATORS ON AVAILABLE CROSS-ZONAL CAPACITY FOR THE YEAR 2023 PURSUANT TO ARTICLE 15(4) INTERNAL MARKET FOR ELECTRICITY REGULATION (EU) 2019/943;*](https://www.netztransparenz.de/xspproxy/api/staticfiles/ntp-relaunch/dokumente/strommarktdesign/clean-energy-package/cep70%20compliance%20report%202023_en.pdf)  *URL:* https://www.netztransparenz.de/en/Electricity-market-design/Clean-Energy-Package [↑](#footnote-ref-2)
2. *Federal Ministry for Economic Affairs and Climate Action (2020): Action Plan Bidding Zone; URL:* [*https://www.bmwk.de/Redaktion/EN/Downloads/a/action-plan-bidding-zone.html*](https://www.bmwk.de/Redaktion/EN/Downloads/a/action-plan-bidding-zone.html) [↑](#footnote-ref-3)
3. 50Hertz Transmission GmbH, Amprion GmbH, Tennet TSO GmbH, TransnetBW GmbH (2023): Grid Development Plan Electricity 2037/2045 – 2nd Draft; URL: <https://www.netzentwicklungsplan.de/en/front> [↑](#footnote-ref-4)