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

Q4 2024

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# Introduction

This annex contains the required information for each Core TSO that has applied capacity reductions for its CNECs in more than 1% of ID CC MTUs of the analysed quarter as described per Article 18(12).

# CEPS

# DAVinCy TSOs

## APG

##### Overview

ATC reductions are essential to prevent network overloads due to the challenges outlined below along with their mitigation measures. For IDCC(a), APG performs ATC validation, while for IDCC(b), a dual-validation approach is applied, combining ATC validation with IVA validation in coordination with six iDaVincy TSOs. This dual approach ensures robustness, particularly in special grid situations or when delays or limitations occur in the IVA process due to its relative novelty.

**APG’s geographic location and outdated trading results from non-Core bidding zones**

APG’s central position in the interconnected European grid, belonging to three capacity calculation regions (Core, Italy North, and SNB), and its proximity to the Balkans, increases APG’s CNEC loading sensitivity to deviations between forecasted and actual conditions as well as misalignments between the regions. This unique position amplifies the impact of outdated market data. For IDCC(a), the use of outdated non-Core D-2 SDAC net positions often leads to discrepancies. Similarly, IDCC(b) is based on the non-Core SIDC status of 16:00 D-1, failing to account for market changes up to 22:00 D-1. This can result in overestimated ATCs that risk physical overloads.

To address these issues, APG updates non-Core net positions during validation to align with actual market outcome. Additionally, APG is driving enhancements to the Core Capacity Calculation Tool to enable IDCC(a) capacities to incorporate all updated SDAC net positions and IDCC(b) capacities to use all the latest SIDC net positions. These improvements aim to enhance accuracy, reduce unnecessary local reductions, and improve operational efficiency, leading to a significant decrease in limitations during the validation step.

In general, enhanced synchronization across CCRs can ensure more consistent and reliable capacity calculations, which could prevent mismatches and reduce the frequent triggering of local validations. The introduction of the CE CCR, that will cover the Core and the Italy North CCRs, represents a significant step toward more accurate IDCC(a) capacities.

**Neglect CNECs with small PTDF and RAM combinations.**

The central ATC extraction algorithm excludes CNECs with RAM below 10 MW for IDCC(a) and 50 MW for IDCC(b) border where their PTDF is ≤ 0.5% for IDCC(a) and 3% for IDCC(b). This can result in the allocation of non-existent capacities. To mitigate this and ensure operational grid security, APG validates all Austrian CNECs.

**Need for limitations higher than initial ATCs due to ATC redistribution**

14% of all reported limitations are not reductions of the initial ATCs but rather limitations applied to the final ATCs. During the validation process, APG can only assess whether the given initial ATCs result in a combination of ATCs that do not overload any APG CNEC. However, due to the central calculation design, a redistribution of ATCs after validation is possible. This redistribution can lead to a completely new set of ATCs that were not known during the validation phase.

As a result, even when the initial ATCs pose no risk, APG calculates validated ATCs that are slightly higher than the initial ATCs. These validated ATCs can subsequently limit the final ATCs in case of significant increases caused by redistribution.

This approach is particularly important given the impact of neglected flows, as it ensures grid security despite potential redistributions.

Unlike ATC validation, IVA validation can only result in lower capacities. Thus, a validated initial domain that does not compromise grid security will remain secure after the validation step because the IVA process effectively restricts the FB domain to ensure safety.

**Congestion Management Process Design Risks**

APG was a main driver in incorporating IDA1 and continuous trading results (up to 16:00 D-1) into DACF grid models, improving their quality for congestion management and IDCC(b) capacity calculations. However, several challenges remain: Not all TSOs provide power-plant-level data, reducing the models' granularity and trades occurring between 16:00 D-1 and 21:40 D-1 remain uncaptured. APG needs to consider these risks in its validation. To address these gaps, APG emphasizes the need for TSOs to include more granular data and advocates for faster congestion management processes. These improvements could mitigate risks and enhance the accuracy of IDCC(b) capacities.

##### Conclusion

APG is actively addressing the challenges associated with IDCC(a) and IDCC(b) calculations. By improving market data synchronization, enhancing validation processes assumptions, and contributing to broader capacity calculation advancements, APG is working to minimize the need for capacity reductions while ensuring operational security and market efficiency.

## German TSOs

## TENNET TSO BV

# ELES

**General measures to avoid cross-zonal capacity reductions in the future, as per Article 18(11)(b) of ID CCM:**

* Improvement in congestion management – we will continue to improve the quality of our inputs for CORE ID 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 as per Article 18(10)(h)(i) of ID CCM**  
   
In Q4 of 2024, ELES applied reduction 15,66 % of MTU. 78% of these reductions were applied on CNECs on AT-SI border (Kainachtall – Maribor 1/2 and Maribor-Cirkovce 1/2). The main reason for the above reductions at ELES lies in the fact, that we are in the cross-road of two CCR, which both aim to maximise capacities in order to fulfil 70% criteria in DA. 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. Maximising capacities in DA often translates to low capacities available for Intraday.

We also have some weaknesses on our network, most critical are usually the lines Podlog – Obersielach (SI-AT) and Divaca – Pehlin (SI - HR) - for both, the most reductions are usually applied, but in Q4 7 % of the time. 6 % of the time reductions were applied on Krsko-Tumbri 1 and 2 tielines (SI-HR), 5 % of the time on Cirkovce-Heviz tieline (SI-HU), and 4 % on the rest of CNECs.

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 ro 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).
* Improve the outage planning coordination.

# ELIA

# HOPS

General measures to avoid cross-zonal capacity reductions in the future, as per Articles 18(10)(h)(i) and 20(11)(b) of the ID CCM

General measures include, but are not limited to:

· Network development and optimization

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

· Improvements concerning congestion management

Core CCR coordinated improvements with coordinated actions to increase cross-zonal capacities (for example improvements of the outage planning coordination in order to increase flexibility of the grid). Introduction of additional effective remedial actions should help to relieve the congestion and therefore allows to reduce the number of IVA application. 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 28,49% MTUs. For most MTUs, the reductions are applied to:

· TL 220kV Zakucac - Mostar (0,27 % MTUs, or around 0,95% of times of all HOPS applied reductions)

· TL 220kV Brinje - VE Padene (0,05% MTUs, or around 0,16% of times of all HOPS applied reductions)

· TL 400 kV Ernestinovo – Pecs 1 (7,29% MTUs, or around 25,6% of times of all HOPS applied reductions)

· TL 400 kV Ernestinovo – Pecs 2 (1,81% MTUs, or around 6,36% of times of all HOPS applied reductions)

· TL 400 kV Ernestinovo - Mitrovica (0,05% MTUs, or around 0,16% of times of all HOPS applied reductions)

TL 220kV Pehlin - Divaca (13,95% MTUs, or around 48,97% of times of all HOPS applied reductions)

TL 220kV Zerjavinec - Podlog (0,68% MTUs, or around 2,38% of times of all HOPS applied reductions)

TL 400kV Melina - Divaca (0,05% MTUs, or around 0,16% of times of all HOPS applied reductions)

TL 400kV Tumbri - Krsko 1 (2,13 % MTUs, or around 7,47% of times of all HOPS applied reductions)

TL 400kV Tumbri - Krsko 2 (2,22 % MTUs, or around 7,79% of times of all HOPS applied reductions)

Applied reductions on network element are mostly low (less than 4,5% of Fmax), while for several MTUs during November (BD20241130) and December (BD20241001-02 and BD20241208) higher values are applied on TL 400kV Ernestinovo - Pecs 1 & 2 due to unsolvable overloads in the relevant grid area caused by unavailability of grid elements in the surrounding area, 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). It is important to emphasize that energy needs increased during Q1 2025 in SEE with a significant flows in the network towards SEE, which is why reductions were applied more often during Q4 2024 to maintain a secured network. Such reductions are planned to be solved by developing and optimising the transmission network.

For the 2025, HOPS plans to install HTLS conductors on TL 220 kV Brinje – VE Padene that 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.

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

# MAVIR

# 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.**

In the analysed quarter (Q3 2024), for most MTUs, the reductions are applied to:

* In the analysed quarter for most MTUs, the reductions are applied to:
* CNEC Krajnik- Vieraden/Mikułowa-Pasikurowice PSE applied 4 MW of IVA (~0,1% of total reductions applied as outcome of individual validation tool) due to influence of planned outages on internal line,
* CNEC Krosno Iskrzynia - Rzeszów/Krosno Iskrzynia - Tarnów PSE applied 144MW of IVA (~4,1% of total reductions applied as outcome of individual validation tool) due to influence of planned outages on internal line,
* CNE Krosno Iskrzynia - Tarnów PSE applied 1737 MW of IVA (~48,9% of total reductions applied as outcome of individual validation tool) due to influence of planned outages on internal line,
* CNEs Mikułowa AT PSE applied 42 MW of IVA (~1,8% of total reductions applied as outcome of individual validation tool) due to influence of planned outages on internal line,
* CNEC Mikułowa PST/Hagenwerder - Mikułowa PSE applied 924 MW of IVA (~26,0% of total reductions applied as outcome of individual validation tool) due to influence of planned outages on internal line,
* CNE Polaniec-Rzeszów PSE applied 15MW of IVA (~0,4% of total reductions applied as outcome of individual validation tool) due to influence of planned outages on internal line,
* CNEC Polaniec-Tarnów/Polaniec-Rzeszow PSE applied 183 MW of IVA (~5,1% of total reductions applied as outcome of individual validation tool) due to influence of planned outages on internal line,
* CNEC Rzeszów - Khmelnytskyi/V.Kapusany-Mukachevo PSE applied 255 MW of IVA (~7,1% of total reductions applied as outcome of individual validation tool) due to influence of outages,
* CNE Wielopole-Nosovice PSE applied 250MW of IVA (~7,0% of total reductions applied as outcome of individual validation tool) due to influence of planned outages on internal line.

# RTE

# SEPS

The volume of IVA applications in Q4 2024 was significantly impacted by high transit flows from north to south.

During the analyzed quarter (Q4 2024), **SEPS applied reductions to approximately 9.28% of MTUs**, affecting a total volume of **85849 MW**. The majority of these reductions were implemented on the following transmission lines:

* **TL 400kV [CZ-SK]** Nosovice – Varin **[OPP/DIR] [SK]**
* **TL 400kV [SK-HU]** Levice – Göd **[DIR] [SK]**
* **TL 400kV [SK-SK]** Veľký Ďur – Levice 1 **[DIR]**

**Measures to Prevent Cross-Zonal Capacity Reductions in the Future**

**1. Planned Reinforcement of Nosovice – Varin Tie-Line (2026)**

A key initiative to mitigate IVA volume impacts is the planned reinforcement of the **Nosovice – Varin tie-line**. This upgrade aims to increase the **maximum current (Imax) from 1740A to 2000A** by 2026, which is expected to enhance system stability and reduce IVA applications on this element.

**2. Solutions for the Critical Network Element (CNE) Velky Dur – Levice**

To address congestion on this element, both short-term and long-term solutions are planned:

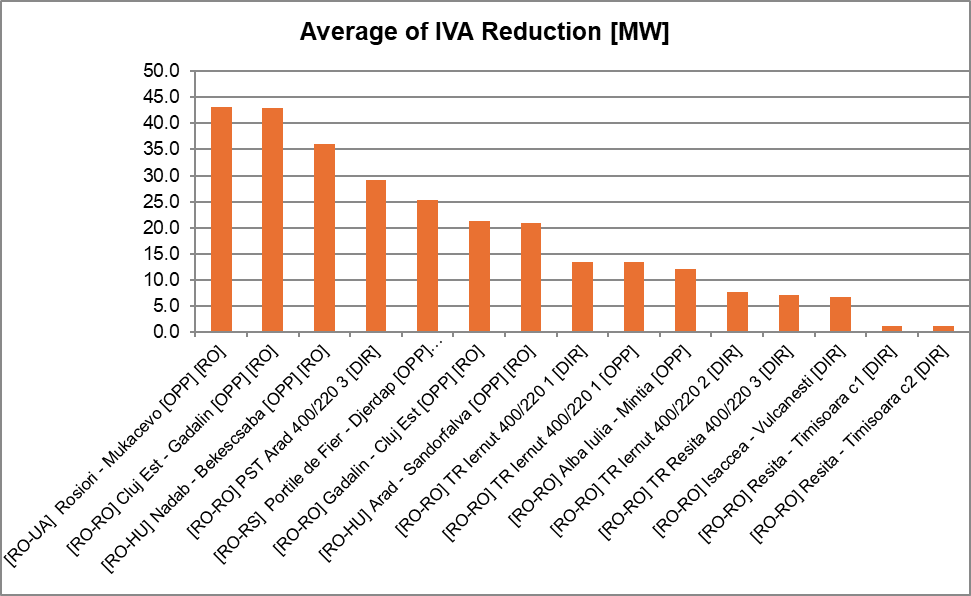
* **Short-Term Solution:**
* A **new topological measure** will be introduced in the affected area to alleviate congestion. This measure is expected to reduce the number of IVA applications in the near term.
* **Long-Term Solution (Projected Completion: Q2 2028):**
* **Modification of critical elements** at the **Velky Dur substation**, significantly reducing flows on **TL 400kV [SK-SK] Velky Dur – Levice 1 [DIR]**.
* **Interconnection of the V449 lines** outside substation Levice.
* **Creation of a long 400kV cross-border transmission line** between **Velky Dur (SK) and God (HU).**

# Transelectrica

In addition to being part of the Core CCR, Transelectrica is also part of SEE CCR with RO – BG border having operational processes for the First Intraday capacity calculation since October 2021 and Second Intraday capacity calculation since October 2022. Moreover, there are three non-EU borders for which there is no coordinated capacity calculation.

Regarding the capacity calculation process, the Core ID 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 18 (2): “Each Core TSO shall validate and have the right to decrease the RAM for reasons of operational security during individual validation. [...] IVA may reduce the RAM only to the minimum degree that is needed to ensure operational security, and only after all the expected available costly and non-costly remedial actions pursuant to Articole 22 of the SO Regulation are considered”.

For the period 20241001 – 20241231, Transelectrica applied an Individual Validation Adjustment (IVA) on the following CNEs, for a total of 10.05% of MTUs. In the graph below the average IVA per CNE is represented for the timestamps where reductions were applied.



OHL 400 kV Portile de Fier - Djerdap is a tieline between Romania and Serbia, both countries having tielines with Bulgaria and Hungary. Because of this, the power flows on OHL 400 kV Portile de Fier - Djerdap are highly impacted by the cross-border exchanges between RO-BG, RO-RS, RO-HU.

General measures to avoid cross-zonal capacity reductions in the future, as per Articles 18(10)(h)(i) and 20(11)(b) of the ID CCM.

* **Development of the transmission grid**

The main measure to reduce overloads in the capacity calculation process is to finalize investment projects with cross-border impact:

* New OHL 400 kV Portile de Fier – Resita and TIE 400 kV Resita – Pancevo circ. 2 have been commissioned in mid November 2024. TIE 400 kV Resita – Pancevo circ. 1 was commissioned in February 2025.
* New Autotransformer 400/220 kV in Rosiori substation to be commissioned in 2027;
* 400 kV OHL Resita - Timisoara - Sacalaz to be commissioned in 2026;
* 400 kV d.c. OHL Timisoara - Arad to be commissioned in 2027;
* Increasing the transmission capacity on the OHLs 220 kV Urechesti - Targu Jiu Nord - Paroseni - Baru Mare - Hasdat to be commissioned in 2028;
* Increasing the transmission capacity on the OHL 220 kV d.c. Portile de Fier - Resita to be commissioned in 2028;
* 400 kV TIE Nadab - Graniceri circ. 2 to be commissioned in 2027;
* 400 kV TIE Portile de Fier - Djerdap circ.2 to be commissioned in 2029;
* 400 kV TIE Oradea Sud - Josza to be commissioned in 2030.

* **Outage planning coordination**

Relevant assets are coordinated in the Outage coordination regions. This coordination has the scope of avoiding simultaneous disconnection of multiple elements with cross-border impact, taking into consideration the system security as a first step. Lately it has been observed that the finalization of the Yearly Maintenance Plan is highly impacted by the level of cross-border capacities provided to the market. Thus, it became a necessity to coordinate the outage of relevant assets also from the perspective of the capacity calculation processes.

* ***Implementation of regional coordinated processes for security analysis and redispatching and countertrading processes***

Results of the intraday capacity calculation process come with a lot of uncertainties, mainly due to the input data, volumes of capacity allocated and available redispatching. Measures to decrease the need of application of IVA include the consideration of internal redispatching. Due to the proximity to real-time, multiple power plants cannot be considered. Also, depending on the location of the congested elements, there may be none, one or multiple generators that can help decreasing the overload, but not necessarily avoiding them altogether.

It is thus mandatory to have security analysis implemented at regional level before real-time with coordinated means of reducing the observed overloads.

At Core CCR level these processes are still under implementation.