Explanatory document to all TSOs' proposal for a harmonised methodology for the allocation process of cross-zonal capacity for the exchange of balancing capacity or sharing of reserves per timeframe in accordance with Article 38(3) of Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing

31 July 2024

DISCLAIMER

This document is released on behalf of the all transmission system operators ("TSOs") for the purposes of approval of the proposal for methodology for a harmonised allocation process of cross-zonal capacity for the exchange of balancing capacity or sharing of reserves per timeframe (hereafter referred to as "methodology for a harmonised allocation process per timeframe") in accordance with Article 38(3) of the Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing ("EB Regulation").

Table of Contents

Abbreviations

The list of abbreviations used in this document:

aFRR	Frequency restoration reserves with automatic activation
BCP	Balancing capacity platform
CACM	Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management
CCR	Capacity Coordination Region
CID	Congestion Income Distribution
CNEC	Critical Network Element Contingency
CZC	Cross-zonal capacity
CZCA	Cross-zonal capacity allocation
CZCAOF	Cross-Zonal Capacity Allocation Optimisation Function
EB Regulation	Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing
ENTSO-E	European Network of Transmission System Operators for Electricity
GCT	Gate closure time
LFC	Load-frequency control
LFCR	Load-frequency control and reserves
LT	Long-term
LTTR	Long-term transmission right
MBA	Market-based allocation
MC	Market coupling
mFRR	Frequency restoration reserves with manual activation
MTU	Market Time Unit
MW	Megawatt
PTDF	Power Transfer Distribution Factor
RAM	Remaining Available Margin
RCC	Regional coordination centre
SDAC	Single day-ahead coupling
SO Regulation	Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity transmission system operation
TSO	Transmission system operator

1. Introduction

The Commission Regulation (EU) 2017/2015 establishing a guideline on electricity balancing (EB Regulation) proposes the application of cross-zonal capacity allocation (CZCA) for the balancing process to improve competition and increase welfare by means of cross-zonal balancing exchanges. This implies that TSOs may allocate cross-zonal capacity (CZC) available for the single day-ahead coupling (SDAC) to the same timeframe in which the balancing capacity (BC) procurement is organised. To yield the largest benefit through CZCA in a market-based environment, the EB Regulation introduces the following CZCA processes:

- Article 40 to develop a methodology based on the co-optimised allocation process;
- Article 41 to develop a methodology based on the market-based allocation and/or the inverted market-based allocation;
- Article 42 to develop a methodology based on economic efficiency analysis.

This document gives background information and rationale for the amendment of the Methodology for a harmonised allocation process of cross-zonal capacity for the exchange of balancing capacity or sharing of reserves per timeframe (HCZCAM) in accordance with Article 38(3) of Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing (EB Regulation) following the ACER decision No. 11/2023 of 19 July 2023 on the TSOs' proposal for the HCZCAM.

The HCZCAM was approved by ACER on 19 July 2023. With the approval came a request for amendment of specific parts of the methodology, which should be submitted by 31 July 2024. The request for amendment concerned the below governance provisions, a voluntary analysis to the maximum volume assessment per Critical Network Element Contingency (CNEC) and the transition of the Congestion Income Distribution (CID) provisions concerning balancing from Commission Regulation (EU) 2015/1222 of 24 July 2015 establishing a guideline on capacity allocation and congestion management (CACM) to the HCZCAM. Furthermore, the definitions of "interdependency" and "Set of Requirements" were added to the HCZCAM together with a derogation provision on the implementation deadline for already operational TSOs (according to EB Regulation Article 41(1)).

For higher legibility, this document is structured as follows:

- **Chapter 2** is dedicated to the governance provisions in the methodology for a harmonised allocation process per timeframe;
- **Chapter 3** is dedicated to the Maximum Volume Assessment amendment in the methodology for a harmonised allocation process per timeframe; and
- **Chapter 4** is dedicated to the Congestion Income Distribution amendment in the methodology for a harmonised allocation process per timeframe.

2. Governance provisions

The following amendments with respect to the governance provisions of balancing capacity platforms (BCPs) have been implemented in the 31 July 2024 version of the HCZCAM:

- Article 2: Definitions have been complemented with the definition of "Interdependency" and "Set of Requirements".

  1) "Interdependency": TSOs can be part of more than one application. A reason could be that a TSO is in one application for positive aFRR whereas it is in another for positive mFRR. As aFRR and mFRR partially interfere it can happen that the TSO applies substitution of reserves between the two applications. Another situation of interdependency is two or more applications being part of one flow-based regime. Here the flow-based capacity calculation affects both applications.

  2) "Set of Requirements": TSOs have added a definition of the Set of Requirements specifying the requirements that the cross-zonal capacity allocation optimisation function software should satisfy.

  Following Article 16(1), due to the interdependencies the TSOs of the affected applications shall integrate their individual applications into one common BC platform. Thus, the interdependencies can be adequately taken into account by one joint BC platform. The affected application TSOs should try to reach a unanimous agreement on which BC platform to combine the individual applications. In case the affected application TSO cannot agree on which BC platform to use, qualified majority voting according to Article 16(1)(b) in the HCZCAM shall be applied. The appropriate population "figures for voting" are taken from the ENTSO-E articles of association, as amended from time to time."

- Article 15(2) describes two levels of change requests:

  1) Change requests concerning the functionality of the CZCAOF software: The CZCAOF software has been developed by All TSOs. Changes of the functionality of the CZCAOF software therefore need to be agreed by All TSOs as these changes affect the CZCAOF software implementation of all BC platforms. Consequently, a corresponding change request shall be addressed to and approved by All TSOs.

  2) Change requests concerning the operation of the CZCAOF software: The operation of the CZCAOF software is conducted by all application TSOs. Consequently, they are responsible for the way how the CZCAOF software is run. As this process shall be identical across applications, changes of the operation of the CZCAOF software need to be addressed to and approved by all application TSOs of all BC platforms.

  Changes of the functionality or the operation of the CZCAOF software may only be requested by TSOs.

  Change requests are always considered as change requests concerning the operation of the CZCAOF software. When a change requests also affects the functionality of the CZCAOF software, it is to be approved by all TSOs for their final approval.

  For the avoidance of doubt: A change in the functionality of the CZCAOF software is expected to result in a change in the operation of the CZCAOF software. In contrast, a change in the operation of the CZCAOF software need not require a change in the functionality of the CZCAOF software.

Costs arising from a change request shall be shared among all application TSOs following the sharing keys defined in Article 28 HCZCAM.

- Article 16(2) requires all application TSOs per BC platform to establish three processes, for operating the CZCAOF, for performing the day-ahead bid curve forecast and for conducting the forecast validation. While an RCC per BC platform shall conduct the forecast validation pursuant to Article 16(4), Article 16(3) defines the designation of a TSO or a company owned by TSOs to operate the CZCAOF and a TSO or a company owned by TSOs to perform the forecasting process for the day-ahead energy bid curve. Operating the CZCAOF and performing the day-ahead bid curve forecast can be conducted by the same entity per BC platform.
- Article 16(9) defines the process of determining the GCT for balancing capacity bid submission by BSPs. Before deciding about a GCT, the application TSOs shall publicly consult with stakeholders at least three months ahead of its implementation and should last at least two weeks. Subsequently, application TSOs shall announce the corresponding GCT at least four weeks ahead of taking effect. The announcement shall include also exceptions for instances such as GCT delay or re-opening of the bidding window. If such an instance occurs the application TSOs shall publish the information as soon as possible and with a reasonable lead time before the affected MTU.
- Articles 16(7) and (8) define the establishment of a joint decision-making body per BC platform to ensure a fair and non-discriminatory process for the MBA process for all application TSOs of a BC platform. This decision-making body shall decide on matters and questions related to the BC platform. The wider scope of decisions shall be defined by the application TSOs per BC platform. All application TSOs of a BC platform shall appoint one representative to the decision-making body of the corresponding BC platform. The decision-making body shall be established when a BC platform starts operating at the latest. Any decisions to be taken by the decision-making body shall follow the rules defined in the HCZCAM.
- In Article 27(5) a maximum 24-month derogation has been added, which can be granted by the respective regulatory authorities if deemed necessary. This derogation should be justified towards the respective regulatory authorities according to Article 27(5)(a),(b),(c) and (d). The maximum 24-month derogation option only concerns those TSOs that prior to the HCZCAM already had an approval of Article 41(1) of the EB Regulation.

3. Provisions referring to the Maximum Volume Assessment amendment

This chapter provides background information of the Maximum Volume assessment addition to the amended HCZCAM.

In **Article 17.2** and **Article 17.3**, the process of defining different limits per CNEC is outlined. Different maximum limits hold significant relevance in a Flow-Based region. For instance, on the inclusion of a new member into an existing application, TSOs may consider reducing the maximum capacity at the borders to the new member to address operational safety and assess market impacts, whilst maintaining the standard 10% limit at all other borders.

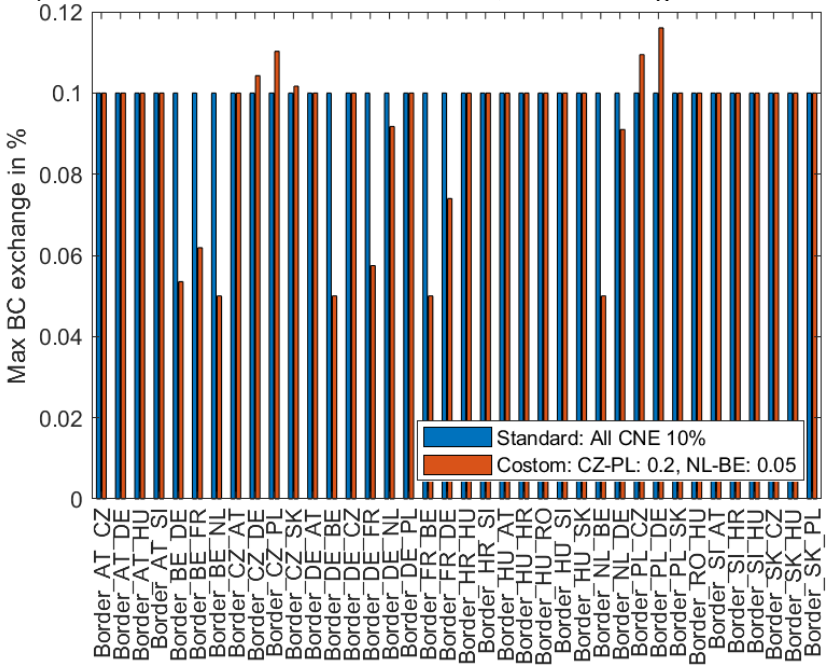
As a direct mapping between balancing capacity market borders and limits on a CNEC is not possible, a process to define the limits per CNEC needs to be established. Paragraph 17(3)a:

(a) the process to define the maximum limits per CNEC shall consider the impact of the limitation on all bidding zone borders. The aim of the process is to efficiently realize different intended limits per bidding zone-border. If contradicting intended limits occur due to a close interconnection of borders in the flow-based region, application TSOs shall aim to reach a unanimous decision on the implementation of the limits. If no unanimous decision can be reached, qualified majority voting applies.

A possible implementation for this process could include the following steps:

1. Define borders for which a different limit than the standard shall apply.
2. Define sensitive CNECs
    a. Define the threshold for PTDF such that only relevant CNECs for a border are included, but still a relevant number of CNECs per border remains, e.g. 0.15.
    b. Sensitive CNECs are all CNECs where the zone-to-zone PTDF is larger than the threshold.
3. Change the limit at all sensitive CNECs to the different maximum limit.

Following this process, an example has been calculated based on the data for the CCR Core for 12.10.23, 16:00-17:00. Employing a standard limit of 10%, and postulating an intended limit of 5% for the Netherlands (NL)- Belgium (BE) border and 20% for the CZ-PL border, the following results were obtained:



For this example, the reduction to 5% works very well (though also some neighbouring borders are affected), the increase to 20% only ends up at an exchange limit of approx. 12%. This exemplary process makes an increase of the intended exchange limits inherently difficult, because even though the limit on the most sensitive CNECs is increased, a 10% limit on a slightly less sensitive CNEC becomes restraining and limits the exchanges below the intended maximum.

When TSOs can take into account the specificities of their CCR and formulate a more elaborate process than the example before, the realization of the intended limits would surpass the results of this example, and the influence on neighbouring borders will decrease as well.

The process how to define the limits per CNEC and the intended limit per border shall be part of an application proposal according to 38(1) EBGL and consulted with all TSOs before the submission. If application TSOs aim for contradicting limits, which are not possible due to a close interconnection in the flow-based domain, they shall strive to find a unanimous agreement. If this cannot be reached, quality majority voting applies. If an application intends to increase the limit beyond 10% between two or more bidding zones, all TSOs neighbouring those bidding zones have a right to veto against this. This TSO then shall provide a justification for the veto.

4. Provisions referring to the Congestion Income Distribution amendment

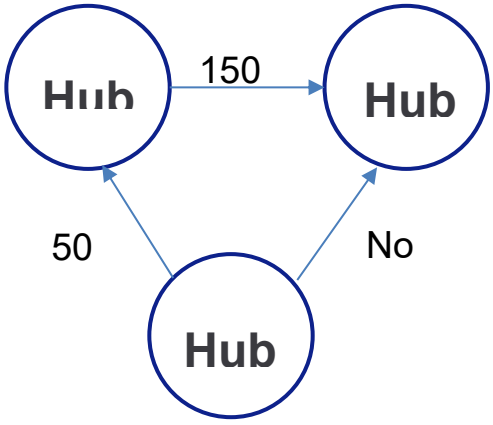
This chapter provides background information of the CID addition to the amended HCZCAM.

In **Article 24.2** and **Article 24.3**, calculations are included to ensure that applications of the methodology also respect the interests of congestion right holders and to avoid any missing money problem for the renumeration of LTAs.

Article 24.2 defines how to calculate the approximated congestion income which would have been generated in the day-ahead-market with the cross-zonal-capacity which was given to balancing. This is then compared against the congestion income actually obtained through the balancing capacity markets. If the monthly sum of the congestion income from the balancing markets is lower than value which would have been generated in day ahead market, the application TSOs shall provide a compensation to the CCR. This compensation is then attributed to the different borders in the CCR according to the shares of decreased congestion income as defined in Article 24.3.

An example calculation will demonstrate the principles for a flow based CCR. Assuming there are three hubs and only the interconnectors are the limiting CNECs[1] with the following PTDFs and RAMs:

CNEC	$PTDF_A$	$PTDF_B$	$PTDF_C$	RAM
$CNEC_{A->C}$	2/3	1/3	0	150 MW
$CNEC_{B->A}$	-1/3	1/3	0	50 MW
$CNEC_{B->C}$	1/3	2/3	0	9999 MW



For simplicity, only one direction is considered per CNEC. In reality both directions would need to be considered.

Now, assume the following market results:

Area	DA Net position	DA Price	BC net position	BC price
Hub A	140 MW	0 €/MWh	-60 MW	60 €/MW/h

[1] In this example, these are CNECs, but in reality there will be N-1 CNECs as well.

Hub B	170 MW	10 €/MWh	+60 MW	50 €/MW/h
Hub C	-310 MW	100 €/MWh	0 MW	-

To calculate the theoretical congestion income from the day-ahead market, the shadow prices of the day-ahead market and the allocation to balancing per CNEC are necessary:

$$\mathrm{CI'}_{CCR,T} = \mathrm{adj}_{\mathrm{CCR,T}} \times \sum_{t\in T, o\in CNEC_{CCR}} \mu_{o,t}^{CNEC} \times \mathrm{BEC}_{\mathrm{o,t}}$$

The adjustment factor $\mathrm{adj}_{\mathrm{CCR,T}}$ has a standard value of 1 for the moment, reasons to differ from this standard value will be given later. To calculate the reservation to balancing, no relieving effects on CNECs can be assumed, as a flow for balancing is not certain. Therefore, only positive values are considered. The BEC values should be one of the outputs of the reserve allocation algorithm. Depending on the details of the allocation algorithm, they could, for example, be calculated as the maximum possible flow from realizing bilateral reserve exchanges:

$$BEC(CNE_X) = \max_{u\in\{0,1\}} \left(\sum_b u_b * SE_b * PTDF_{CNE_x,b}, 0\right)$$

$$BEC(CNE_{A->C}) = \max\left(60 * -\frac{1}{3}, 0\right) = 0\ MW$$

$$BEC(CNE_{B\to A}) = \max\left(60 * \frac{2}{3}, 0\right) = 40\ MW$$

$$BEC(CNE_{B\to C}) = \max\left(60 * \frac{1}{3}, 0\right) = 20\ MW$$

SE: Balancing capacity exchanged between two BZs.

The shadow prices associated with limiting CNECs, resulting from the DA allocation, with the assumed zonal prices, are as follows:

$$\mu_{A\to C}^{CNEC} = 190\frac{€}{MWh}$$

$$\mu_{B\to A}^{CNEC} = 80\frac{€}{MWh}$$

With this, the reduced congestion income in day-ahead market can be calculated:

$$\mathrm{CI'}_{CCR,T} = 0\mathrm{MW} * 190\frac{€}{MWh} + 40\ \mathrm{MW} * 80\frac{€}{MWh} = 3200€$$

The adjustment factor $\mathrm{adj}_{\mathrm{CCR,T}}$ for $\mathrm{CI'}_{CCR,T}$ can be used to account for the overestimation of the congestion income which could have been generated in the day-ahead market due to the non-linearity of shadow prices. i.e. due to the fact that the expected price spreads with the increased capacities would be smaller compared to the price spreads obtained with the actually allocated capacities in day ahead.

Effectively this means, that the allocation to balancing uses some of the cross-border capacity, which increases price differences and therefore also shadow prices in day-ahead market. Consequently, also the congestion income which would have been generated in day-ahead market is overestimated. The adjustment allows to compensate for this effect.

As the congestion income from balancing is:

$$\mathrm{EBCI}_{CCR,T} = -\sum_{Hub} NP_{BC,Hub} * Price_{BC,Hub} = 60MW * \frac{60€}{MWh} - 60MW * \frac{50€}{MWh} = 600\ €$$

According to CID Methodology (Article 7 (5)), electricity balancing congestion income (EBCI) is shared using balancing capacity market spreads for borders that are part of the application (A->B in the example) and day-ahead market spreads for borders that are not part of the application (B->C and A->C in the example). This results in the following EBCI share per border.

$$EBCI_{A\to C} = 285.72$$
$$EBCI_{B\to A} = 57.14$$
$$EBCI_{B\to C} = 257.14$$

Assuming, for the sake of the argument, that this was the only MTU with an allocation to balancing in the whole month the compensation to the CCR would be:

$$\mathrm{C}_{CCR,T} = \max\left(\mathrm{CI'}_{CCR,T} - \mathrm{EBCI}_{CCR,T}, 0\right) = 2600\ €$$

In the second Article (24.3) the distribution of the compensation to the borders of the CCR is calculated. For this, first the decreased congestion income per border is calculated:

$$CI_{b,t}^{DEC} = \sum_{p\in P} |MS_{b,t} \times \max\left(AAF_{b,t}^{BC,p}, 0\right) \times \mathrm{SF}_t| \text{ if } AAF_{b,t} \geq 0$$
$$CI_{b,t}^{DEC} = 0 \; if \; AAF_{b,t} < 0$$

AAF = Additional Aggregated Flow
MS = Market Spread

To identify the relevant directions for which the congestion income from the DA could have been reduced, it is crucial to determine the directed borders where $AAF_{b,t}$ has the same direction as $AAF_{b,t}^{BC,p}$. For this, directed borders with positive $AAF_{b,t}$ are considered.

$$AAF_{A\to C} = 150$$
$$AAF_{B\to A} = 10$$
$$AAF_{B\to C} = 160$$

Consequently, only A->C, B->A, B->C directed borders are considered when computing the decreased CI. For directed borders C->A, A->B, C->B the compensation is zero.

Assuming a scaling factor (SF) = 1 and positive AAFs for all listed CNECs, the following results are obtained:

$$CI_{A\to C}^{DEC} = \left|100\frac{€}{MWh} \times 0\mathrm{MW} \times 1\right| = 0€$$
$$CI_{B\to A}^{DEC} = \left|-10\frac{€}{MWh} \times 40\mathrm{MW} \times 1\right| = 400€$$
$$CI_{B\to C}^{DEC} = \left|90\frac{€}{MWh} \times 20\mathrm{MW} \times 1\right| = 1800€$$

According to the formula for the compensation distribution,

$$c_{b,T} = \frac{\sum_{t\in T} max\left(CI_{b,t}^{DEC} \times Corr_t - EBCI_{b,t}, 0\right)}{\sum_{t\in T, b\in B_{CCR}} max\left(CI_{b,t}^{DEC} \times Corr_t - EBCI_{b,t}, 0\right)} \times \mathrm{C}_{CCR,T}$$
$$Corr_t = \frac{CI'_{CCR,t}}{\sum_{b\in B_{CCR}} CI_{b,t}^{DEC}}$$

compensation shares per directed border are calculated:

$$Corr = \frac{3200}{2200} = 1.45$$

$$c_{A\to C,T} = \frac{\max(0\times 1.45-285.72)\times 2600}{\max(0\times 1.45-285.72)+\max(400\times 1.45-57.14)+\max(1800\times 1.45-257.14)} = 0$$

$$c_{B\to A,T} = \frac{\max(400\times 1.45-57.14)\times 2600}{\max(0\times 1.45-285.72)+\max(400\times 1.45-57.14)+\max(1800\times 1.45-257.14)} = 472.73$$

$$c_{B\to C,T} = \frac{\max(1800\times 1.45-257.14)\times 2600}{\max(0\times 1.45-285.72)+\max(400\times 1.45-57.14)+\max(1800\times 1.45-257.14)} = 2127.27$$

This means the border B->A receives 18% of the compensation and border B->C receives 82% of the compensation.

The compensation process described in **Article 24.2.** can be omitted in case there is agreement among the TSOs of the concerned CCR following the respective voting arrangement.