Report of THE GERMAN TRANSMISSION SYSTEM OPERATORS on available cross-zonal capacity for the year 2025 PURSUANT TO ARTICLE 15(4) INTERNAL MARKET FOR ELECTRICITY REGULATION (EU) 2019/943

AS OF: 17/06/2026

CREATED BY

THE GERMAN TRANSMISSION SYSTEM OPERATORS WITH CONTROL AREA RESPONSIBILITIES

50hertz | Elia Group

amprion

TenneT Taking power further

TRANSNET BW

IN COLLABORATION WITH THE TRANSMISSION SYSTEM OPERATOR WITHOUT CONTROL AREA RESPONSIBILITY

baltic cable

Table of Contents

SUMMARY

The EU Electricity Market Regulation (EU) 2019/943, which entered into force on 04/07/2019, prescribes a minimum value for the capacity to be available for cross-zonal electricity trading of 70% as of 01/01/2020. With its "Bidding Zone Action Plan" [1], Germany is applying a transitional arrangement provided in Art. 15 of the EU Electricity Market Regulation and is increasing the capacity for cross-zonal electricity trading from the level of before 2020 by a linear trajectory to a minimum of 70% by 31/12/2025. Implementation of an action plan is associated with an obligation to carry out annual evaluations of compliance with the minimum values for cross-zonal electricity trading by the involved transmission system operators. The present report has been produced to meet this obligation by the transmission system operators with control area (cTSO) 50Hertz Transmission GmbH (50Hertz), Amprion GmbH (Amprion), TransnetBW GmbH (TransnetBW) and TenneT TSO GmbH (TenneT) as well as the transmission system operator without control area responsibility Baltic Cable AB (BCAB). In accordance with the requirements of the EU Electricity Market Regulation, the methodology and data basis of the present report had been submitted to the national regulatory authority Bundesnetzagentur (Federal Network Agency for Electricity, Gas, Telecommunications, Post and Railways, BNetzA) for approval.

The minimum values for cross-zonal electricity trading at the borders Germany – Denmark 1 [2], Germany – Denmark 2, and Germany – Norway 2 were fulfilled at all times during 2025 by the transmission system operators with control area 50Hertz and TenneT. At the border Germany – Sweden 4, a deviation of the linear trajectory occurred in 1954 hours due to unavailability of critical network elements in the TenneT control area (including the distribution network level) in accordance with Art. 16(3) of the EU Electricity Market Regulation to ensure system security.

On the network elements of the Core region, the cTSOs complied with the requirements according to Art. 16 of the EU Electricity Market Regulation in all hours, although in a few hours a deviation below the currently applicable minimum value of 60.3% for the year under review occurred. In these hours, the deviation was necessary to ensure system security or was due to the methodological discrepancy described in Chapter 3.1.2. This took place in accordance with the requirements of Art. 16(3) of the EU Electricity Market Regulation at all times.

In summary, 50Hertz, Amprion, TransnetBW, TenneT, and BCAB complied with the statutory requirements for cross-zonal electricity trading pursuant to Art. 15 and 16 of the EU Electricity Market Regulation at all times during the year 2025.

[1] https://www.bmwi.de/Redaktion/DE/Downloads/A/aktionsplan-gebotszone.pdf?__blob=publicationFile&v=10

[2] For the direction Denmark 1 to Germany, a lower deviation must be disclosed, which, however, does not represent a lower deviation if the assumptions at the time of the capacity calculation are taken into account.

1. LEGAL BACKGROUND

The EU Electricity Market Regulation (EU) 2019/943, which entered into force on 04/07/2019, stipulates that transmission system operators (TSOs) may not restrict the cross-zonal transmission capacity to eliminate congestion within a bidding zone. This requirement is considered met if a minimum value of 70% is achieved for the cross-zonal electricity trading. Specifically, this means that as of 01/01/2020, at least 70% of the border transmission capacity of borders with NTC[3] capacity calculation and at least 70% of the transmission capacity of the critical network elements of borders with flow-based capacity calculation (in consideration of system stability) must be offered for cross-zonal electricity trading (cf. Art. 16(8)).

For Member States that have identified structural grid congestion, the EU Electricity Market Regulation opens the possibility of submitting an action plan to reduce this congestion (cf. Art. 15(1)). In this case, the minimum value for cross-zonal trade capacity is to be raised annually in steps during the period from 01/01/2021 through 31/12/2025 until reaching 70%, starting from the average level of the past three years or the maximum of these years (cf. Art. 15(2)) as a minimum value in 2020.

Against this backdrop and after consultation with stakeholders and Member States, the Federal Republic of Germany submitted the Bidding Zone Action Plan on 28/12/2019 to the European Commission (EC) and the Agency for the Cooperation of Energy Regulators (ACER). The Bidding Zone Action Plan contains concrete measures by which Germany will counteract the structural congestion described above and raise the minimum capacity for cross-zonal electricity trading in stages up to 70% by 31/12/2025.

Implementation of an action plan is associated with an obligation to carry out annual evaluations of compliance with the minimum values for cross-zonal trade capacity by the involved TSOs. The data basis for these evaluations must be approved by the corresponding national regulatory authority (NRA), in this case by the BNetzA.

The present report was produced by the TSOs with control area responsibility (cTSO) 50Hertz Transmission GmbH (50Hertz), Amprion GmbH (Amprion), TransnetBW GmbH (TransnetBW) and TenneT TSO GmbH (TenneT), as well as the TSO without control area responsibility Baltic Cable AB (BCAB), to comply with the obligations under Art. 15(4) EU Electricity Market Regulation for the year 2025.

Table 1: Relative Trading Margin of the German TSOs in the Core Region in 2025

	50 Hertz	**Amprion**	**Tennet**	**TransnetBW**
<60.3%without IVA	0.0037%	0.0109%	0.0336%	0.0000%
<60.3% IVA (fallback)	0.152%	0.0318%	0.1012%	0.0447%
<60.3% IVA (overload)	0.0018%	0.0003%	0.0028%	0.0000%

[3] NTC (net transfer capacity) refers both to a capacity calculation method for determining border-specific transmission capacity and to its result.

60.3%-70%	22.7267%	7.2630%	10.1640%	1.5447%
>=70%	77.1158%	92.6939%	89.6984%	98.4106%

2. LINEAR TRAJECTORY OF THE GERMAN ACTION PLAN

In accordance with the Bidding Zone Action Plan, the Federal Ministry for Economic Affairs and Climate Action (BMWE, formerly known as BMWi/BMWK) has instructed the German TSOs to calculate the initial values for the linear trajectory pursuant to Art. 15(2) of the EU Electricity Market Regulation.

Based on the principles for calculating and reporting the initial values provided by the BNetzA[4], the German TSOs 50Hertz, Amprion, TransnetBW and TenneT[5] have calculated and published[6] the initial values for the German bidding zone borders[7] and critical network elements. The principles for calculating the initial values stipulate, amongst other rules, that a common average be calculated and defined as the initial value for all bidding zone borders and critical network elements that are part of the flow-based market coupling[8] in the capacity calculation region[9] Core. Starting from this initial value, a staged linear trajectory of minimum values is to be determined for the intervening years until reaching the target level of 70% on 31/12/2025. Until the implementation of the Core flow-based market coupling (Core FBMC) on 08/06/2022, the minimum values determined in this way were applied within the flow-based market coupling in the Central Western European region (CWE) and at the NTC borders that will be part of the Core FBMC in the future.

This report examines the German borders of the CCR Core according to the flow-based market coupling method for the time after 09/06/2022.

An initial value must be determined and applied for each of the borders in the capacity calculation region Hansa Germany – Denmark 1 (DE-DK1), Germany – Denmark 2 (DE-DK2) and for the borders of Germany – Sweden 4 (DE-SE4) and Germany – Norway 2 (DE-NO2). The minimum capacities and the linear trajectory will be applied at the border DE-NO2 based on the general principle of equal treatment and on European competition law. As part of the European Economic Area, Norway is treated as an EU Member State in these

[4] Bundesnetzagentur - Europäische Marktkopplung - Prinzipien zur Berechnung und Ausweisung der Startwerte nach Artikel 15 Absatz 2 Verordnung (EU) 2019/943

[5] The initial value for the border DE-SE4 was determined by TenneT.

[6] https://www.netztransparenz.de/EU-Network-Codes/CEP-Startwerte

[7] This refers to the Germany-Luxembourg bidding zone. To improve readability, the term “German bidding zone” is used below.

[8] Flow-based Market Coupling, FBMC

[9] Capacity Calculation Region, CCR

cases because it has adopted the EU Electricity Market Regulation (EU) 2019/943 into national law. These calculations result in the initial values and the corresponding linear trajectories, as shown below.

CCR Core

Region	**% of capacity per critical network element (CNE)**						
	2020	**2021**	**2022**	**2023**	**2024**	**2025**	**As of 31/12/2025**
CWE/CEE resp. Core region	11.5	21.3	31.0	40.8	50.5	60.3	70.0

Table 2: Linear trajectory curve for critical grid elements in the CWE and CEE regions (merged into the Core region as of 08/06/2022)

The minimum remaining available margin introduced for the CWE region in April 2018 (CWE-MinRAM) of 20% will continue to apply in the CCR Core as well if this is possible without sacrificing system stability.

CCR Hansa

Border		**% of capacity per border**						
		2020	**2021**	**2022**	**2023**	**2024**	**2025**	**As of 31/12/2025**
DE-SE4		41.4	46.2	50.9	55.7	60.5	65.2	70.0
DE-DK1		23.9	31.6	39.4	47.0	54.6	62.3	70.0
DE-NO2		0	11.7	23.3	35.0	46.7	58.3	70.0
DE-DK2[10]	Kontek → KFCGS[11] →	70.0 0.0	70.0 11.7	70.0 23.3	70.0 35.0	70.0 46.7	70.0 58.3	70.0

Table 3: Linear trajectory curve for critical network elements in the Hansa region

TenneT's commitment regarding the minimum value on the border DE-DK1 resulting from the "Commission Decision of 07/12/2018 […] Case AT.40461 – DE/DK Interconnector" remains unaffected.

[10] For interconnectors commissioned after January 1st, 2020, the BNetzA has stipulated that these have a starting value of 0% in the year of commissioning and that this value increases to up to 70% annually. Therefore, the minimum value for the DE-DK2 border is made up of the individual values of the two interconnectors located on the border.

[11] The minimum value in percent is applied to the available transmission capacity after deducting the forecast feed-in from the offshore wind farms.

3. MONITORING METHODOLOGY

The methodology for monitoring compliance with the minimum values for cross-zonal electricity trading pursuant to the EU Electricity Market Regulation and the stipulations of the BNetzA is described in the following. The minimum value must be respected by the offered capacity within every market time unit (MTU), in other words every hour, and in both directions. The minimum value defines the minimum capacity to be offered. The first step of evaluating compliance with the minimum values is based on the capacities offered in the day-ahead capacity calculation. The offered capacity is also referred to below as the “trade margin”.

The trade margin consists of two components. The first is the coordinated trade margin which represents the offered capacity at the border or borders in question that participate in the capacity coordination. The second is the uncoordinated trade margin. This represents the consequences of the trade capacities offered to other borders not participating in the capacity coordination, if data are available. Third countries that are not EU members are treated as EU Member States.[12] This ensures a consistent method for calculating the initial values for the German TSOs.

In case of a deviation of the linear trajectory according to the method described above, further special analysis is required. Additional components of relevance to compliance are then taken into account, such as offered capacity in the long-term[13] and intraday (ID) timeframe as well as capacities reserved for cross-border balancing power, just like the consideration of other European borders in calculating the uncoordinated trade margin.[14] Such conclusive compliance evaluations are described in the results section below. In case of a deviation of the linear trajectory, an analysis of whether this caused a restriction to cross-border electricity trading is triggered. Such restrictions are considered situations in which the capacity was fully utilised, and a market price difference remained such that an additional exchange would have been cost-efficient. [15]

---

[12] In this respect, this methodology differs from the approach taken by ACER in their Report on the Result of Monitoring the Margin Available for Cross-Zonal Electricity Trade in the EU.

[13] Within the scope of the methodology monitoring for the Core flow-based capacity calculation region, the long-term capacity is already included in the coordinated trade margin in advance. In this case, no further consideration takes place at this point.

[14] In this respect, this methodology differs from the approach taken by ACER in their Report on the Result of Monitoring the Margin Available for Cross-Zonal Electricity Trade in the EU

[15] In the case of HVDC interconnectors with implicit loss procurement, the relative price difference must be greater than the applied loss factor of the interconnector, as a further increase of the exchange would otherwise not be economic.

3.1 Core region

As described in Chapter 2, a common initial value and linear trajectory of the minimum value to be maintained on each critical network element (CNE), considering the respective critical outage combinations (CNEC), was calculated for all German borders that are part of the CCR Core.

Since 08/06/2022, the transmission capacities for the German borders in the core region have been calculated using the flow-based methodology. The monitoring methodology is described below.

Calculating the offered trade margin

The offered trade margin is determined according to the EU Electricity Market Regulation for each CNEC. As described above, the offered trade margin is the sum of the coordinated and uncoordinated trade margins. The resulting offered trade margin is given as a percentage. This value is calculated as the trade capacity offered at the CNEC (sum of the coordinated and uncoordinated shares) divided by its physical capacity (F_{max}). For all MTUs, the value for F_{max} used in the calculations for compliance monitoring is equivalent to the physical limit applied in the capacity calculation. When applying default flow-based parameters (DFPs) or spanning [16] due to technical problems in the flow-based capacity calculation, it is not possible to determine the relative offered trade margin. MTUs where DFPs or spanning were applied are therefore excepted from the compliance evaluation.

Determining the coordinated trade margin

The reported coordinated trade margin corresponds firstly to the remaining available margin (RAM) offered for the cross-zonal trading within the day-ahead capacity calculation, which is published daily on the website of JAO [17].

For the monitoring of the capacities allocated in the CCR Core, the capacities allocated in the long-term area are also taken into account in accordance with Article 4(4)b of the DA CCM. This is made possible by the following procedure, which is explained in a simplified representation in Figure 1.

[16] The application of DFP and spanning are fallback procedures according to Art. 22 of Core DA CCM. Capacities allocated when DFPs are applied correspond at least to the allocated cross-zonal long-term capacities. Spanning interpolates missing flow-based parameters of up to two consecutive MTUs based on the available parameters of the previous and subsequent MTU.

[17] https://publicationtool.jao.eu/core/

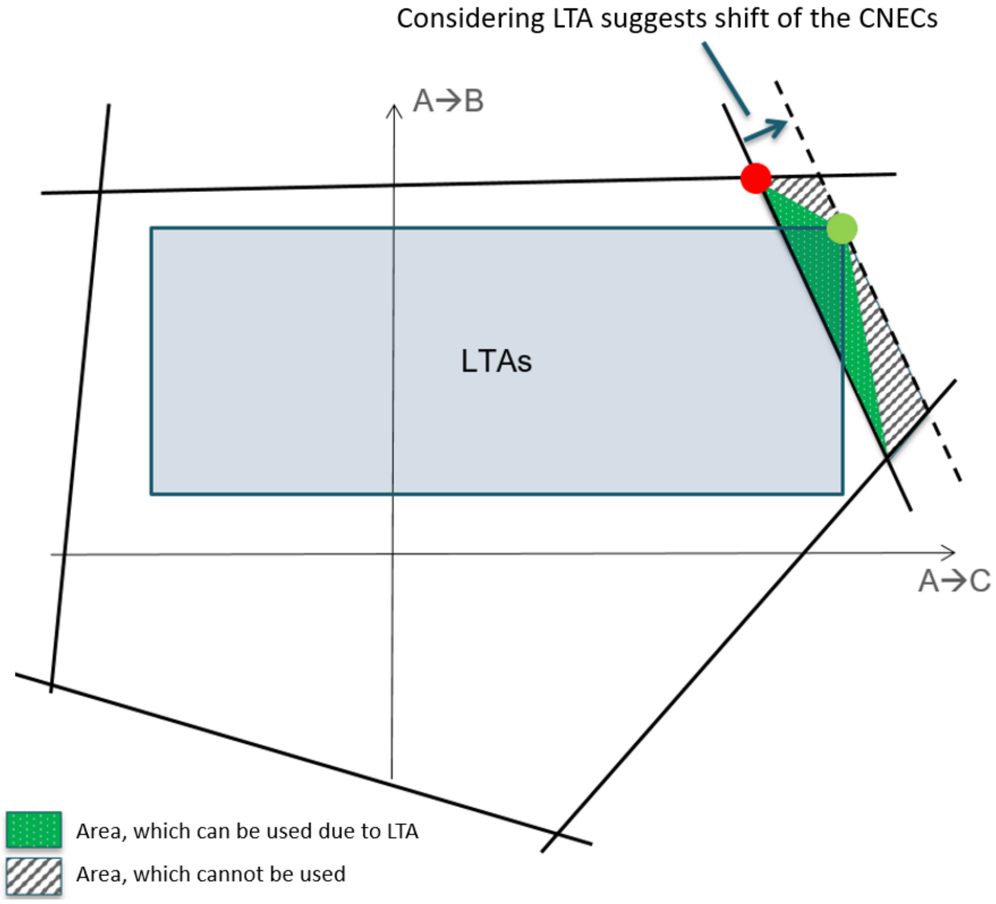


Figure 1: Consideration of allocated long-term capacities in the coordinated trade margin (simplified representation)

1) Determination of the offered margin per CNEC before LTA inclusion (red dot) → $RAM_{CNEC\ i,MTU\ j}$
2) Determination of the maximum LTA impact on the CNEC (green dot)

$$F\_LTA_{\max CNEC\ i,MTU\ j} = \sum LTA_{MTU\ j} \text{ x } PTDFpositive_{CNEC\ i,MTU\ j}$$

LTA is a vector containing all long-term capacities allocated within the respective capacity calculation region. $PTDFpositive$ describes a vector containing the positive (i.e., burdening) zone-to-zone PTDFs of the respective CNECs of the borders, where the long-term capacities were allocated.

3) Determination of the maximum of both values:

$$coordinated\ trade\ margin\ _{CNEC\ i,MTU\ j} = \max\left(RAM_{CNEC\ i,MTU\ j}\ ;\ F\_LTA_{max}\right)$$

Calculating the uncoordinated trade margin

The influence of the cross-zonal trade capacity offered in the CCR Core on the respective CNEC is determined for calculating the uncoordinated trade margin. Specifically, the corresponding load producing

PTDFs are multiplied by the respective NTCs to determine the influence of the NTCs on the respective CNEC.[18]

The individual uncoordinated trade margins of the various NTC border directions are added up to determine the total uncoordinated trade margin of the CNEC.

$$Uncoordinated\ trade\ margin = \sum_{j,k;j\neq k} Uncoordinated\ trade\ margin_{j\rightarrow k}$$

This takes into account borders where the PTDF values in the reference programme (RefProg) are available within the day-ahead Core FBMC capacity calculation.[19]

[18] In this respect, this methodology differs from the approach taken by ACER in their Report on the Result of Monitoring the Margin Available for Cross-Zonal Electricity Trade in the EU

[19] The borders of the reference programme for Core can be viewed in the JAO Publication Tool: https://publicationtool.jao.eu/core/refprog

Parameter	**Input data**	**Source**
Uncoordinated trade margin	NTCs	day-ahead[20] Net Transfer Capacity requested from the ENTSO-E Transparency Platform
Coordinated and uncoordinated trade margin	PTDFs of Core CNECs	Core CC Tool (partly publicly available under JAO Publication Tool[21])
Coordinated trade margin	RAM	Core CC Tool (publicly available under JAO Publication Tool[22])
Coordinated trade margin	LTAs	Core CC Tool (publicly available under JAO Publication Tool[23])

Table 4: Data sources for the CCR Core

Impact of individual validation on the trade margin offered

The capacity available on the CNECs for cross-border trading is increased to the minimum value if the minimum value was not reached for the respective CNEC as a result of the capacity calculation. Within the framework of the individual validation of the TSOs, probable market results are therefore checked to see whether potentially occurring overloads on the network elements can be mitigated through the use of secured available remedial actions (including redispatch, cross border redispatch, PST tapping and topological measures). If this is not the case, the capacity available for cross-border trade is reduced to avoid jeopardising operational security. The capacity reduction as a result of the validation does not necessarily lead to a lower deviation of the minimum values, as on most CNECs significantly more than the minimum trade margin is made available. Only in a few hours do the capacity reductions as a result of validation lead to values below the minimum values.

Special case of Core region internal DC interconnectors

In accordance with Article 12(1) of the Core Day-Ahead Capacity Calculation Methodology DC interconnectors at Core region internal borders are integrated into the flow-based capacity calculation via the "Evolved Flow-Based Procedure". In this process, the converter stations function as so-called 'virtual hubs' having their own net positions, i.e., they represent either a load or a generation node. These virtual hubs thus also have PTDFs to map their influence on the CNECs.

[20] https://transparency.entsoe.eu/transmission/forecast/dayAhead

[21] https://publicationtool.jao.eu/core/finalComputation

[22] https://publicationtool.jao.eu/core/finalComputation

[23] https://publicationtool.jao.eu/core/lta

Therefore, the virtual hubs of the DC interconnector compete with the other bidding zones for free capacity on the CNECs to enable cross-zonal electricity trading via the interconnector. The maximum net position of the virtual hubs is thereby usually limited by the maximum physical transmission capacity of the DC interconnector.

In the case of a DC interconnector with a physical transmission capacity of 1,000 MW, the possible net position of the virtual hub would consequently be between -1,000 MW and +1,000 MW. The maximum possible net position thereby also reflects the coordinated trade capacity offered on the DC interconnector. There is no uncoordinated trade margin, as the entire trading capacity of the DC interconnector is made available to cross-zonal electricity trading within the flow-based capacity calculation region. In the above example, a minimum capacity of 70% would be fulfilled provided that the offered maximum net position of the virtual hub is at least +/- 700 MW. If the exchange via the DC interconnector is restricted by Core AC CNEC, this does not change the offered coordinated trading capacity for the DC interconnector.

On October 1, 2025, quarter-hour products were introduced in the European day-ahead market. Consequently, the maximum physical transmission capacity of ALEGrO has been determined on a 15-minute basis since that date. To ensure comparability of all values for the year 2025, all input data for 2025 used in the calculation of ALEGrO's commercial margin were therefore consistently considered at a uniform 15-minute resolution.

3.1.1 Validation within the framework of the Core capacity calculation

The four German TSOs with control area responsibilities, together with the Austrian TSO APG and the Dutch TSO TTN, have developed the DAVinCy procedure to perform individual validation within the Core day-ahead capacity calculation process. This procedure consists of the following steps:

- Determination of probable market outcomes: The outcome of the Core day-ahead capacity calculation is the capacity available for cross-border trading per CNEC. How the market will use the available capacity, i.e., which combination of cross-border trades will be realized, is not known at the time of the capacity calculation and individual validation. Therefore, eight likely market outcomes are determined for further assessment.
- Determination of congestion: For each of the eight market outcomes, the network elements (CNECs and internal network elements) that are congested are identified.
- Removal of congestions: Then, considering all assured available remedial actions (redispatch, cross-border redispatch, PST tapping, and topological measures), the congestions are relieved to the extent possible. The result is the remaining congestion that cannot be removed.
- Determination of the necessary capacity reduction: For this purpose, DAVinCy analyses to what extent the offered capacities must be reduced so that neither CNECs nor internal network elements are overloaded after all remedial actions have been applied. As a result, the capacity available on the CNECs for cross-border trading is reduced by means of so-called Individual Validation Adjustments (IVA).

The complexity of the IVAs in the context of DAVinCy results from the simultaneous consideration of possible market outcomes, the resulting network conditions as well as congestion management usage and its influence on the capacities for cross-zonal exchange. A joint validation leads to advantages. Important aspects are summarized below:

- Capacity reductions as a result of the DAVinCy process results are always justified by a potential threat to operational security. The Internal EU Electricity Market Regulation explicitly provides for this case as permissible. For each IVA application, it is published for which network element congestion is imminent after considering the assured available remedial actions.[24]
- Overall, the joint validation leads to lower capacity reductions than if all six TSOs would perform the validation independently. On the one hand, this is due to the fact that the availability of remedial actions is greater in the consortium, and, on the other hand, the limitation of capacity can be designed more efficiently, in this case lower, due to the available CNECs.
- A capacity reduction or IVA application in a control area does not equate to the presence of congestion in the same control area. DAVinCy results very often show that congestion in one control area can be most efficiently addressed with an IVA application in an adjacent control area.

A capacity reduction is not the same as a deviation of the linear trajectory. As a result of the preliminary capacity calculation, capacity is often released for cross-zonal trading per CNEC that is significantly greater than the minimum value.

<u>DAVinCy fallback</u>

A so-called DAVinCy fallback is applied in the following two possible situations: 1. the results from the validation are not plausible for at least one MTU or 2. the validation calculation fails for at least one MTU. In these cases, the available coordinated trade margin for CCR Core-internal trades on DAVinCy TSOs' CNECs is reduced to 20%[25]. Long-term capacity will not be curtailed in the event of a fallback and will remain available to the market. This limitation, which can also lead to a deviation of the linear trajectory, is necessary because without validation the TSOs have no knowledge of whether their grid elements are being overloaded, which in turn creates a high risk for operational security.

---

[24] https://publicationtool.jao.eu/core/validationReductions

[25] When the Core FBMC was put into operation, in case of DAVinCy fallback, the sum of trading from outside and inside the CCR Core was capped at 20%. On 13/09/2022, a change was made to guarantee a coordinated trade margin for CCR Core internal trades of 20%.

3.1.2 Discrepancy between the German requirements for monitoring and the Core capacity calculation method

The methodology of the German regulatory authority BNetzA, which is decisive for the German TSOs in terms of monitoring, differs from the CCR Core capacity calculation method with regard to the determination of the non-coordinated margin available for trade. In the German monitoring method, the loading flows of the offered capacities at borders outside CCR Core are added together when determining the non-coordinated trade margin. In the Core capacity calculation method, by contrast, the forecasted exchange is assumed for each of the borders outside CCR Core. This can have either a loading or a relieving effect. An assumed relief of CNECs by other borders reduces the non-coordinated trade margin and may even cause it to become negative. Consequently, a correspondingly higher coordinated trade margin is required to reach the minimum value for the trade margin than would be necessary if only the offered capacities per direction or the loading flows were taken into account.

Regardless of the calculation method, the respective input data should be of the same quality in order to prevent methodological discrepancies. Compared with summation according to the monitoring logic, the netting of trade flows as applied in the Core capacity calculation – given comparable data – leads to an equal or lower non-coordinated margin. In rare cases, however, it can be observed that trade outside the Core region is forecast to be higher in the Core capacity calculation than in the monitoring. One reason for this may be short-term capacity restrictions (e.g. technical outages) that are not taken into account in the forecast of the Core capacity calculation. In these cases, the non-coordinated trade margin in the Core capacity calculation is higher than under the German monitoring method. This can result in the minimum values under the German monitoring method not being met, because the Core capacity calculation determines a lower coordinated trade margin than would be required under the German monitoring method. As the German TSOs have no means of increasing the coordinated trade margin in the Core capacity calculation depending on the non-coordinated trade margin according to the German methodology, but are bound to the Core methodology, the German TSOs cannot be held responsible for such cases.

3.2 Hansa region

As described at the start of Chapter 2 , individual initial values and linear progression curves were calculated for each bidding zone boundary within the CCR Hansa. As an NTC capacity calculation is carried out at all four boundaries, the values apply to each boundary.

3.2.1 NTC borders Germany – Denmark 1 and Germany – Norway 2

The transmission capacities of the bidding zone boundaries DE-DK1 and DE-NO2 are determined using a coordinated NTC procedure (cNTC). This allows the individual minimum capacities of the boundaries to be applied as minimum trading margins (proportion of the maximum permissible power flow) on the respective critical network elements. The calculation is based on a Common Grid Model (CGM) in accordance with Articles 67 and 70 of Regulation (EU) 2017/1485 establishing a guideline on transmission system operation (SOGL), for both the import and export directions and for all MTUs. As different minimum values apply to the

DE-DK1 and DE-NO2 borders in accordance with the Action Plan, the transmission capacities are first determined on the basis of the lower minimum margin (DE-NO2) in order to establish the transmission capacity of the relevant border. Subsequently, the transmission capacity of the border with the higher minimum margin (DE-DK1) is determined, taking into account the previously determined transmission capacity of the other border (DE-NO2). Consequently, the transmission capacities of the two borders may be determined by different CNECs. The monitoring methodology applied by TenneT is described below.

The NTC calculation for DE-NO2 and thus the monitoring of the minimum values refers to the receiving side of the bidding zone border.[26] As the NordLink cable, which forms the DE-NO2 border, is operated with implicit loss procurement, the transmission capacities on the sending side are not exclusively available for cross-border trade, but are additionally utilised by the implicitly procured loss power.

<u>Calculation of the offered trading margin</u>

As described above, the offered trading margin consists of two components: the coordinated and the uncoordinated trading margin. When applying an NTC procedure, only the offered trading margins of the respective limiting CNECs are relevant for determining compliance, as only these determine the respective transmission capacity. Accordingly, the uncoordinated trading margin is also considered only for the limiting CNECs. As different minimum values apply to the DE-DK1 and DE-NO2 borders and different CNECs act as limiting factors, the calculation and monitoring of the trading margins for the DE-DK1 and DE-NO2 borders are carried out separately.

<u>Determination of the coordinated trading margin</u>

The coordinated trading margin on the limiting CNECs corresponds to the proportion of the determined transmission capacities that place a load on the respective limiting CNEC (calculation is performed using NTC and PTDF values). Within the framework of a cNTC method, the coordinated trading margin is not exclusively available to any single border, but is shared between the participating borders. The coordinated trading margin for the respective border is therefore the sum of the two products of the respective NTC (DE-NO2 and DE-DK1) and the associated PTDF of the limiting CNEC for the border in question. This is carried out once for the DE-NO2 border and once for the DE-DK1 border, using the respective limiting CNEC and the associated PTDF values. The coordinated trading margin of the respective CNEC is therefore derived from the contributions of both transmission capacities (DE-DK1 and DE-NO2).

<u>Calculation of the uncoordinated trading margin</u>

[26] The terms 'receiving side' and 'sending side' of a bidding zone boundary refer to the respective directions of the transmission capacities. Each direction always points from the energy-sending side (bidding zone) to the energy-receiving side (bidding zone).

The uncoordinated trading margin on the limiting CNECs corresponds to the load-bearing shares of the capacities offered on neighbouring borders, which must be offered on the limiting CNECs in each direction (the share is calculated using PTDF).[27] To this end, the capacities offered on neighbouring borders are estimated on the basis of the information available at the time of the DA capacity calculation. This results in a value for the uncoordinated trading margin per limiting CNEC for each MTU and direction.

[27] In this respect, this method differs from the approach taken in *the ACER Report on the Result of Monitoring the Margin Available for Cross-Zonal Electricity Trade in the EU* by the Agency for the Cooperation of Energy Regulators.

Parameter	Input data	Source
Relative trade margin	F_{max}	Calculation based on nominal voltage and I_{max} from the D2CF CGM
Coordinated trade margin	NTC	Internal AC load flow calculation based on D2CF-CGM
Coordinated and uncoordinated trade margin	PTDF	Internal calculation from D2CF CGM
Uncoordinated trade margin	NTC	Forecasted day-ahead capacity (Art. 11.1 EU Regulation 543/2013) from ENTSO-E Transparency Platform

Table 5: Data sources for the CCR Hansa

3.2.2 NTC border Germany – Denmark 2

The methodology applied by 50Hertz at the border DE-DK2 is described below.

Calculating the offered trade margin

Because only the interconnectors with direct current (DC) properties Kontek cable and, since 15/12/2020, KF CGS exist at the border DE-DK2, no unscheduled load flows occur, only the coordinated trade margin is to be determined.

Determining the coordinated trade margin

The coordinated trade margin corresponds to the transmission capacity offered at the border according to the DA capacity calculation. The transmission capacity increased overall when the hybrid interconnector KF CGS went into operation on 15/12/2020. The KF CGS connects the grid connections of the German offshore wind farms Baltic 1 and Baltic 2 to those of the Danish offshore wind farms Kriegers Flak DK, thereby establishing an interconnector between Germany and eastern Denmark. This transmission capacity arises from the total transmission capacity minus the forecasted offshore wind power infeed.

On October 1, 2025, quarter-hour products were introduced in the European day-ahead market, resulting in the wind feed-in forecasts of the offshore wind farms located on this border being changed to 15-minute values from that point onward. Since the transmission capacity of the entire border also depends on offshore wind feed-in, the capacity of the DE–DK2 border has been published in quarter-hour intervals since that date. To ensure comparability of all values for the year 2025, all capacity values for the DE–DK2 border in 2025 were therefore considered using a uniform 15-minute resolution.

Parameter	Input data	Source
Coordinated trade margin	NTC for the Kontek cable and for KF CGS	System management and grid control systems

Table 6: Data sources for determining the trade margin at the DE-DK2 border

3.2.3 NTC border Germany – Sweden 4

The transmission capacity at the DE-SE4 bidding zone border is determined by the transmission system operators Baltic Cable AB (BCAB), Svenska kraftnät and TenneT. The TSOs carry out capacity calculations independently of one another. TenneT determines the transmission capacity by assessing wind feed-in to the Schleswig-Holstein Netz AG grid, as well as line unavailability at TenneT and Schleswig-Holstein Netz AG, based on a joint threshold concept. BCAB determines the availability and constraints of the Baltic Cable. This provides threshold values for transmission capacity at maximum and minimum wind feed-in for different grid states (unavailability of grid elements). Transmission capacity is then determined on the basis of outage planning and the wind forecast.

On 1 October 2025, European market coupling was switched to a quarter-hourly basis. From this date onwards, the capacities used in market coupling can also be offered at a 15-minute resolution. For the DE–SE4 border, this has been the case since 1 October 2025 due to wind forecasts changing at 15-minute intervals.

To ensure the comparability of all values for the year 2025, all capacity values at the DE–SE4 border were therefore taken into account using a uniform 15-minute resolution.

The minimum capacity of the DE–SE4 border relates directly to the transmission capacity of the Baltic Cable interconnector. Uncoordinated trading margins are not taken into account. For the monitoring of the DE-SE4 border, until 12 October 2025, the offered capacity (relative to the receiving side of the bidding zone border) will be compared with the minimum capacity in relation to the maximum power of the Baltic Cable (600 MW on the receiving side).

The focus on the receiving side stems from the fact that the Baltic Cable interconnector is operated with implicit loss procurement and the transmission capacities on the sending side are not exclusively available for cross-border trade, but are additionally utilized by the implicitly procured loss power.

From 12 October 2025 until 31 December 2025 TenneT temporarily used the maximum capacity of the limiting transformer in Herrenwyk with 300 MW as a basis for its calculations. This basis defines the resulting receiving and sending NTC values at the DE–SE4 border, taking into account 70% of the available capacity of the limiting element. A detailed explanation of this topic can be found in Chapter 4.2.4.

4. RESULTS

4.1 Core region

The results of the offered cross-zonal trade margin on the network elements of the CCR Core are depicted for the year 2025 below. First, the methodology for evaluating the results is described.

As described in Art. 16(8)(b) of the EU Electricity Market Regulation for borders with flow-based capacity allocation[28], the offered trade margin per critical network element (CNE) is determined in consideration of the critical contingencies. This method is depicted in Figure 2 and described in more detail below.

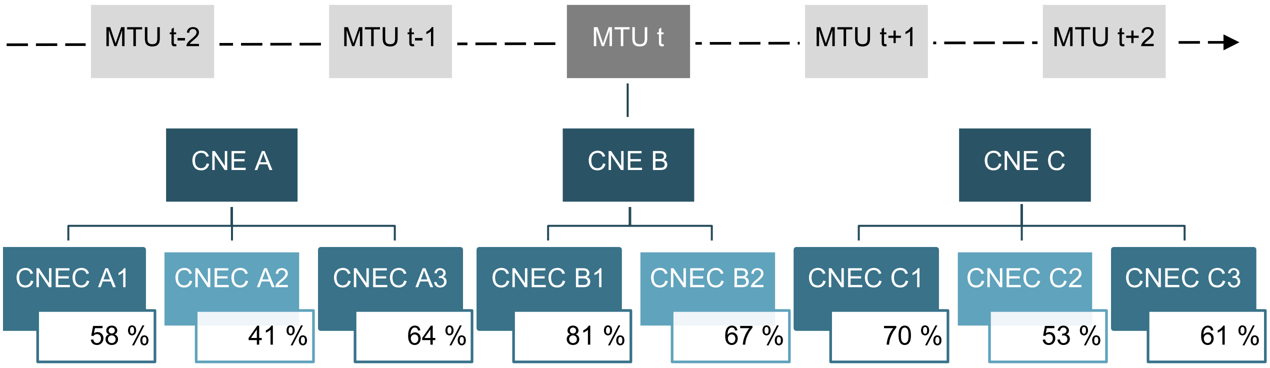


Figure 2: Example of determining the offered trade capacity per critical network element

Figure 2 shows an example of determining the offered trade capacity per critical network element in consideration of the critical contingency combinations as per Art. 16(8) of the EU Electricity Market Regulation. The percentile values correspond to the offered cross-zonal trade margin relative to the available physical capacity (F_{max}) per CNEC. The CNEC shown in light blue defines the minimum offered trade margin of the respective CNE.

A CNE represents a real physical network element. In the operational capacity calculation process, various critical contingencies of other network elements are considered in each MTU per CNE. The combination of CNE and contingency forms a CNEC. The minimum trade margin that can be offered at one CNE is therefore determined by the CNEC that permits the lowest trade margin. Only the minimum offered trade margin per

[28] C.f. Art. 16(8) of the EU Electricity Market Regulation: "*[…] for borders using a flow-based approach, the minimum capacity shall be a margin set in the capacity calculation process as available for flows induced by cross-zonal exchange. The margin shall be 70%* [Note: For Germany, the target values of the action plan apply here until 31/12/2025*] of the capacity respecting operational security limits of internal and cross-zonal critical network elements, taking into account contingencies, as determined in accordance with the capacity allocation and congestion management guideline adopted on the basis of Article 18(5) of Regulation (EC) No 714/2009. […]*"

CNE is depicted below.[29] One value per CNE therefore enters the evaluation for each MTU[30]. This means that the subsequent figures depict only a (critical) subset of the data rather than all data determined for all CNECs. In a consideration of all CNECs, the relative share would still further increase with relatively high offered trade margins. The depiction focuses on the relative trade margin, which is defined as the ratio of offered trade margin to the available physical capacity (F_{max}). Exclusively considering the CNE with the lowest trade margin over the respective region per MTU is inappropriate, as only one value per MTU (of the network element or CNE with the lowest trade margin) would enter the depiction. This can theoretically result in the entire evaluation being determined by a single network element which exhibits continuously low offered trade margins over the time period in question.

CNEs where relatively high trade margins were offered would not be represented in such an analysis. As described above, this form of representation would also be insufficient for depicting the requirements of the EU Electricity Market Regulation since the minimum margins for cross-zonal trade capacity must be complied with at *all* critical network elements. In addition, such an analysis would also fail to achieve the monitoring goal of obtaining an overview of all physical network elements and the associated offered trade margins to allow for any necessary measures to satisfy future minimum requirements at all network elements.

4.1.1 Evaluation of process stability

In 2025 there were 24 spanning or DFP MTU applied due to technical problems in the flow-based capacity calculation. The 24 MTU span the full day of 21/05/2025.

Figure 3 shows the share of MTUs, in which a process failure in the Core capacity calculation occurred. Because of the missing data base for the concerned MTUs in the CCR Core, the listed hours have been excluded from the compliance assessment. For this reason, 8,756 out of 8,760 hours were considered.

---

[29] In this respect, this methodology differs from the approach taken by ACER in their Report on the Result of Monitoring the Margin Available for Cross-Zonal Electricity Trade in the EU.

[30] There is no differentiation here of the flow direction through the respective CNE. In other words, the minimum value is determined based on both flow directions per CNE.

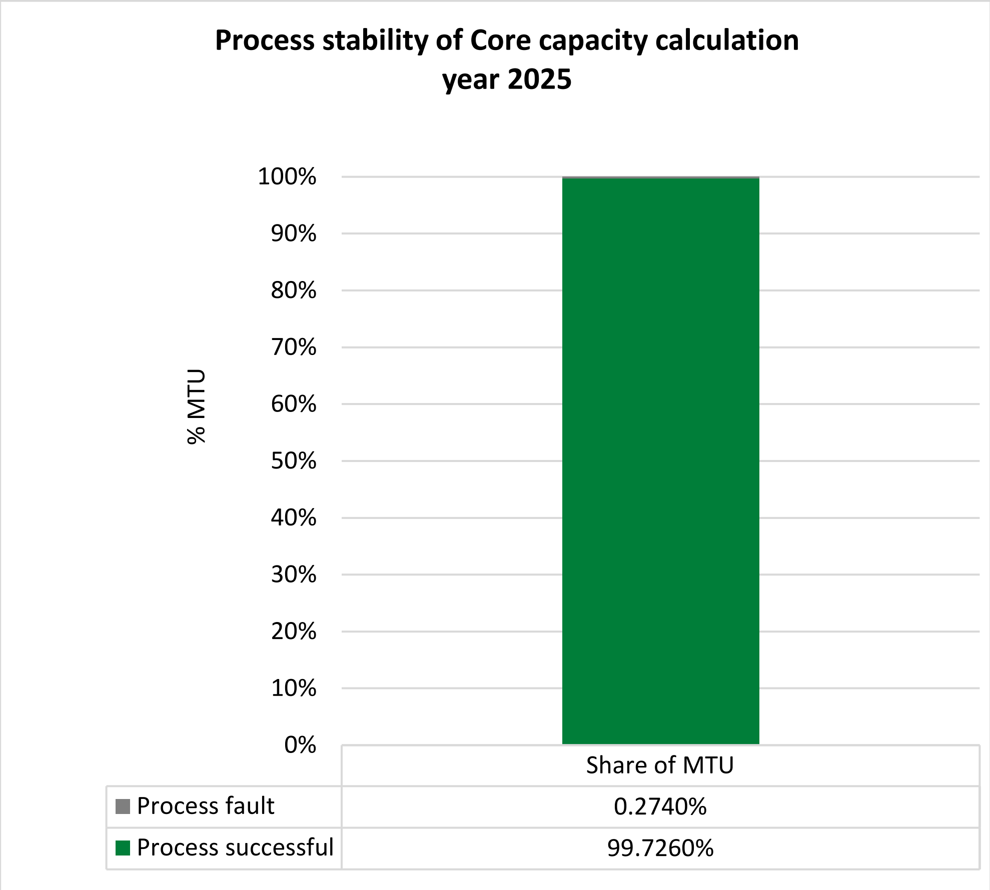


Figure 3: Process stability capacity calculation in the Core region for the year 2025

4.1.2 Evaluation of deviations from the linear trajectory as a result of the validation process

In the following explanation, the results for the four German control areas are presented separately. The results are presented in a bar chart and additionally in a frequency distribution graph for each control area.

The bar charts show values below the current 60.3% minimum value. The categories "<60.3% (overload)" and "<60.3% (fallback)" refer to the validation process described in section 3.1.1. As a result of the validation process IVAs are applied to reduce relative trade margins to ensure operational security. When considering the cases with IVA application, cause and effect must be differentiated.

In the year 2025 IVAs were applied in 131 MTUs on German CNECs. In 81 of in total 131 MTUs the IVAs were necessary, as network elements were potentially overloaded despite considering all available remedial actions. These situations could only be remedied by the applied IVAs, which ensured operational security. In 50 of in total 131 MTUs, IVAs were required due to a DAVinCy fallback. In this situation, the validation could not be carried out in accordance with the pre-defined process and the offered trade margin was reduced as a precaution to ensure operational security. It is important to mention that not all IVA applications result in relative trade margins below the 60.3% minimum value. Only 13 out of 63 MTUs with IVA application fell below the minimum value as a result of an overload (‘IVA (overload)’ category in the following relative trade margin figures). As a result of the DAVinCy fallback with IVA application, the 60.3% minimum value was not met in 50 out of 50 MTUs (category "IVA (fallback)" in the following figures of the relative trade margin). For the cases of a lower deviation from minimum value due to a remaining congestion, Figure 4 shows in which countries the remaining congestion would have potentially occurred geographically or how often a DAVinCy fallback was the cause.

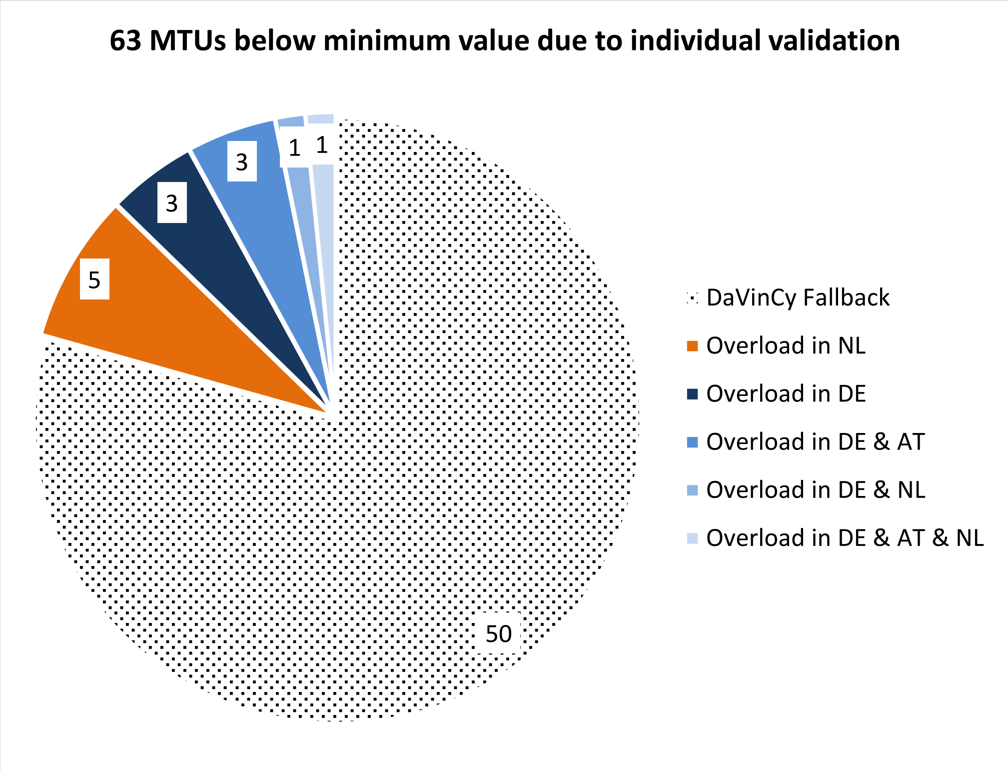


Figure 4: Overview of causes for deviations from the linear trajectory as a result of the validation process

Figure 4 shows that in 9 hours an overload was expected on a German network element and network elements of other countries, which resulted in the reduction of the offered relative trade margin below the minimum value. Irrespective of the geographic location of possible overloads of network elements, the EU Electricity Market Regulation provides for the possibility of deviating below the minimum value to ensure operational security. In this respect, the hours set out above do not constitute a violation of the applicable legal requirements.

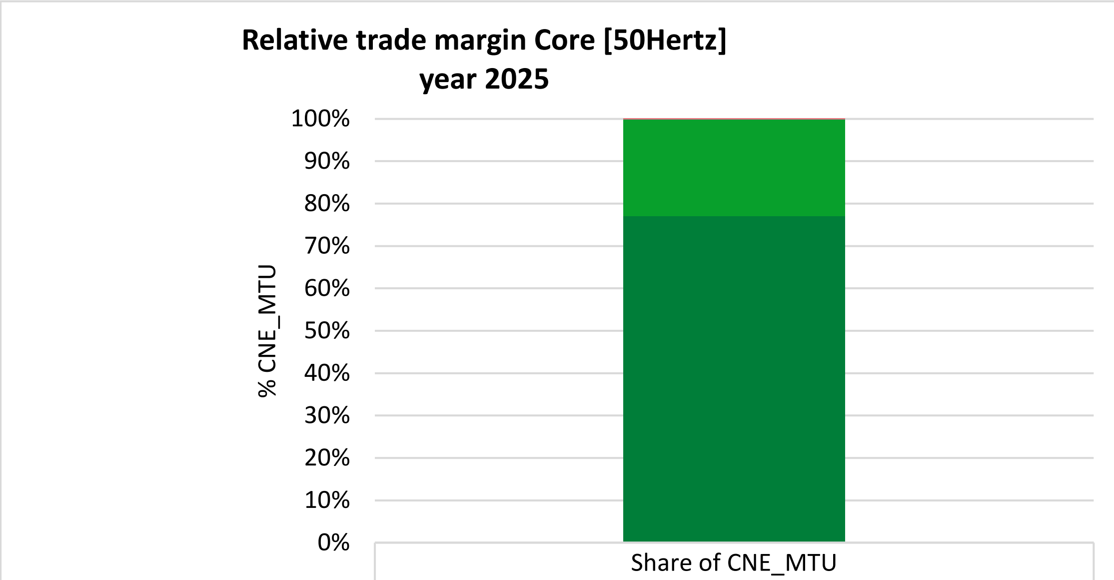
4.1.3 Analysis of deviations from the linear trajectory due to a discrepancy between the German monitoring methodology and the CCR Core capacity calculation

As described in section 3.1.2 , there is a discrepancy between the German monitoring method and the CCR Core capacity calculation, which can lead to a deviation from the linear trend curve according to the German monitoring method. In 2025, such discrepancies occurred in 54 MTUs. The cause is the difference in the determination of the uncoordinated margin, as explained in the methodology chapter in section 3.1.2 . The German TSOs bear no responsibility for these cases, as the Core capacity calculation method does not provide for the possibility of increasing the coordinated margin in accordance with the German monitoring method.

The core capacity calculation process begins two days prior to delivery. One of the input parameters is a forecast (RefProg) of trading within and outside the CCR Core, with the latter being used to calculate the offered uncoordinated trading margin. The total offered capacity comprises the coordinated trading margin within the CCR Core and the uncoordinated trading margin on borders outside the CCR Core. Under the German monitoring method, however, the actual NTC offered is used as the basis for calculating the uncoordinated trading margin. If, during the period between the forecast for the Core capacity calculation, trading at a boundary outside the CCR Core is restricted, for example due to a failure, the uncoordinated trading margin – and thus also the sum of the coordinated and uncoordinated trading margins – may consequently be lower in the German monitoring method than in the Core capacity calculation. Table 10 in the Annex shows the cases that led to a deviation from the linear trend line in the years 2025. Of particular importance here is the column *'main cause of lower uncoordinated margin DE'.* This identifies the boundary outside the CCR Core, the higher forecast from the core capacity calculation and, finally, the NTC actually offered. It thus provides transparency regarding the specific boundaries outside the CCR Core where the core capacity calculation assumed a higher level of trading than was subsequently available in practice as NTC.

4.1.4 Presentation of results per control area

4.1.4.1 50Hertz control area



	Share of CNE_MTU
< 60.3 % without IVA	0.0037%
< 60.3 % IVA (fallback)	0.1520%
< 60.3 % IVA (overload)	0.0018%
[60.3 - 70 %)	22.7267%
>= 70 %	77.1158%

Figure 5: Relative trade margin Core [50Hertz] during the year 2025 (minimum value 60.3%)

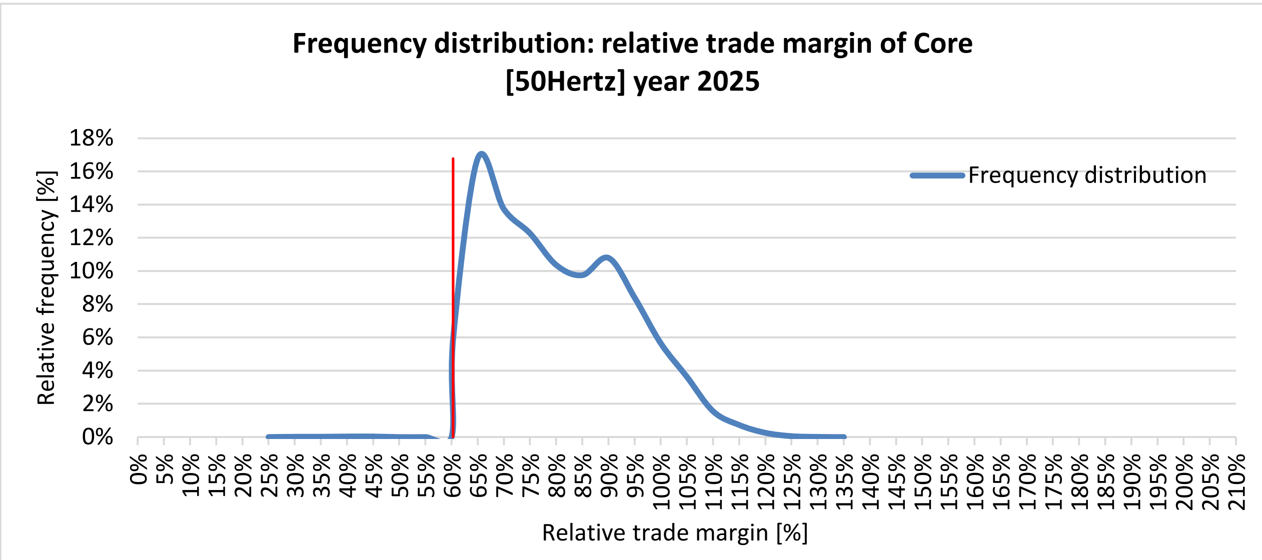


Figure 6: Frequency distribution Core [50Hertz] during the year 2025 (minimum value 60.3%)

Figures 5 and 6 show the distribution of the offered relative trade margin on the CNEs of the 50Hertz control area for the year 2025, based on 327.025values (one value per CNE and MTU) in a total of 8,736 MTUs.

The number of 50Hertz CNEs considered in the Core capacity calculation process varies as a result of switch offs and is thus partly different per day. The small quantity of CNE_MTUs that fall below the minimum values is the result of the validation process or the discrepancy between the German monitoring method and the Core capacity calculation method. Thus, all lower deviations of the minimum capacity are justified either as a measure to ensure system security and thus meet the requirements of Art. 16(3) of the EU Electricity Market Regulation or are due to the different methodologies.

4.1.4.2 Amprion control area

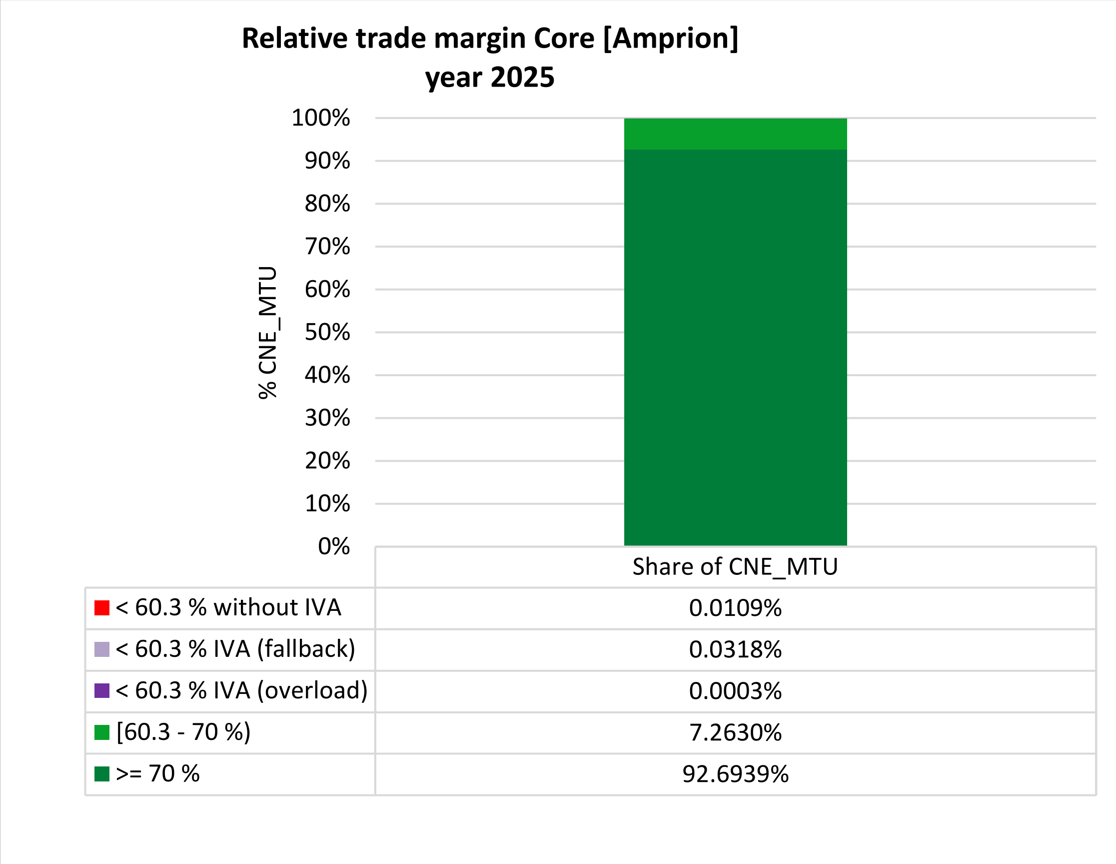


Figure 7: Relative trade margin Core [Amprion] during the year 2025 (minimum value 60.3%)

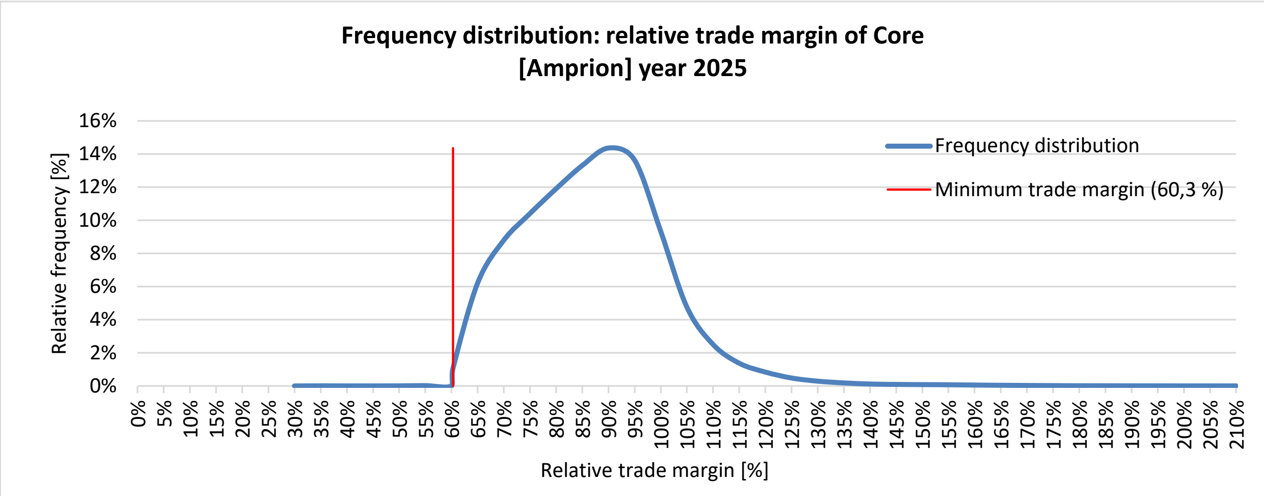


Figure 8: Frequency distribution Core [Amprion] during the year 2025 (minimum value 60.3%)

Figures 7 and 8 show the distribution of the offered relative trade margin on the CNEs of the Amprion control area for the year 2025 based on 1.202.681 values (one value per CNE and MTU) in a total of 8,736 MTUs. The small quantity of CNE_MTUs that fall below the minimum values is the result of the validation process or the discrepancy between the German monitoring method and the Core capacity calculation method. Thus, all lower deviations of the minimum capacity are justified either as a measure to ensure system security and thus meet the requirements of Art. 16(3) of the EU Electricity Market Regulation or are the results of methodological discrepancies.

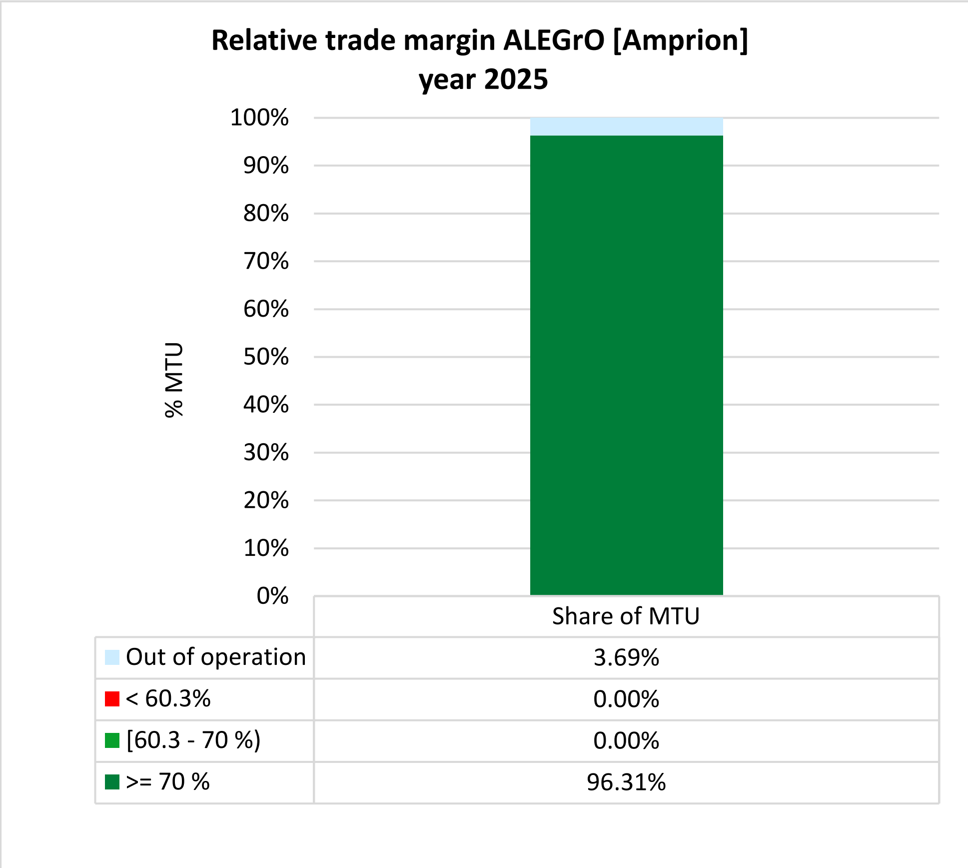


Figure 9: Relative trade margin ALEGrO [Amprion] during the year 2025 (minimum value 60.3%)

Figure 9 shows the transmission capacity provided by Amprion on ALEGrO's German hub 'AL_DE' for cross-zonal power trading in relation to ALEGrO's available thermal capacity.[31] Amprion was able to offer 100% of the available thermal transmission capacity of 1,000 MW to cross-zonal trading in all MTUs for the year 2023. As there are only two values across all (0 MW; 1000 MW), they are not presented as a frequency distribution at this point.

As a DC network element, ALEGrO is not included in the Core capacity calculation as a CNEC and cannot be overloaded. Therefore, compared to the AC network elements of the CCR Core, the differentiation of the category for lower deviations of the minimum value of 60.3% is omitted.

---

[31] A detailed description of the monitoring methodology for ALEGrO can be found in chapters 3.1.2 (special case Core-internal DC interconnectors) and 4.1.2.1 (Amprion control area).

From 12/05/2025, 5 am, until 23/05/2025, 1 pm, on 04/07/2025 and on 05/07/2025, planned outages of ALEGrO took place due to maintenance.

To summarize, Amprion complied with the legal requirements for cross-zonal electricity trading in accordance with Articles 15 and 16 of the Internal Electricity Market Regulation in the Core region at all times in the year 2025.

4.1.4.3 TenneT control area

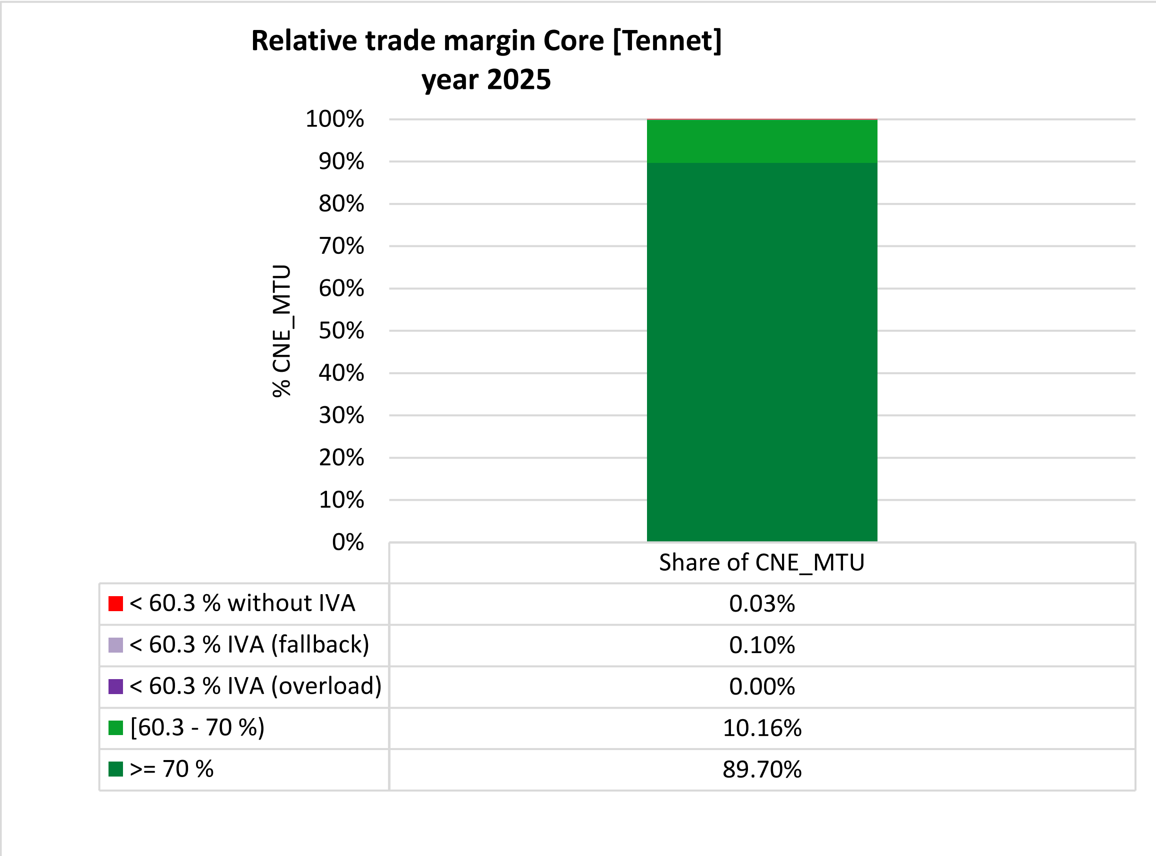


Figure 10: Relative trade margin Core [TenneT] during the year 2025 (minimum value 60.3%)

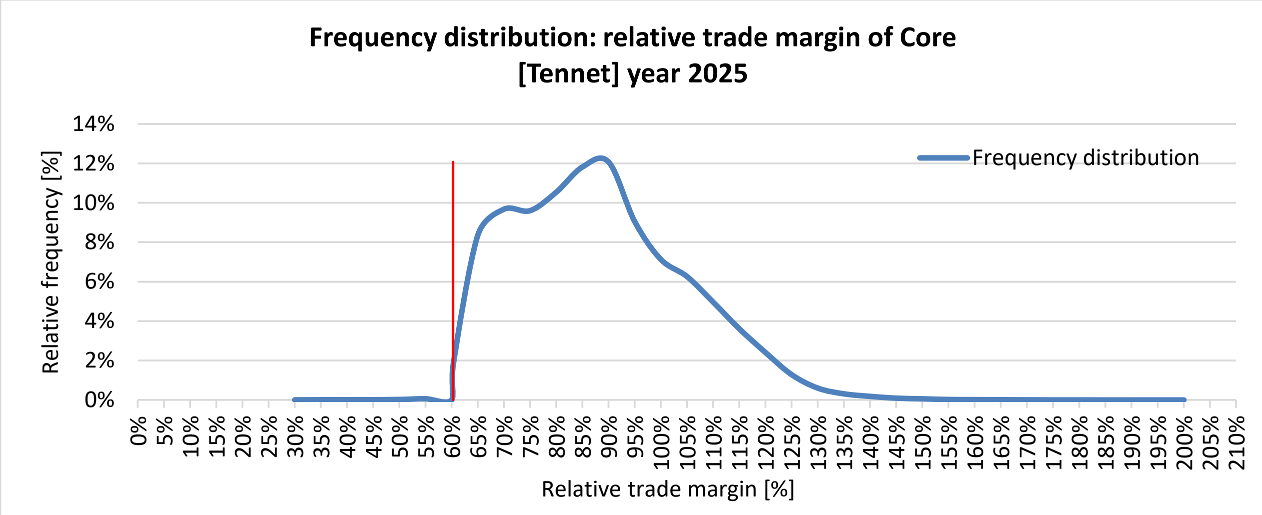
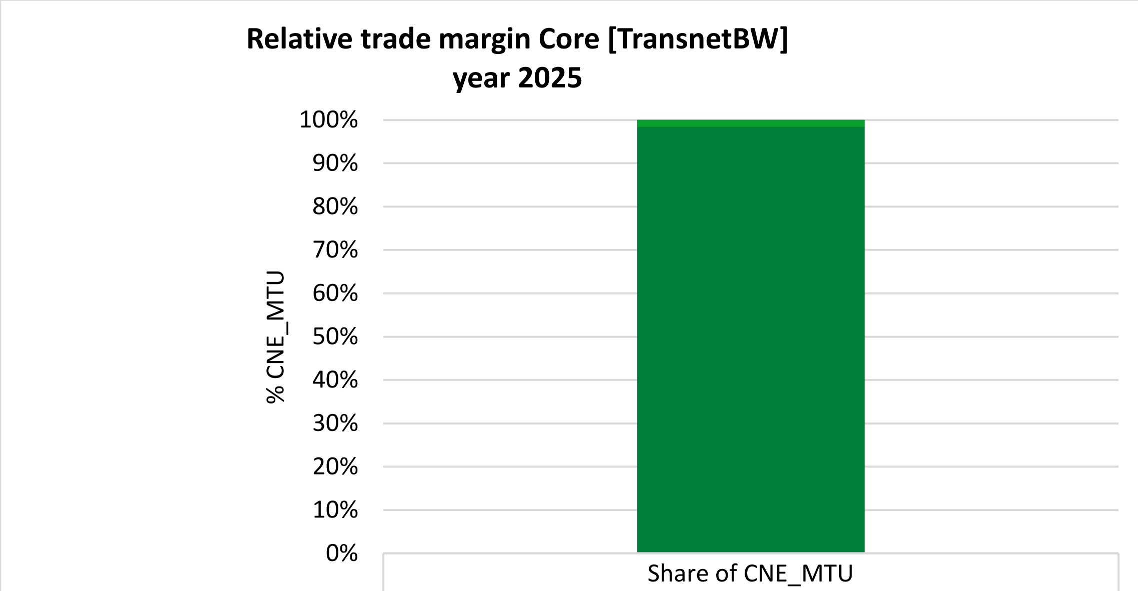


Figure 11: Frequency distribution Core [TenneT] during the year 2025 (minimum value 60.3%)

Figures 10 and 11 show the distribution of the offered relative trading margin across the CNEs in the TenneT control area in 2025 based on 353,750 values (one value per CNE and MTU) across a total of 8,736 MTUs. This means that, on average, 40.5 CNEs from the TenneT control area were taken into account per MTU in the representations. The small number of CNE_MTUs deviating from the linear trend curve is the result of the validation process or the discrepancy between the German monitoring method and the Core capacity calculation method. Thus, all deviations from the linear trend curve are either justified as measures to ensure system security and therefore meet the requirements of Article 16(3) of the Internal Electricity Market Regulation, or are justified by the different methodologies.

4.1.4.4 TransnetBW control area



	Share of CNE_MTU
< 60.3 % without IVA	0,00%
< 60.3 % IVA (fallback)	0,04%
< 60.3 % IVA (overload)	0,00%
[60.3 - 70 %)	1,54%
>= 70 %	98,41%

Figure 12: Relative trade margin Core [TransnetBW] during the year 2025 (minimum value 60.3%)

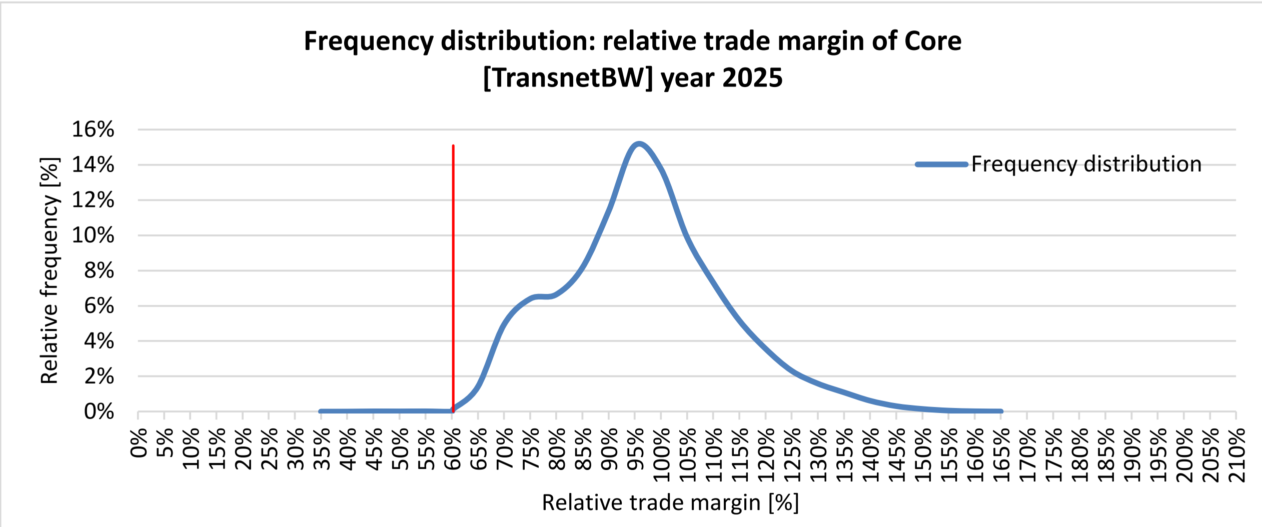


Figure 13: Frequency distribution Core [TransnetBW] during the year 2025 (minimum value 60.3%)

Figures 12 and 13 show the distribution of the offered relative trading margin across the CNEs of the TransnetBW control area in 2025, based on 230,460 values (one value per CNE and MTU) covering a total of 8,751 MTUs.

On average, approximately 26,4 CNEs of the TransnetBW control area were considered per MTU.

The small share of CNE-MTUs in the dataset falling below the minimum values results from the validation process described above.

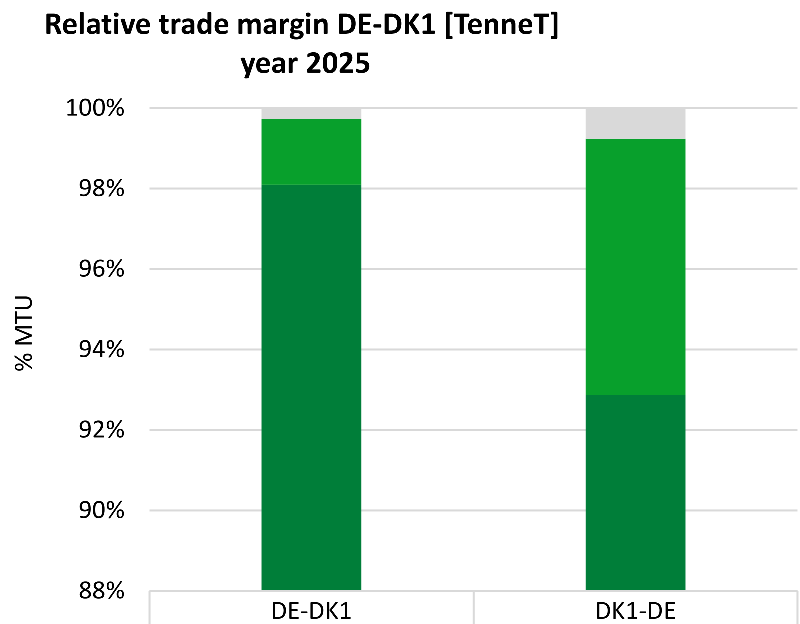
These instances of undershooting the minimum capacity are to be regarded as justified measures to ensure system security.

In summary, TransnetBW complied at all times with the legal requirements for cross-zonal electricity trading pursuant to Articles 15 and 16 of the Electricity Market Regulation in the Core Region over the assessment period from 1 January 2025 to 31 December 2025.

4.2 Hansa Region

4.2.1 NTC border Germany – Denmark 1

Figure 14 shows the distribution of the offered relative trading margin across the CNEs in the TenneT control area, which determined the hourly NTC values for the year 2025 in the respective directions. Both directions comprise 8,760 values (one value per MTU). Due to process disruptions, the capacity calculation yielded no result for 24 MTUs in the DE-DK1 direction and for 67 MTUs in the DK1-DE direction. During these hours, a backup NTC of 2,230 MW was applied for both directions, which was secured by countertrading measures. The backup NTC corresponds to at least the minimum capacity according to TenneT's commitment and cannot be converted to the CNEC-based minimum capacity considered here. Apart from the MTUs with process disruption, the minimum value was maintained in the direction from Denmark 1 to Germany and from Germany to Denmark 1 in all MTUs. Figure 15 shows the frequency distribution of the relative trading margins of the CNE_MTU as a kind of density function.



	DE-DK1	DK1-DE
Process fault	0.27%	0.76%
< 62.3 %	0.00%	0.00%
[62.3- 70 %)	1.63%	6.37%
>= 70 %	98.09%	92.87%

Figure 14: Relative trade margin DE-DK1 [TenneT] year 2025 (minimum value 62.3%)

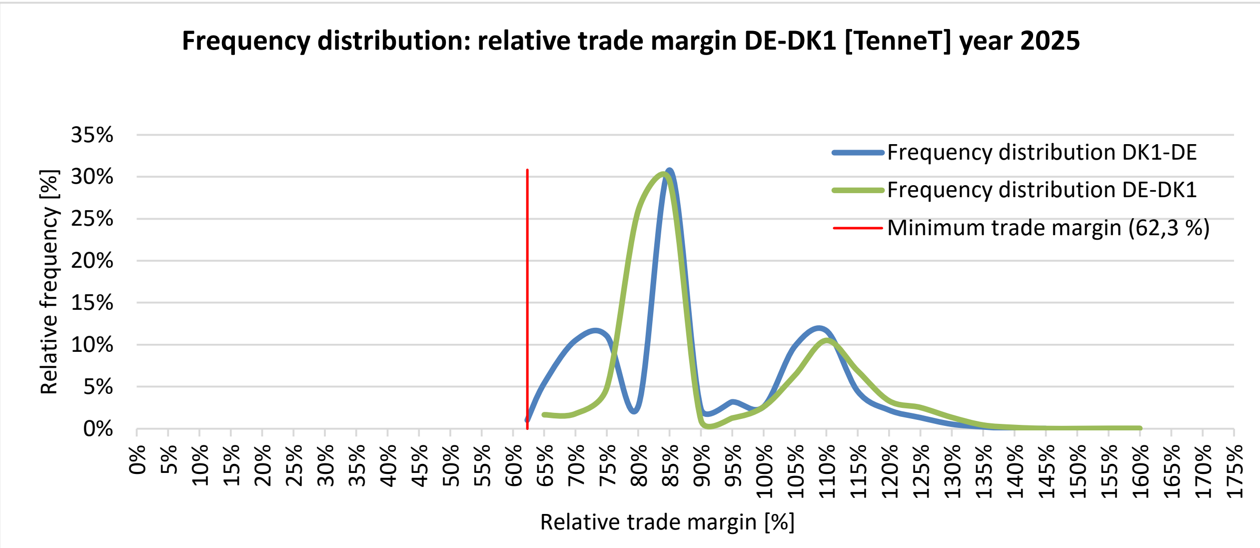


Figure 15: Frequency distribution: relative trade margin DE-DK1 [TenneT] year 2025 (minimum value 62.3%)

4.2.2 NTC border Germany – Denmark 2

For the border DE-DK2, the respectively applicable minimum value was complied with during every MTU of 2025. The minimum value per border and MTU was 70.0% of the F_{max} of the Kontek cable plus 58.3 % of the F_{max} of the Kriegers Flak CGS (after deducting the forecasted DA offshore wind power infeed)[32]. After the KF CGS went into operation, this results in a minimum value of below 70% in total for the border DE-DK2, which has to be determined on quarter-hourly basis. The following figure shows the actually offered trade margin relative to the transmission capacity at the border DE-DK2 in the year 2025[33].

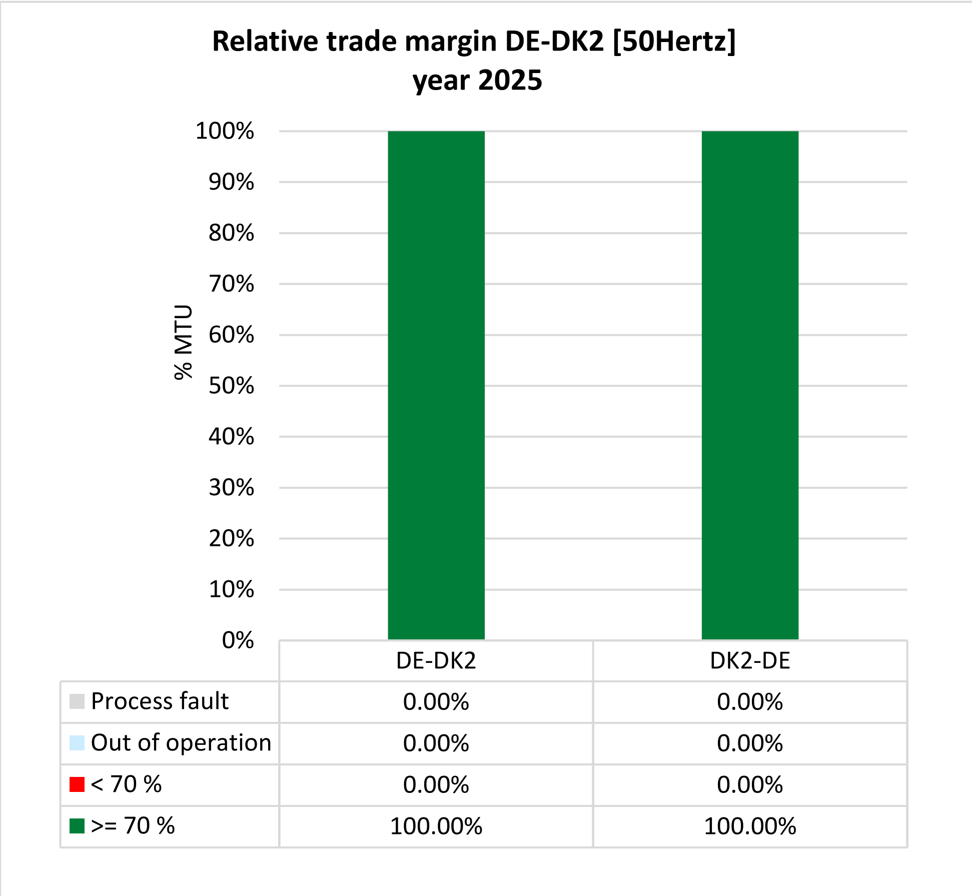


Figure 16: Relative trade margin DE-DK2 [50Hertz] year[34]

Figure 16 shows that the trade margin amounted to at least the target value of the transmission capacity during all quarter-hours considered. Included are 35,040 quarter-hours in the export direction and in the import direction.

---

[32] See also section 3.2.2 NTC border DE-DK2 in the monitoring methodology section.

[33] For the sake of simplicity, figure 16 shows a comparison with 70% and not with the sometimes lower minimum value.

[34] The "Process fault" category refers to hours in which the capacity calculation process could not be carried out in accordance with the process; the "out of service" category refers to hours in which neither of the two interconnectors on the border was in operation.

The table below shows the number of hours in which the availability of the two interconnectors on the DE-DK2 border was restricted in 2025.[35]

Interconnector	maintenance	Partial disturbance / disturbance
Kontek cable	1,292	2,068 / 88
KFCGS[36]	3,504	31,057 / 479

Table 7: Availability of interconnectors on the DE-DK2 border in quarter-hours

The partial restriction on the border is essentially due to:

- Maintenance: Regular maintenance work is carried out annually on both interconnectors, for which they are partially or completely taken out of operation.
- Partial fault / disturbance: The Kontek interconnector was slightly and temporarily disrupted due to technical problems and was therefore wholly or partially out of operation. As a result of a temperature anomaly on one of the cables belonging to the KF CGS, the transmission capacity of the system was slightly reduced throughout the year 2025. In addition, two technical faults led to a complete failure of the KF CGS, one with a multi-day outage caused by issues in the reactive power control.

4.2.3 NTC border Germany – Norway 2

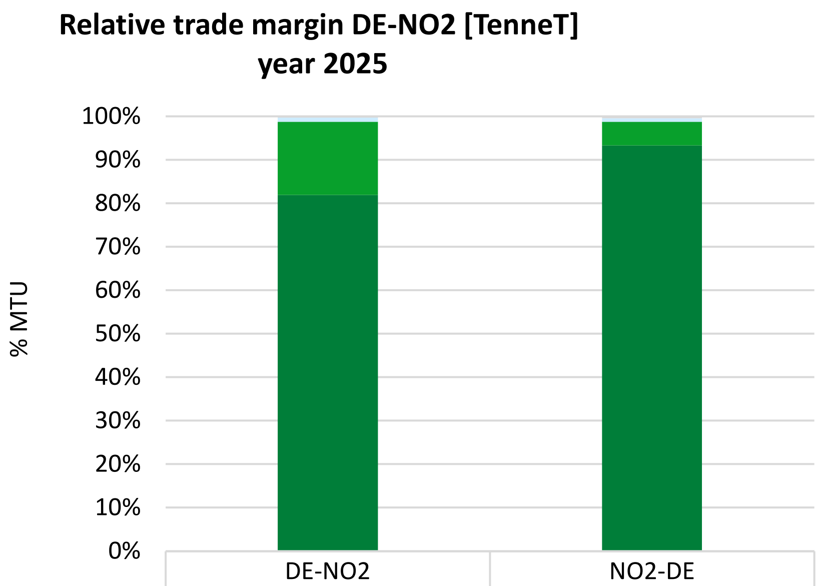
Figure 17 shows the distribution of the offered relative trading margin across the AC and DC CNECs of the TenneT control area, which determined the hourly NTC values for the year 2025 in the respective direction. Both directions comprise 8,760 values (one value per MTU). The minimum value for 2025 of 58.3% in accordance with the linear progression curve of the action plan was consistently maintained on all critical network elements within the TenneT control area. The NTC for the direction DE to NO2 was determined in 3,085 hours by the NordLink cable (DC-CNEC). The NTC in the direction from NO2 to DE was determined

[35] In 5 hours and 28 hours respectively, no cross-border capacity was made available in the export and import direction. Cross-border capacity was available in the opposite direction in each case. During these hours, the Kontek cable was not available and the reduced transmission capacity on the KFCGS due to a partial fault was fully utilised for the transmission of the feed-in from the offshore wind farm. The monitoring requirements as described in section 3.2.2 were therefore met and these hours were therefore assigned to the >=70% class.

[36] In hours with several occurrences, a fault has overwritten the partial fault or maintenance. A partial fault has overwritten maintenance except in the case of the partial fault on KFCGS that lasted the whole year.

by the NordLink cable (DC-CNEC) in 2,715 hours. If the NTC is determined by the DC-CNEC, NTC equals F_{max}. The relative trading margin offered by DC-CNECs is therefore always 100%.

Due to operational disruptions, the capacity calculation yielded no result for 24 MTU in the DE-NO2 direction and for 39 MTU in the NO2-DE direction. During these hours, a backup NTC of 843 MW was applied in the DE-NO2 direction and 817 MW in the NO2-DE direction.



	DE-NO2	NO2-DE
Process fault	0.27%	0.45%
Out of operation	0.98%	0.78%
< 58.3 %	0.00%	0.00%
[58.3%-70%)	16.85%	5.46%
>=70%	81.89%	93.32%

Figure 17: Relative trade margin DE-NO2 [TenneT] year 2025 (minimum value 58.3%)

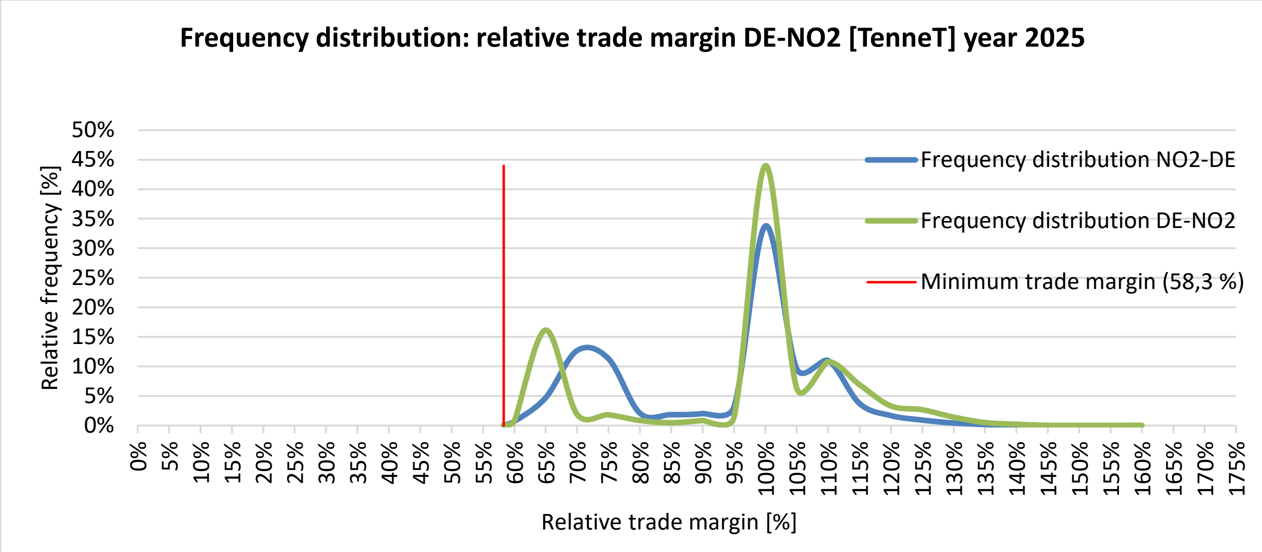


Figure 18: Frequency distribution: relative trade margin DE-NO2 [TenneT] year 2025 (minimum value 58.3%)

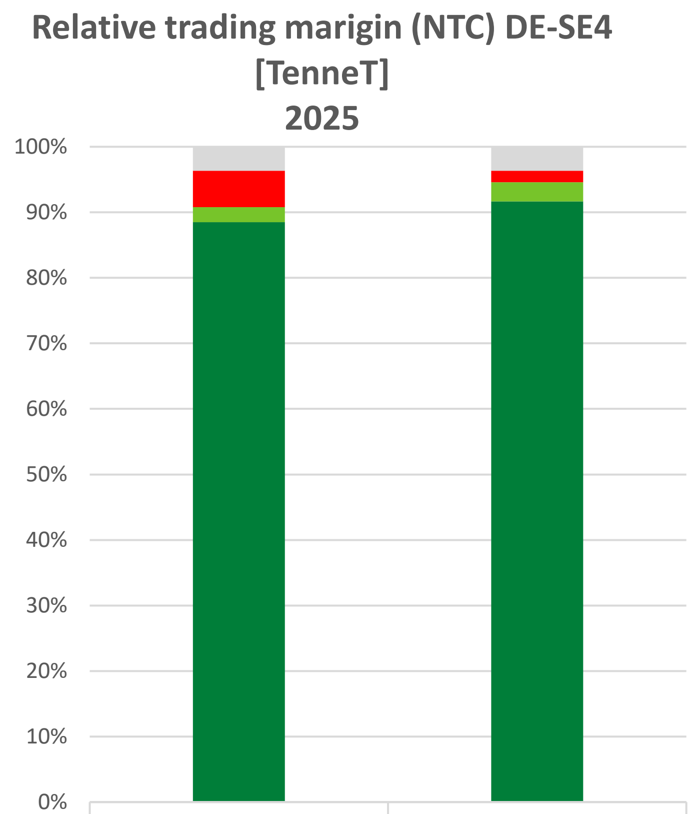
The NordLink cable was out of service for 88 hours in 2025 due to maintenance work or faults. During normal operation, the F_{max} value is 1,400 MW. For 12 hours, the cable was in restricted monopoly operation. For 227 hours, the cable was in monopoly operation with a limit on the F_{max} value (DC-CNEC) of 685 MW. For 250 hours, the F_{max} value was limited to 1,120 MW due to a fault. The hours with a restricted F_{max} value are part of the relative MACZT distributions shown. The following table shows the number of hours with F_{max} restrictions by cause.

Table 1 : *Availability of the NordLink cable at the DE-NO2 border*

Operating status (number of hours)	**F_{max} [MW]**	**Maintenance (scheduled)**	**Repair (planned)**	**Fault (unplanned)**	**Total**
Out of service	0	87	1	0	**88**
Restricted monopoly	548	9	0	3	**12**
Monopoly	685	203	0	24	**227**
Limited operation	1120	52	198	0	**250**
Normal operation	1400	-	-	-	**8183**

4.2.4 NTC border Germany – Sweden 4

In 2025, the Baltic Cable, which forms the DE-SE4 border, was in operation for 33,752 quarter-hours. During the remaining 1,288 quarter-hours, the cable was scheduled to be out of service for maintenance, meaning that no cross-border transmission capacity was available. Figure 19 shows the distribution of the offered trading margin for the DE-SE4 border in 2025.



	DE-SE4	SE4-DE
Out of service	3.68%	3.68%
< 65,2%	5.55%	1.76%
65,2 - 70 %	2.27%	2.88%
>= 70 %	88.50%	91.68%

Figure 19: Relative trading margin DE-SE4 [TenneT] in 2025 (minimum value 65.2%)

The minimum capacity at the DE–SE4 border was provided via the Baltic Cable at 391 MW until 12 October 2025, in accordance with the linear progression curve of the action plan. This value corresponds to 65.2% of the Baltic Cable’s maximum transmission capacity.

Despite insufficient transmission capacity for the N-1 scenario, the required cross-border capacity was according to TenneT maintained thanks to the Emergency Power Control System (EPC) replacing the N-1 criterion in the capacity calculation and renewable infeed curtailment being used as a remedial action. However, since 12 October 2025, due to the SvK's objections to increasingly frequent EPC activation in non-emergency situations it was no longer considered by TenneT as available for the purpose of N-1 protection. Consequently, TenneT temporarily used the 300 MW transformer in Herrenwyk as the limiting element for the N-1 analysis so that this results in a target value of 210 MW here. TenneT has started developing an alternative technical solution to ensure that the calculation approach as valid before 12.10.2025 could be used again by enabling curtailment of sufficient wind capacities, and thereby avoiding limiting the cross-border flow on the DE/LU-SE4 border.

The minimum capacity was maintained in the southbound direction (SE4 to DE) for 33,136 quarter-hours (98.2% of operating hours). In the northbound direction (DE to SE4), the minimum capacity was maintained in accordance with the linear progression curve for 31,806 quarter-hours (94.2% of operating hours).

Until the 12.10.2025 under normal operating conditions (i.e. no outage of physical grid components), there was no deviation from the linear trend curve in 2025, as wind turbines could be curtailed to relieve critically loaded grid elements in the Baltic Cable connection area. From 12.10.2025 onwards the linear trend curve was also respected with the transformer in Herrenwyk representing the limiting element for the N-1 analysis. Due to planned and unplanned unavailability of critical grid elements in the TenneT control area (including the distribution network level), deviations from the linear trend curve were required in 2,266 quarter-hours in accordance with Article 16(3) of the Internal Electricity Market Regulation in order to ensure system security. These deviations from the linear trend curve affected the northbound direction in 1,946 quarter-hours and the southbound direction in 616 quarter-hours. All deviations from the linear trend curve were reported to the BNetzA without delay. Market restrictions occurred in 322 quarter-hours with a deviation from the linear trend curve in the northbound direction. Market restrictions occurred in 393 quarter-hours with a deviation from the linear trend curve in the southbound direction.

Supplement: EPC Issues

The Role of the EPC Function in the Baltic Cable

Emergency Power Control (EPC) is a key protection function of the Baltic Cable HVDC system and many other HVDC systems. Its purpose is to rapidly and controllably reduce power flow through the cable link in order to prevent overloads and maintain system stability in the event of faults or critical operating conditions. The EPC can be triggered manually by the control centres or automatically. Automatic triggering is based on defined grid parameters. Current-based and frequency-based logic is used for this purpose, serving to prevent overloads in the AC grid and to stabilise the power balance. Although triggering the EPC system resolves acute faults within its immediate area of operation, it can cause subsequent problems in adjacent system components. For reasons of system security, frequent or unnecessary triggering must therefore be avoided at all costs.

How TenneT used EPC as an N-1 substitute in capacity calculation

The EPC function, which was originally intended as a remedial measure for N-1 scenarios, was taken into account in capacity calculations as a substitute for the N-1 scenario until October 2025. This meant that, in the event of a critical grid element failure, EPC could ensure system stability through rapid power reduction, thereby allowing higher transmission capacities to be offered.

Why EPC was no longer used for congestion management

In 2025, there was a significant increase in automatic EPC triggers occurring in TenneT's and Schleswig-Holstein Netz AGs grid. According to TenneT, the cause was the specific grid situation on the German side:

- The East Coast Line (380 kV) is not yet in operation, meaning that up to 60% of the Baltic Cable's power must be transmitted via the 110 kV grid of SH Netz.
- Under certain switching conditions and PST settings (Hamburg East), load flows shift towards Krümmel and Lübeck, leading to high loads on 110 kV components.
- The agreed curative curtailment of wind turbines by SHN could no longer be implemented quickly enough, as the magnitude of the overloads and the volatility of their occurrence – exacerbated by the introduction of 15-minute capacity allocation – pushed feed-in management to its limits.
- In these situations, overcurrent relays in the distribution network send signals to the EPC logic, leading to abrupt power reductions.

The consequence:

- On the Swedish side, there were high calls for control reserves, and the Swedish TSO Svenska kraftnät (SvK) informed about the potentially problematic effects of frequent EPC activations from the German side and demanded the immediate cessation of EPC triggers during normal operating conditions without any unplanned outages.
- The EPC function, which was originally intended as a remedial measure, has in fact become a frequent congestion management measure, which is not in line with its intended operation.

Measure: Restriction of transmission capacity

To prevent further EPC triggers and maintain system security, TenneT has temporarily reduced transmission capacity at the DE/LU–SE4 border in both directions from 12 October 2025. The basis for this measure is the 70 per cent criterion of the limiting transformer in Herrenwyk, whose decisive capacity is 210 MW. This has corresponding effects on both the sending and receiving sides of the NTC value at the DE–SE4 border. Instead of considering EPC as an N-1 replacement in the capacity calculation, TenneT assumed the hypothetical outage of the 380 kV Siems–Herrenwyk line as an N-1 scenario. In this case, the entire load flow of the Baltic Cable would shift to the Herrenwyk transformer (rated capacity: 300 MW). Applying the 70 per cent criterion for cross-border electricity trade resulted therefore in a capacity value of 210 MW that must be adhered to for the limiting element (Herrenwyk transformer). In light of these considerations, TenneT temporarily reduced the capacity on the DE/LU-SE4 border accordingly.

TenneT's Outlook

In the short term, TenneT is working on a preventive wind redispatch mechanism triggered directly by TenneT, which should be deployed as soon as possible. This approach bypasses SH Netz's grid management within the process, enabling TenneT to proactively curtail wind generation before critical load flows occur. In accordance with the applicable German action plan, the measure restores grid capacity to at least the minimum required level under an N-0 assessment, consistent with the operational approach applied prior to 12 October 2025. This, in turn, enables an increase in cross-border capacities at the DE–SE4 borders without triggering the EPC in the base case.

In the short term, TenneT is working on a preventive wind redispatch mechanism triggered directly by TenneT which should be deployed as soon as possible. This approach bypasses SH Netz's grid management within the process, enabling TenneT to proactively curtail wind generation before critical load flows occur. In accordance with the applicable German action plan, the measure restores grid capacity to at least the minimum required level under an N-0 assessment, consistent with the operational approach applied prior to 12 October 2025. This, in turn, enables an increase in cross-border capacities at the DE–SE4 borders without triggering the EPC in the base case.

The deviations from the linear curve are attributable to the specific connection configuration of the Baltic Cable. Cross-bidding-zone transmission capacity is heavily dependent on the availability of the interconnectors of TenneT's transmission grid and the downstream distribution grid of Schleswig-Holstein Netz AG (SHN). The following figure shows the grid topology of the high-voltage and extra-high-voltage grids at the German grid connection point of the Baltic Cable.

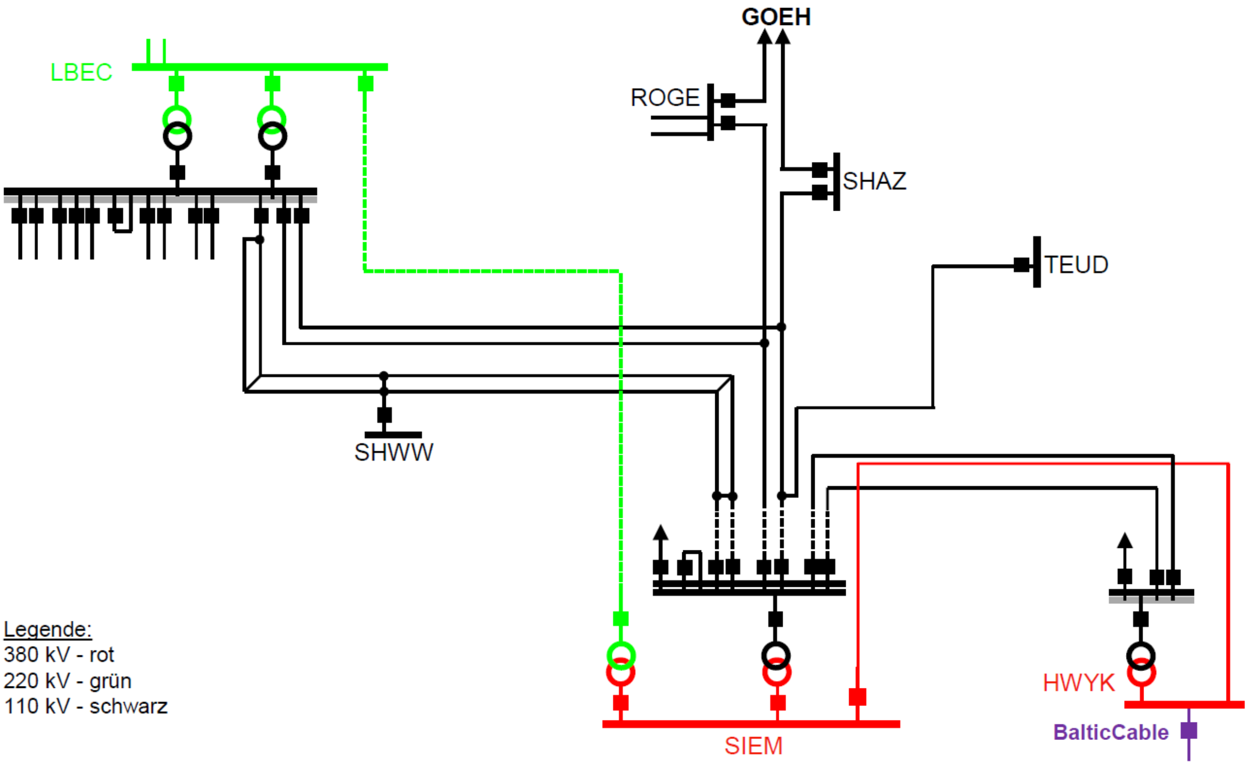


Figure 20: Grid topology of the high-voltage and extra-high-voltage grid at the German grid connection point of the Baltic Cable (Source: SHN).

On the German side, the Baltic Cable is connected to TenneT's transmission grid at the Lübeck-Herrenwyk (HWYK) grid connection point. From there, a 380 kV overhead line operated by TenneT runs to the Lübeck-Siems (SIEM) substation. The Lübeck-Siems substation is connected to the Lübeck (LBEC) substation via a 220 kV underground cable operated by TenneT, with a capacity of approximately 350 MW. The underground cable alone is not sufficient to transport the power from the Baltic Cable (600 MW on the receiving side). To transmit the power from the Baltic Cable, the SHN distribution network must therefore also be utilised, which additionally connects the Lübeck-Herrenwyk and Lübeck-Siems substations to the Lübeck substation. At the DE-SE4 border, there is an unusual connection configuration for the Baltic Cable in that its power can only be transmitted cumulatively with the aid of both the transmission grid and the distribution grid.

Furthermore, the Lübeck substation is connected to the rest of TenneT's transmission network via just two parallel 220 kV overhead lines to the Hamburg-Nord substation (not shown in the figure), which are also necessary for the export of power from the Baltic Cable. Each line has a capacity of approximately 460 MW. Only both lines together can ensure the export of power from the Baltic Cable. Should relevant elements of the transmission grid or the downstream distribution network become unavailable due to necessary shutdowns or failures, this may therefore lead to restrictions on available transmission capacity, which may require the cross-bidding-zone transmission capacity to be limited to below the minimum capacity, provided that effective relief measures are not technically available. Against this background, TenneT has developed a corresponding capacity calculation process in collaboration with SHN, which gives the Baltic Cable priority over other feed-ins in congestion situations and takes into account technically available relief measures at distribution network level. This provides for a reduction in cross-bidding-zone transmission capacity in each direction in the event of the (combined) unavailability of individual lines, depending on the forecast wind feed-in. The thresholds for the respective shutdown scenarios are set out in the Baltic Cable operating manual.

At the times of deviation from the linear curve, which occurred prior to 12 October 2025, grid elements belonging to TenneT or SHN that are essential for providing the minimum capacity were unavailable due to faults or work on the grid.

The deviations from the linear trend curve are justified by the fact that they were necessary to ensure system security in TenneT's control area and at the SHN distribution network level, as neither TenneT nor SHN had effective load shedding measures technically available at those times. The deviations from the linear trend curve at the DE-SE4 border in 2025 are justified on grounds of system security in accordance with Article 16(3) of the Internal Electricity Market Regulation, as effective load shedding measures were not technically available.

TenneT anticipates that the connection situation of the Baltic Cable will improve significantly with the commissioning of the so-called East Coast Line. The resulting improved connection of the Baltic Cable to the high-voltage grid will enable virtually complete independence from the grid situation in the downstream network. Based on the current project status, completion of the East Coast Line with a connection in Siems is expected in Q3 2028.

LIST OF ABBREVIATIONS

AC	Alternating current
ACER	European Union Agency for the Cooperation of Energy Regulators
APG	Austrian Power Grid
BCAB	Baltic Cable AB (German TSO without control area responsibility)
BMWK	Federal Ministry for Economic Affairs and Climate Action
BNetzA	Federal Network Agency
CCR	Capacity Calculation Region
CEPS	Czech TSO
CGM	Common Grid Model
CNE	Critical Network Element
CNEC	Critical Network Element in combination with the respective Critical Contingency Combination
cNTC	Coordinated NTC method
Core FBMC	Flow-based market coupling in the Capacity Calculation Region Core
CWE	Central Western European region
CZ	Czechia
DA	Day-ahead
DA CCM	Day-Ahead Capacity Calculation Methodology
DAVinCy	Day-ahead Validation of Capacity
DC	Direct current
DE	Germany
DE-DK1	Border Germany – Denmark 1
DE-DK2	Border Germany – Denmark 2
DE-NO2	Border Germany – Norway 2
DE-SE4	Border Germany – Sweden 4
DFP	Default flow-based parameter
DK	Denmark
D2CF CGM	Two Day-ahead Congestion Forecast Common Grid Model
EEA	European Economic Area
EU	European Union
F_{max}	Physical capacity
F_{ref}	Reference flow
KF CGS	Kriegers Flak Combined Grid Solution
HVDC	High Voltage Direct Current
ID	Intraday
IVA	Individual Validation Adjustment
JAO	Joint Allocation Office
LTA	Long Term Allocation

MinRAM	Minimum Remaining Available Margin
MTU	Market Time Unit
NO	Norway
NTC	Net transfer capacity
PL	Poland
PSDF	Phase Shift Distribution Factor
PTDF	Power Transfer Distribution Factors
RAM	Remaining Available Margin
RefProg	Reference programme for day-ahead capacity calculation
SE	Sweden
SHN	Schleswig-Holstein Netz AG (DSO in Schleswig-Holstein)
SOGL	System Operation Guideline
TSO	Transmission system operator
cTSO	Transmission system operator with control area responsibility
TTN	TenneT TSO B.V. (Dutch TSO)

LIST OF FIGURES

LIST OF TABLES

ANNEX

Tabelle 2: Wesentliche Ursache für die Diskrepanz zwischen deutscher Monitoring-Methode und der Core Kapazitätsberechnung

Zeit (UTC)	Kritisches Netzelement	ÜNB	MNCC DE	MNCC Core	Wesentliche Ursache (Grenze / NTC / RefProg)	Relative Handelsmarge [%]
2025-02-26 23:00	[D8-D8] Lauchstaedt - Vieselbach 471 [DIR]	50Hertz Transmission	238,66	242	DK2-DE / 39 / 588	60,29
2025-02-26 23:00	[D8-D8] Lauchstaedt - Vieselbach 472 [DIR]	50Hertz Transmission	238,66	242	DK2-DE / 39 / 588	60,29
2025-02-27 00:00	[D8-D8] Lauchstaedt - Vieselbach 471 [DIR]	50Hertz Transmission	237,89	258	DK2-DE / 39 / 588	59,62
2025-02-27 00:00	[D8-D8] Lauchstaedt - Vieselbach 472 [DIR]	50Hertz Transmission	237,89	258	DK2-DE / 39 / 588	59,62
2025-02-27 01:00	[D8-D8] Lauchstaedt - Vieselbach 471 [DIR]	50Hertz Transmission	238,41	258	DK2-DE / 39 / 588	59,64
2025-02-27 01:00	[D8-D8] Lauchstaedt - Vieselbach 472 [DIR]	50Hertz Transmission	238,41	258	DK2-DE / 39 / 588	59,64
2025-02-27 02:00	[D8-D8] Lauchstaedt - Vieselbach 471 [DIR]	50Hertz Transmission	235,58	260	DK2-DE / 39 / 588	59,45
2025-02-27 02:00	[D8-D8] Lauchstaedt - Vieselbach 472 [DIR]	50Hertz Transmission	235,58	260	DK2-DE / 39 / 588	59,45

2025-02-27 03:00	[D8-D8] Lauchstaedt - Vieselbach 471 [DIR]	50Hertz Transmission	236,26	271	DK2-DE / 39 / 588	59,03
2025-02-27 03:00	[D8-D8] Lauchstaedt - Vieselbach 472 [DIR]	50Hertz Transmission	236,26	271	DK2-DE / 39 / 588	59,03
2025-02-27 04:00	[D8-D8] Lauchstaedt - Vieselbach 471 [DIR]	50Hertz Transmission	234,75	255	DK2-DE / 39 / 588	59,61
2025-02-27 04:00	[D8-D8] Lauchstaedt - Vieselbach 472 [DIR]	50Hertz Transmission	234,75	255	DK2-DE / 39 / 588	59,61
2025-03-09 12:00	[D2-D2] Diele - Doerpen West [DIR]	TenneT TSO	216,97	271	NL_NO2 / 0 / -310 DK1_NL / 0 / -624	56,94
2025-03-09 12:00	[D2-D2] Diele - Rhede [DIR]	TenneT TSO	217,07	271	NL_NO2 / 0 / -310 DK1_NL / 0 / -624	57,01
2025-03-09 12:00	[D2-D2] Doerpen West - Y Rhede [OPP]	TenneT TSO	217,07	271	NL_NO2 / 0 / -310 DK1_NL / 0 / -624	57,01
2025-03-28 11:00	[D2-D2] Diele - Rhede [DIR]	TenneT TSO	131,66	287	NL_NO2 / 0 / -426 DK1_NL / 0 / -444	50,4
2025-03-28 11:00	[D2-D2] Doerpen West - Y Rhede [OPP]	TenneT TSO	131,66	287	NL_NO2 / 0 / -426 DK1_NL / 0 / -444	50,4
2025-03-28 12:00	[D2-D2] Diele - Rhede [DIR]	TenneT TSO	129,93	286	NL_NO2 / 0 / -590 DK1_NL / 0 / -291	50,29

2025-03-28 12:00	[D2-D2] Doerpen West - Y Rhede [OPP]	TenneT TSO	129,93	286	NL_NO2 / 0 / -590 DK1_NL / 0 / -291	50,35
2025-03-28 13:00	[D2-D2] Doerpen West - Y Rhede [OPP]	TenneT TSO	121,79	199	NL_NO2 / 0 / -346 DK1_NL / 0 / -263	55,43
2025-03-28 13:00	[D2-D2] Diele - Rhede [DIR]	TenneT TSO	121,79	199	NL_NO2 / 0 / -346 DK1_NL / 0 / -263	55,49
2025-04-03 05:00	[D2-D2] Doerpen West - Y Rhede [OPP]	TenneT TSO	132,46	212	DK1_NL / 0 / -676	55,27
2025-04-03 05:00	[D2-D2] Diele - Rhede [DIR]	TenneT TSO	132,46	212	DK1_NL / 0 / -676	55,34
2025-04-03 05:00	[D7-D2] Meppen - Doerpen West [OPP] [D2]	TenneT TSO	63,7	109	DK1_NL / 0 / -676	58,25
2025-04-03 05:00	[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	TenneT TSO	67,06	112	DK1_NL / 0 / -676	58,27
2025-04-03 05:00	[D2-D2] Doerpen West - Y Niederlangen [DIR]	TenneT TSO	73,26	103	DK1_NL / 0 / -676	58,97
2025-04-03 05:00	[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	Amprion	67,06	112	DK1_NL / 0 / -676	59,68
2025-04-03 05:00	[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	Amprion	63,7	109	DK1_NL / 0 / -676	60,17

2025-04-09 05:00	[D2-D2] Diele - Rhede [DIR]	TenneT TSO	188,41	209	DK1_NL / -428 / -700	59,18
2025-04-09 05:00	[D2-D2] Doerpen West - Y Rhede [OPP]	TenneT TSO	188,41	209	DK1_NL / -428 / -700	59,18
2025-04-09 08:00	[D2-D2] Diele - Rhede [DIR]	TenneT TSO	95,01	179	DK1_NL / 0 / -696	55,05
2025-04-09 08:00	[D2-D2] Doerpen West - Y Rhede [OPP]	TenneT TSO	95,01	179	DK1_NL / 0 / -696	55,05
2025-04-09 09:00	[D2-D2] Diele - Rhede [DIR]	TenneT TSO	157,51	188	DK1_NL / -273 / -700	58,53
2025-04-09 09:00	[D2-D2] Doerpen West - Y Rhede [OPP]	TenneT TSO	157,51	188	DK1_NL / -273 / -700	58,6
2025-04-10 12:00	[D2-D2] Diele - Rhede [DIR]	TenneT TSO	155,72	182	DK1_NL / -321 / -700	58,81
2025-04-10 12:00	[D2-D2] Doerpen West - Y Rhede [OPP]	TenneT TSO	155,72	182	DK1_NL / -321 / -700	58,81
2025-04-10 13:00	[D2-D2] Diele - Rhede [DIR]	TenneT TSO	165,45	181	DK1_NL / -364 / -697	59,51
2025-04-10 13:00	[D2-D2] Doerpen West - Y Rhede [OPP]	TenneT TSO	165,45	181	DK1_NL / -364 / -697	59,51
2025-04-10 14:00	[D2-D2] Diele - Rhede [DIR]	TenneT TSO	98,24	168	DK1_NL / 0 / -621	55,98
2025-04-10 14:00	[D2-D2] Doerpen West - Y Rhede [OPP]	TenneT TSO	98,24	168	DK1_NL / 0 / -621	55,98

2025-04-10 15:00	[D2-D2] Diele - Rhede [DIR]	TenneT TSO	97,39	177	DK1_NL / 0 / -700	55,33
2025-04-10 15:00	[D2-D2] Doerpen West - Y Rhede [OPP]	TenneT TSO	97,39	177	DK1_NL / 0 / -700	55,33
2025-08-03 07:00	[D2-D2] Doerpen West - Y Niederlangen [DIR]	TenneT TSO	156,8	215	NL_NO2 / 0 / -452 DK1_NL / 0 / -684	57,35
2025-08-03 07:00	[D2-D2] Diele - Doerpen West [DIR]	TenneT TSO	233,06	272	NL_NO2 / 0 / -452 DK1_NL / 0 / -684	57,92
2025-08-03 07:00	[D2-D2] Doerpen West - Y Rhede [OPP]	TenneT TSO	233,12	272	NL_NO2 / 0 / -452 DK1_NL / 0 / -684	57,92
2025-08-03 07:00	[D2-D2] Diele - Rhede [DIR]	TenneT TSO	233,12	272	NL_NO2 / 0 / -452 DK1_NL / 0 / -684	57,99
2025-08-03 07:00	[D7-D2] Meppen - Doerpen West [OPP] [D2]	TenneT TSO	166,71	213	NL_NO2 / 0 / -452 DK1_NL / 0 / -684	58,03
2025-08-03 07:00	[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	TenneT TSO	170,99	215	NL_NO2 / 0 / -452 DK1_NL / 0 / -684	58,16
2025-08-03 07:00	[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	Amprion	166,71	213	NL_NO2 / 0 / -452 DK1_NL / 0 / -684	58,37

2025-08-03 07:00	[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	Amprion	170,99	215	NL_NO2 / 0 / -452 DK1_NL / 0 / -684	58,57
2025-08-03 07:00	[D2-D7] Doerpen West - Meppen EMSLD WB [OPP] [D7]	Amprion	190,06	214	NL_NO2 / 0 / -452 DK1_NL / 0 / -684	59,37
2025-08-03 07:00	[D7-D7] Hanekenfaehr - Meppen BACCUM W [OPP]	Amprion	159,52	205	NL_NO2 / 0 / -452 DK1_NL / 0 / -684	58,21
2025-08-03 07:00	[D7-D7] Hanekenfaehr - Meppen BACCUM O [OPP]	Amprion	162,01	205	NL_NO2 / 0 / -452 DK1_NL / 0 / -684	58,36
2025-08-03 07:00	[D7-D7] Meppen - Hanekenfaehr BACCUM O [DIR]	Amprion	116,88	136	NL_NO2 / 0 / -452 DK1_NL / 0 / -684	59,53
2025-08-03 07:00	[D7-D7] Meppen - Hanekenfaehr BACCUM W [OPP]	Amprion	123,97	141	NL_NO2 / 0 / -452 DK1_NL / 0 / -684	59,56
2025-08-04 18:00	[D7-D7] Mittelbexbach - Uchtelfangen BLIES S [OPP]	Amprion	745,09	772	IT_SI / 0 / 447	59,17
2025-08-04 18:00	[D7-D7] Mittelbexbach - Uchtelfangen BLIES N [OPP]	Amprion	745,42	773	IT_SI / 0 / 447	59,18
2025-08-07 19:00	[D7-D7] Ensdorf - Uchtelfangen TAUBNT N [DIR]	Amprion	712,61	720	IT_SI / 0 / 169	60,11

2025-08-07 19:00	[FR-D7] Vigy - Ensdorf VIGY2 S [DIR] [D7]	Amprion	736,07	744	IT_SI / 0 / 169	60,04
2025-08-07 19:00	[FR-D7] Vigy - Ensdorf VIGY1 N [DIR] [D7]	Amprion	712,61	720	IT_SI / 0 / 169	60,06
2025-09-12 00:00	[D7-D2] Meppen - Doerpen West [OPP] [D2]	TenneT TSO	79,3	88	NL_NO2 / 0 / -620 0 / -16	59,98
2025-09-12 00:00	[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	TenneT TSO	83,32	92	NL_NO2 / 0 / -620 0 / -16	59,99
2025-09-12 00:00	[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	Amprion	79,3	88	NL_NO2 / 0 / -620 0 / -16	60,08
2025-09-12 00:00	[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	Amprion	83,32	92	NL_NO2 / 0 / -620 0 / -16	60,08
2025-09-12 00:00	[D7-D7] Meppen - Hanekenfaehr BACCUM W [OPP]	Amprion	68,92	82	NL_NO2 / 0 / -620 0 / -16	59,87
2025-09-12 00:00	[D7-D7] Meppen - Hanekenfaehr BACCUM O [DIR]	Amprion	72,04	85	NL_NO2 / 0 / -620 0 / -16	59,9
2025-09-12 01:00	[D7-D2] Meppen - Doerpen West [OPP] [D2]	TenneT TSO	80,23	114	NL_NO2 / 0 / -620 DK1_NL / 0 / -232	58,74

2025-09-12 01:00	[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	TenneT TSO	84,27	118	NL_NO2 / 0 / -620 DK1_NL / 0 / -232	58,74
2025-09-12 01:00	[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	Amprion	84,27	118	NL_NO2 / 0 / -620 DK1_NL / 0 / -232	59,07
2025-09-12 01:00	[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	Amprion	80,23	114	NL_NO2 / 0 / -620 DK1_NL / 0 / -232	59,11
2025-09-12 01:00	[D2-D2] Doerpen West - Y Niederlangen [DIR]	TenneT TSO	91,62	102	NL_NO2 / 0 / -620 DK1_NL / 0 / -232	59,95
2025-09-12 01:00	[D7-D7] Meppen - Hanekenfaehr BACCUM O [DIR]	Amprion	72,85	110	NL_NO2 / 0 / -620 DK1_NL / 0 / -232	58,8
2025-09-12 01:00	[D7-D7] Meppen - Hanekenfaehr BACCUM W [OPP]	Amprion	69,77	107	NL_NO2 / 0 / -620 DK1_NL / 0 / -232	58,81
2025-09-12 01:00	[D7-D7] Hanekenfaehr - Meppen BACCUM O [OPP]	Amprion	139,73	143	NL_NO2 / 0 / -620 DK1_NL / 0 / -232	60,27
2025-09-12 01:00	[D7-D7] Hanekenfaehr - Meppen BACCUM W [OPP]	Amprion	136,71	140	NL_NO2 / 0 / -620 DK1_NL / 0 / -232	60,28
2025-09-12 02:00	[D2-D2] Doerpen West - Y Niederlangen [DIR]	TenneT TSO	157	235	NL_NO2 / 0 / -620 DK1_NL / 0 / -406	56,4

2025-09-12 02:00	[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	TenneT TSO	85,12	138	NL_NO2 / 0 / -620 DK1_NL / 0 / -406	57,7
2025-09-12 02:00	[D7-D2] Meppen - Doerpen West [OPP] [D2]	TenneT TSO	81,03	133	NL_NO2 / 0 / -620 DK1_NL / 0 / -406	57,75
2025-09-12 02:00	[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	Amprion	81,03	133	NL_NO2 / 0 / -620 DK1_NL / 0 / -406	58,34
2025-09-12 02:00	[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	Amprion	85,12	138	NL_NO2 / 0 / -620 DK1_NL / 0 / -406	58,34
2025-09-12 02:00	[D2-D7] Doerpen West - Meppen EMSLD WB [OPP] [D7]	Amprion	244,5	260	NL_NO2 / 0 / -620 DK1_NL / 0 / -406	59,8
2025-09-12 02:00	[D7-D7] Meppen - Hanekenfaehr BACCUM W [OPP]	Amprion	70,53	126	NL_NO2 / 0 / -620 DK1_NL / 0 / -406	58,06
2025-09-12 02:00	[D7-D7] Meppen - Hanekenfaehr BACCUM O [DIR]	Amprion	73,69	128	NL_NO2 / 0 / -620 DK1_NL / 0 / -406	58,1
2025-09-12 02:00	[D7-D7] Hanekenfaehr - Meppen BACCUM O [OPP]	Amprion	232,75	254	NL_NO2 / 0 / -620 DK1_NL / 0 / -406	59,49
2025-09-12 02:00	[D7-D7] Hanekenfaehr - Meppen BACCUM W [OPP]	Amprion	230,19	252	NL_NO2 / 0 / -620 DK1_NL / 0 / -406	59,52

2025-09-12 03:00	[D2-D2] Doerpen West - Y Niederlangen [DIR]	TenneT TSO	158,69	252	NL_NO2 / 0 / -620 DK1_NL / 0 / -501	55,68
2025-09-12 03:00	[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	TenneT TSO	86,15	149	NL_NO2 / 0 / -620 DK1_NL / 0 / -501	57,24
2025-09-12 03:00	[D7-D2] Meppen - Doerpen West [OPP] [D2]	TenneT TSO	82	144	NL_NO2 / 0 / -620 DK1_NL / 0 / -501	57,28
2025-09-12 03:00	[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	Amprion	86,15	149	NL_NO2 / 0 / -620 DK1_NL / 0 / -501	57,9
2025-09-12 03:00	[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	Amprion	82	144	NL_NO2 / 0 / -620 DK1_NL / 0 / -501	57,94
2025-09-12 03:00	[D2-D7] Doerpen West - Meppen EMSLD WB [OPP] [D7]	Amprion	246,08	277	NL_NO2 / 0 / -620 DK1_NL / 0 / -501	59,19
2025-09-12 03:00	[D7-D7] Meppen - Hanekenfaehr BACCUM W [OPP]	Amprion	71,63	136	NL_NO2 / 0 / -620 DK1_NL / 0 / -501	57,62
2025-09-12 03:00	[D7-D7] Meppen - Hanekenfaehr BACCUM O [DIR]	Amprion	74,72	138	NL_NO2 / 0 / -620 DK1_NL / 0 / -501	57,68
2025-09-12 03:00	[D7-D7] Hanekenfaehr - Meppen BACCUM O [OPP]	Amprion	234,3	271	NL_NO2 / 0 / -620 DK1_NL / 0 / -501	58,83

2025-09-12 03:00	[D7-D7] Hanekenfaehr - Meppen BACCUM W [OPP]	Amprion	231,78	269	NL_NO2 / 0 / -620 DK1_NL / 0 / -501	58,84
2025-09-12 04:00	[D2-D2] Doerpen West - Y Rhede [OPP]	TenneT TSO	170,53	254	NL_NO2 / 0 / -600 DK1_NL / 0 / -577	55,08
2025-09-12 04:00	[D2-D2] Diele - Doerpen West [DIR]	TenneT TSO	170,39	254	NL_NO2 / 0 / -600 DK1_NL / 0 / -577	55,6
2025-09-12 04:00	[D2-D2] Doerpen West - Y Niederlangen [DIR]	TenneT TSO	158,28	250	NL_NO2 / 0 / -600 DK1_NL / 0 / -577	55,64
2025-09-12 04:00	[D2-D2] Diele - Rhede [DIR]	TenneT TSO	170,53	254	NL_NO2 / 0 / -600 DK1_NL / 0 / -577	56,13
2025-09-12 04:00	[D7-D2] Meppen - Doerpen West [OPP] [D2]	TenneT TSO	182,79	258	NL_NO2 / 0 / -600 DK1_NL / 0 / -577	56,55
2025-09-12 04:00	[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	TenneT TSO	191,07	263	NL_NO2 / 0 / -600 DK1_NL / 0 / -577	56,72
2025-09-12 04:00	[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	Amprion	182,79	258	NL_NO2 / 0 / -600 DK1_NL / 0 / -577	57,37
2025-09-12 04:00	[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	Amprion	191,07	263	NL_NO2 / 0 / -600 DK1_NL / 0 / -577	57,54

2025-09-12 04:00	[D2-D7] Doerpen West - Meppen EMSLD WB [OPP] [D7]	Amprion	240,58	282	NL_NO2 / 0 / -600 DK1_NL / 0 / -577	58,76
2025-09-12 04:00	[D7-D7] Meppen - Hanekenfaehr BACCUM W [OPP]	Amprion	71,57	140	NL_NO2 / 0 / -600 DK1_NL / 0 / -577	57,33
2025-09-12 04:00	[D7-D7] Meppen - Hanekenfaehr BACCUM O [DIR]	Amprion	74,71	142	NL_NO2 / 0 / -600 DK1_NL / 0 / -577	57,41
2025-09-12 04:00	[D7-D7] Hanekenfaehr - Meppen BACCUM O [OPP]	Amprion	229	276	NL_NO2 / 0 / -600 DK1_NL / 0 / -577	58,33
2025-09-12 04:00	[D7-D7] Hanekenfaehr - Meppen BACCUM W [OPP]	Amprion	226,74	273	NL_NO2 / 0 / -600 DK1_NL / 0 / -577	58,37
2025-09-18 01:00	[D7-D2] Meppen - Doerpen West [OPP] [D2]	TenneT TSO	119,3	130	DK1_NL / 0 / -571	59,88
2025-09-18 01:00	[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	TenneT TSO	122,3	132	DK1_NL / 0 / -571	59,88
2025-09-18 01:00	[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	Amprion	119,3	130	DK1_NL / 0 / -571	60
2025-09-18 01:00	[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	Amprion	122,3	132	DK1_NL / 0 / -571	60,04

2025-09-18 01:00	[D7-D7] Meppen - Hanekenfaehr BACCUM O [DIR]	Amprion	111,3	125	DK1_NL / 0 / -571	59,77
2025-09-18 01:00	[D7-D7] Meppen - Hanekenfaehr BACCUM W [OPP]	Amprion	112,28	125	DK1_NL / 0 / -571	59,88
2025-09-18 02:00	[D7-D2] Meppen - Doerpen West [OPP] [D2]	TenneT TSO	120,13	142	DK1_NL / 0 / -684	59,28
2025-09-18 02:00	[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	TenneT TSO	123,03	144	DK1_NL / 0 / -684	59,33
2025-09-18 02:00	[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	Amprion	123,03	144	DK1_NL / 0 / -684	59,58
2025-09-18 02:00	[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	Amprion	120,13	142	DK1_NL / 0 / -684	59,59
2025-09-18 02:00	[D2-D2] Doerpen West - Y Niederlangen [DIR]	TenneT TSO	134,92	139	DK1_NL / 0 / -684	60,23
2025-09-18 02:00	[D7-D7] Meppen - Hanekenfaehr BACCUM O [DIR]	Amprion	111,43	136	DK1_NL / 0 / -684	59,33
2025-09-18 02:00	[D7-D7] Meppen - Hanekenfaehr BACCUM W [OPP]	Amprion	112,33	136	DK1_NL / 0 / -684	59,39
2025-09-18 08:00	[D7-D2] Meppen - Doerpen West [OPP] [D2]	TenneT TSO	119,14	139	DK1_NL / 0 / -684	59,38

2025-09-18 08:00	[D2-D2] Doerpen West - Y Niederlangen [DIR]	TenneT TSO	124,3	144	DK1_NL / 0 / -684	59,44
2025-09-18 08:00	[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	Amprion	96,21	117	DK1_NL / 0 / -684	59,59
2025-09-18 08:00	[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	Amprion	119,14	139	DK1_NL / 0 / -684	59,63
2025-09-18 08:00	[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	TenneT TSO	128,94	144	DK1_NL / 0 / -684	59,64
2025-09-18 08:00	[D2-D7] Doerpen West - Meppen EMSLD WB [OPP] [D7]	Amprion	163,89	171	DK1_NL / 0 / -684	60,14
2025-09-18 08:00	[D7-D7] Hanekenfaehr - Meppen BACCUM W [OPP]	Amprion	119,14	139	DK1_NL / 0 / -684	59,46
2025-09-18 08:00	[D7-D7] Hanekenfaehr - Meppen BACCUM O [OPP]	Amprion	115,56	136	DK1_NL / 0 / -684	59,48
2025-09-18 08:00	[D7-D7] Meppen - Hanekenfaehr BACCUM O [DIR]	Amprion	101,82	109	DK1_NL / 0 / -684	60,1
2025-09-18 09:00	[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	Amprion	95,19	118	DK1_NL / 0 / -684	59,51

2025-09-18 09:00	[D2-D2] Doerpen West - Y Niederlangen [DIR]	TenneT TSO	123,75	141	DK1_NL / 0 / -684	59,52
2025-09-18 09:00	[D7-D2] Meppen - Doerpen West [OPP] [D2]	TenneT TSO	118,41	135	DK1_NL / 0 / -684	59,55
2025-09-18 09:00	[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	TenneT TSO	103,91	120	DK1_NL / 0 / -684	59,63
2025-09-18 09:00	[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	Amprion	118,41	135	DK1_NL / 0 / -684	59,72
2025-09-18 09:00	[D2-D7] Doerpen West - Meppen EMSLD WB [OPP] [D7]	Amprion	163,02	167	DK1_NL / 0 / -684	60,27
2025-09-18 09:00	[D7-D7] Hanekenfaehr - Meppen BACCUM W [OPP]	Amprion	118,41	135	DK1_NL / 0 / -684	59,59
2025-09-18 09:00	[D7-D7] Hanekenfaehr - Meppen BACCUM O [OPP]	Amprion	114,92	133	DK1_NL / 0 / -684	59,62
2025-09-18 09:00	[D7-D7] Meppen - Hanekenfaehr BACCUM O [DIR]	Amprion	101,31	107	DK1_NL / 0 / -684	60,2
2025-09-18 20:00	[D7-D2] Meppen - Doerpen West [OPP] [D2]	TenneT TSO	141,77	151	DK1_NL / 0 / -684	59,96
2025-09-18 20:00	[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	TenneT TSO	144,91	153	DK1_NL / 0 / -684	59,96

2025-09-18 20:00	[D2-D2] Doerpen West - Y Niederlangen [DIR]	TenneT TSO	141,92	149	DK1_NL / 0 / -684	60,07
2025-09-18 20:00	[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	Amprion	141,77	151	DK1_NL / 0 / -684	60,07
2025-09-18 20:00	[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	Amprion	144,91	153	DK1_NL / 0 / -684	60,1
2025-09-18 20:00	[D7-D7] Meppen - Hanekenfaehr BACCUM O [DIR]	Amprion	129,65	144	DK1_NL / 0 / -684	59,78
2025-09-18 20:00	[D7-D7] Meppen - Hanekenfaehr BACCUM W [OPP]	Amprion	129,91	144	DK1_NL / 0 / -684	59,81
2025-09-18 21:00	[D7-D2] Meppen - Doerpen West [OPP] [D2]	TenneT TSO	139,68	150	DK1_NL / 0 / -684	59,9
2025-09-18 21:00	[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	TenneT TSO	142,79	153	DK1_NL / 0 / -684	59,9
2025-09-18 21:00	[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	Amprion	139,68	150	DK1_NL / 0 / -684	59,93
2025-09-18 21:00	[D2-D2] Doerpen West - Y Niederlangen [DIR]	TenneT TSO	139,78	148	DK1_NL / 0 / -684	60,01
2025-09-18 21:00	[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	Amprion	142,79	153	DK1_NL / 0 / -684	60,02

2025-09-18 21:00	[D7-D7] Meppen - Hanekenfaehr BACCUM W [OPP]	Amprion	127,88	143	DK1_NL / 0 / -684	59,74
2025-09-18 21:00	[D7-D7] Meppen - Hanekenfaehr BACCUM O [DIR]	Amprion	127,67	143	DK1_NL / 0 / -684	59,76
2025-09-19 05:00	[D2-D2] Doerpen West - Y Niederlangen [DIR]	TenneT TSO	151,63	175	DE_NO2 / 0 / -400	59,26
2025-09-19 05:00	[D7-D2] Meppen - Doerpen West [OPP] [D2]	TenneT TSO	150,41	172	DE_NO2 / 0 / -400	59,3
2025-09-19 05:00	[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	TenneT TSO	153,12	174	DE_NO2 / 0 / -400	59,33
2025-09-19 05:00	[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	Amprion	150,41	172	DE_NO2 / 0 / -400	59,47
2025-09-19 05:00	[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	Amprion	153,12	174	DE_NO2 / 0 / -400	59,59
2025-09-19 05:00	[D7-D7] Meppen - Hanekenfaehr BACCUM O [DIR]	Amprion	139,82	162	DE_NO2 / 0 / -400	59,41
2025-09-19 05:00	[D7-D7] Meppen - Hanekenfaehr BACCUM W [OPP]	Amprion	140,15	162	DE_NO2 / 0 / -400	59,42

2025-09-19 15:00	[D7-D2] Meppen - Doerpen West [OPP] [D2]	TenneT TSO	115,84	143	DK1_NL / 0 / -684 DE_NO2 / 0 / -400	58,92
2025-09-19 15:00	[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	TenneT TSO	118,14	145	DK1_NL / 0 / -684 DE_NO2 / 0 / -400	58,94
2025-09-19 15:00	[D2-D2] Doerpen West - Y Niederlangen [DIR]	TenneT TSO	121,4	143	DK1_NL / 0 / -684 DE_NO2 / 0 / -400	59,86
2025-09-19 15:00	[D7-D7] Meppen - Hanekenfaehr BACCUM O [DIR]	Amprion	109,78	137	DK1_NL / 0 / -684 DE_NO2 / 0 / -400	59,56
2025-09-19 15:00	[D7-D7] Meppen - Hanekenfaehr BACCUM W [OPP]	Amprion	108,81	136	DK1_NL / 0 / -684 DE_NO2 / 0 / -400	60,29
2025-10-18 00:00	[D2-D2] Doerpen West - Y Niederlangen [DIR]	TenneT TSO	271,19	276	NL_NO2 / 0 / -620	60,24
2025-10-18 00:00	[D7-D2] Meppen - Doerpen West [OPP] [D2]	TenneT TSO	269,26	272	NL_NO2 / 0 / -620	60,29
2025-10-18 01:00	[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	TenneT TSO	264,47	285	NL_NO2 / 0 / -620	59,66
2025-10-18 01:00	[D7-D2] Meppen - Doerpen West [OPP] [D2]	TenneT TSO	261,3	283	NL_NO2 / 0 / -620	59,75
2025-10-18 20:00	[D2-D2] Doerpen West - Y Niederlangen [DIR]	TenneT TSO	171,49	250	NL_NO2 / 0 / -620 DK1_NL / 0 / -461	56,64

2025-10-18 20:00	[D7-D2] Meppen - Doerpen West [OPP] [D2]	TenneT TSO	181,47	257	NL_NO2 / 0 / -620 DK1_NL / 0 / -461	56,74
2025-10-18 20:00	[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	TenneT TSO	184,51	259	NL_NO2 / 0 / -620 DK1_NL / 0 / -461	56,79
2025-10-18 20:00	[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	Amprion	181,47	257	NL_NO2 / 0 / -620 DK1_NL / 0 / -461	57,4
2025-10-18 20:00	[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	Amprion	184,51	259	NL_NO2 / 0 / -620 DK1_NL / 0 / -461	57,4
2025-10-18 20:00	[D2-D7] Doerpen West - Meppen EMSLD WB [OPP] [D7]	Amprion	171,96	245	NL_NO2 / 0 / -620 DK1_NL / 0 / -461	57,54
2025-10-18 20:00	[D7-D7] Hanekenfaehr - Meppen BACCUM O [OPP]	Amprion	165,29	238	NL_NO2 / 0 / -620 DK1_NL / 0 / -461	57,39
2025-10-18 20:00	[D7-D7] Hanekenfaehr - Meppen BACCUM W [OPP]	Amprion	164,3	237	NL_NO2 / 0 / -620 DK1_NL / 0 / -461	57,4
2025-10-18 20:00	[D7-D7] Meppen - Hanekenfaehr BACCUM O [DIR]	Amprion	117,41	126	NL_NO2 / 0 / -620 DK1_NL / 0 / -461	60,07
2025-10-18 20:00	[D7-D7] Meppen - Hanekenfaehr BACCUM W [OPP]	Amprion	118,83	126	NL_NO2 / 0 / -620 DK1_NL / 0 / -461	60,15

2025-10-18 21:00	[D2-D2] Doerpen West - Y Niederlangen [DIR]	TenneT TSO	240,08	258	NL_NO2 / 0 / -620	59,55
2025-10-18 21:00	[D7-D2] Meppen - Doerpen West [OPP] [D2]	TenneT TSO	250,88	268	NL_NO2 / 0 / -620	59,64
2025-10-18 21:00	[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	TenneT TSO	265,91	281	NL_NO2 / 0 / -620	59,69
2025-10-18 21:00	[D2-D7] Doerpen West - Meppen EMSLD WB [OPP] [D7]	Amprion	249,43	265	NL_NO2 / 0 / -620	59,76
2025-10-18 21:00	[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	Amprion	262,78	279	NL_NO2 / 0 / -620	59,77
2025-10-18 21:00	[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	Amprion	265,91	281	NL_NO2 / 0 / -620	59,78
2025-10-18 21:00	[D7-D7] Hanekenfaehr - Meppen BACCUM W [OPP]	Amprion	240,08	257	NL_NO2 / 0 / -620	59,71
2025-10-18 21:00	[D7-D7] Hanekenfaehr - Meppen BACCUM O [OPP]	Amprion	241,09	258	NL_NO2 / 0 / -620	59,72
2025-10-19 00:00	[D2-D2] Doerpen West - Y Niederlangen [DIR]	TenneT TSO	208,48	211	NL_NO2 / 0 / -620	60,29
2025-10-19 03:00	[D2-D2] Doerpen West - Y Niederlangen [DIR]	TenneT TSO	205,94	212	NL_NO2 / 0 / -620	60,22

2025-10-19 03:00	[D7-D7] Hanekenfaehr - Meppen BACCUM W [OPP]	Amprion	205,31	209	NL_NO2 / 0 / -620	60,29
2025-11-12 05:00	[D7-D7] Rheinau - Hoheneck KUGELB W [DIR]	Amprion	364,24	373	CH_FR / 2385 / 2640	60,05
2025-11-12 05:00	[D7-D7] Buerstadt - Rheinau KURPFA W [DIR]	Amprion	376,87	382	CH_FR / 2385 / 2640	60,24
2025-11-15 06:00	[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	Amprion	158,71	164	NL_NO2 / 0 / -620	60,17
2025-12-01 17:00	[D7-D2] Meppen - Doerpen West [OPP] [D2]	TenneT TSO	161	175	NL_NO2 / 0 / -620	59,75
2025-12-01 17:00	[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	TenneT TSO	163,73	177	NL_NO2 / 0 / -620	59,83
2025-12-01 17:00	[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	Amprion	161	175	NL_NO2 / 0 / -620	59,86
2025-12-01 17:00	[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	Amprion	163,73	177	NL_NO2 / 0 / -620	59,89
2025-12-01 17:00	[D2-D2] Doerpen West - Y Niederlangen [DIR]	TenneT TSO	158,25	170	NL_NO2 / 0 / -620	59,9
2025-12-01 17:00	[D7-D7] Meppen - Hanekenfaehr BACCUM W [OPP]	Amprion	149,79	167	NL_NO2 / 0 / -620	59,73

2025-12-01 17:00	[D7-D7] Meppen - Hanekenfaehr BACCUM O [DIR]	Amprion	149,87	166	NL_NO2 / 0 / -620	59,78
2025-12-01 18:00	[D7-D2] Meppen - Doerpen West [OPP] [D2]	TenneT TSO	161,16	182	NL_NO2 / 0 / -620	59,41
2025-12-01 18:00	[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	TenneT TSO	163,96	184	NL_NO2 / 0 / -620	59,45
2025-12-01 18:00	[D2-D2] Doerpen West - Y Niederlangen [DIR]	TenneT TSO	158,32	177	NL_NO2 / 0 / -620	59,52
2025-12-01 18:00	[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	Amprion	161,16	182	NL_NO2 / 0 / -620	59,55
2025-12-01 18:00	[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	Amprion	163,96	184	NL_NO2 / 0 / -620	59,62
2025-12-01 18:00	[D7-D7] Meppen - Hanekenfaehr BACCUM O [DIR]	Amprion	149,95	173	NL_NO2 / 0 / -620	59,46
2025-12-01 18:00	[D7-D7] Meppen - Hanekenfaehr BACCUM W [OPP]	Amprion	149,98	174	NL_NO2 / 0 / -620	59,46
2025-12-01 19:00	[D7-D2] Meppen - Doerpen West [OPP] [D2]	TenneT TSO	156,29	185	NL_NO2 / 0 / -620	59,03
2025-12-01 19:00	[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	TenneT TSO	159,07	187	NL_NO2 / 0 / -620	59,07

2025-12-01 19:00	[D2-D2] Doerpen West - Y Niederlangen [DIR]	TenneT TSO	153,61	179	NL_NO2 / 0 / -620	59,19
2025-12-01 19:00	[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	Amprion	156,29	185	NL_NO2 / 0 / -620	59,27
2025-12-01 19:00	[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	Amprion	159,07	187	NL_NO2 / 0 / -620	59,27
2025-12-01 19:00	[D7-D7] Meppen - Hanekenfaehr BACCUM O [DIR]	Amprion	145,33	176	NL_NO2 / 0 / -620	59,2
2025-12-01 19:00	[D7-D7] Meppen - Hanekenfaehr BACCUM W [OPP]	Amprion	145,37	176	NL_NO2 / 0 / -620	59,2
2025-12-01 20:00	[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	TenneT TSO	160,11	182	NL_NO2 / 0 / -620	59,36
2025-12-01 20:00	[D7-D2] Meppen - Doerpen West [OPP] [D2]	TenneT TSO	157,4	180	NL_NO2 / 0 / -620	59,37
2025-12-01 20:00	[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	Amprion	157,4	180	NL_NO2 / 0 / -620	59,52
2025-12-01 20:00	[D2-D2] Doerpen West - Y Niederlangen [DIR]	TenneT TSO	154,82	174	NL_NO2 / 0 / -620	59,54
2025-12-01 20:00	[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	Amprion	160,11	182	NL_NO2 / 0 / -620	59,55

2025-12-01 20:00	[D7-D7] Meppen - Hanekenfaehr BACCUM O [DIR]	Amprion	147,63	171	NL_NO2 / 0 / -620	59,49
2025-12-01 20:00	[D7-D7] Meppen - Hanekenfaehr BACCUM W [OPP]	Amprion	147,69	171	NL_NO2 / 0 / -620	59,49
2025-12-02 09:00	[D2-D2] Doerpen West - Y Niederlangen [DIR]	TenneT TSO	159,06	187	NL_NO2 / 0 / -620	59,06
2025-12-02 09:00	[D7-D2] Meppen - Doerpen West [OPP] [D2]	TenneT TSO	167,21	192	NL_NO2 / 0 / -620	59,22
2025-12-02 09:00	[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	TenneT TSO	171,44	194	NL_NO2 / 0 / -620	59,33
2025-12-02 09:00	[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	Amprion	167,21	192	NL_NO2 / 0 / -620	59,43
2025-12-02 09:00	[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	Amprion	171,44	194	NL_NO2 / 0 / -620	59,52
2025-12-02 09:00	[D7-D7] Meppen - Hanekenfaehr BACCUM W [OPP]	Amprion	153,65	184	NL_NO2 / 0 / -620	59,17
2025-12-02 09:00	[D7-D7] Meppen - Hanekenfaehr BACCUM O [DIR]	Amprion	154,61	183	NL_NO2 / 0 / -620	59,27
2025-12-02 10:00	[D2-D2] Doerpen West - Y Niederlangen [DIR]	TenneT TSO	163,57	173	NL_NO2 / 0 / -577	59,95

2025-12-02 10:00	[D7-D2] Meppen - Doerpen West [OPP] [D2]	TenneT TSO	171,72	178	NL_NO2 / 0 / -577	60,11
2025-12-02 10:00	[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	Amprion	171,72	178	NL_NO2 / 0 / -577	60,17
2025-12-02 10:00	[D7-D7] Meppen - Hanekenfaehr BACCUM W [OPP]	Amprion	157,96	170	NL_NO2 / 0 / -577	59,93
2025-12-02 10:00	[D7-D7] Meppen - Hanekenfaehr BACCUM O [DIR]	Amprion	158,9	170	NL_NO2 / 0 / -577	59,96
2025-12-02 12:00	[D2-D2] Doerpen West - Y Niederlangen [DIR]	TenneT TSO	167,97	179	NL_NO2 / 0 / -620	59,91
2025-12-02 12:00	[D7-D2] Meppen - Doerpen West [OPP] [D2]	TenneT TSO	176,18	186	NL_NO2 / 0 / -620	59,97
2025-12-02 12:00	[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	Amprion	176,18	186	NL_NO2 / 0 / -620	60,03
2025-12-02 12:00	[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	TenneT TSO	180,41	188	NL_NO2 / 0 / -620	60,08
2025-12-02 12:00	[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	Amprion	180,41	188	NL_NO2 / 0 / -620	60,16
2025-12-02 12:00	[D7-D7] Meppen - Hanekenfaehr BACCUM W [OPP]	Amprion	162,24	175	NL_NO2 / 0 / -620	59,88

2025-12-02 12:00	[D7-D7] Meppen - Hanekenfaehr BACCUM O [DIR]	Amprion	163,16	175	NL_NO2 / 0 / -620	59,91
2025-12-02 17:00	[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	TenneT TSO	156,06	187	NL_NO2 / 0 / -620	58,91
2025-12-02 17:00	[D7-D2] Meppen - Doerpen West [OPP] [D2]	TenneT TSO	154,09	185	NL_NO2 / 0 / -620	58,92
2025-12-02 17:00	[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	Amprion	156,06	187	NL_NO2 / 0 / -620	59,18
2025-12-02 17:00	[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	Amprion	154,09	185	NL_NO2 / 0 / -620	59,23
2025-12-02 17:00	[D2-D2] Doerpen West - Y Niederlangen [DIR]	TenneT TSO	159,32	180	NL_NO2 / 0 / -620	59,42
2025-12-02 17:00	[D7-D7] Meppen - Hanekenfaehr BACCUM O [DIR]	Amprion	157,28	172	NL_NO2 / 0 / -620	59,85
2025-12-02 17:00	[D7-D7] Meppen - Hanekenfaehr BACCUM W [OPP]	Amprion	158,52	172	NL_NO2 / 0 / -620	59,85
2025-12-02 18:00	[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	TenneT TSO	156,2	186	NL_NO2 / 0 / -620	58,96
2025-12-02 18:00	[D7-D2] Meppen - Doerpen West [OPP] [D2]	TenneT TSO	154,14	184	NL_NO2 / 0 / -620	59

2025-12-02 18:00	[D2-D7] Doerpen West - Meppen EMSLD WB [DIR] [D7]	Amprion	154,14	184	NL_NO2 / 0 / -620	59,23
2025-12-02 18:00	[D2-D7] Y-Meppen (-Doerpen West - Niederlangen) EMSLD OW [DIR] [D7]	Amprion	156,2	186	NL_NO2 / 0 / -620	59,23
2025-12-02 18:00	[D2-D2] Doerpen West - Y Niederlangen [DIR]	TenneT TSO	159,34	179	NL_NO2 / 0 / -620	59,51
2025-12-02 18:00	[D7-D7] Meppen - Hanekenfaehr BACCUM O [DIR]	Amprion	157,37	170	NL_NO2 / 0 / -620	59,94
2025-12-02 18:00	[D7-D7] Meppen - Hanekenfaehr BACCUM W [OPP]	Amprion	158,59	170	NL_NO2 / 0 / -620	59,97
2025-12-02 19:00	[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	TenneT TSO	156,26	188	NL_NO2 / 0 / -620	58,86
2025-12-02 19:00	[D7-D2] Meppen - Doerpen West [OPP] [D2]	TenneT TSO	154,23	186	NL_NO2 / 0 / -620	58,91
2025-12-02 19:00	[D2-D2] Doerpen West - Y Niederlangen [DIR]	TenneT TSO	159,52	180	NL_NO2 / 0 / -620	59,42
2025-12-02 19:00	[D7-D7] Meppen - Hanekenfaehr BACCUM O [DIR]	Amprion	157,57	172	NL_NO2 / 0 / -620	59,79
2025-12-02 19:00	[D7-D7] Meppen - Hanekenfaehr BACCUM W [OPP]	Amprion	158,73	173	NL_NO2 / 0 / -620	59,88

2025-12-02 20:00	[D7-D2] Meppen - Y Niederlangen [OPP] [D2]	Amprion	154,01	180	NL_NO2 / 0 / -620	59,15
2025-12-02 20:00	[D7-D2] Meppen - Doerpen West [OPP] [D2]	Amprion	152,28	178	NL_NO2 / 0 / -620	59,21
2025-12-02 20:00	[D2-D2] Doerpen West - Y Niederlangen [DIR]	Amprion	157,18	172	NL_NO2 / 0 / -620	59,74
2025-12-02 21:00	[D7-D2] Meppen - Doerpen West [OPP] [D2]	Amprion	153,29	176	NL_NO2 / 0 / -620	59,85