Methodological paper:

Estimating the margin available for cross-zonal trade pursuant to ACER Recommendation 01/2019 in light of Article 16(8) of Regulation (EU) 2019/943

Version 2

ACER
European Union Agency for the Cooperation of Energy Regulators

Trg Republike 3
1000 Ljubljana
Slovenia

If you have any queries relating to this document, please contact:

ACER
press@acer.europa.eu

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Version	Amendment
28 October 2019	First version of the methodological paper.
9 December 2020	Update of the methodological paper to adapt to the new content of the data request 2020.

Content

1. Introduction

(1) This document is an update of the methodological paper estimating the margin available for cross-zonal trade pursuant to ACER Recommendation 01/2019 in light of Article 16(8) of Regulation (EU) 2019/943[1] that had been published on the 28th of October 2019. This update aims at reflecting the adjustments that were brought to ACER's methodology to estimate the margin available for cross-zonal trade to take into account the improved data that has been made available since the last version.

(2) This paper is intended to describe the methodology used to estimate, for each Member State and coordination area, the level of margin available for cross-zonal trade (MACZT) in order to assess performance with respect to the minimum level of margin to be made available for cross-zonal trade, i.e. at least 70% of the maximum admissible active power flow (Fmax), pursuant to Article 16(8) of Regulation (EU) 2019/943, which applies since the 1st of January 2020.

(3) ACER Recommendation 01/2019 (hereafter 'the Recommendation')[2] describes in detail the principles and calculation formulas underlying the computation of MACZT. This document goes a step further and describes the steps to estimate this margin, for the MACZT monitoring report that ACER intends to produce regularly, in the context of its monitoring activities.

(4) In particular, this paper describes the simplifications and caveats necessary to perform the calculations due to limited data, model availability and robustness in some cases. This methodological paper applies for the monitoring of MACZT since January 2020, but it may be subject to updates for future editions of the MACZT report.

(5) The document is organised as follows: an overview of the approach is first provided, and then the detailed calculation process is presented. Then, the necessary caveats are described, and the required data and the sources are listed. The terms used in this methodological paper follow the definitions included in Section 2 of the Recommendation.

2. General approach

(6) The Recommendation describes the full process to estimate MACZT levels on critical network elements with contingencies (CNECs), and to monitor the impact of allocation constraints and technical profiles on MACZT of these CNECs for the day-ahead (DA) and intraday (ID) timeframes.

(7) The MACZT report intends to monitor all these aspects, in order to compare MACZT with the minimum 70% target, and to the targets set by the applicable derogations and action plans granted to the TSOs.

(8) Given the current predominance of the DA timeframe among short-term electricity markets, and the current absence of coordinated ID capacity calculation on many bidding-zone borders, the analysis focuses solely on the DA timeframe.

(9) In order to perform the calculations, the concept of coordination areas is introduced. It refers to the sets of bidding-zone borders where capacity calculation is fully coordinated.

(10) In line with the Recommendation, the calculation of MACZT is split between the margin from coordinated capacity calculation (MCCC), and the margin from non-coordinated capacity

[1] See https://www.acer.europa.eu/en/Electricity/Market%20monitoring/Documents/Estimating%20the%20margin%20available%20for%20cross-zonal%20trade.pdf

[2] See https://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Recommendations/ACER%20Recommendation%2001-2019.pdf

calculation (MNCC). MCCC is available within FB coordination areas; however, it should be estimated for net transfer capacity (NTC) coordination areas, while MNCC should be estimated for all coordination areas. All estimations rely on linear flow-based parameters (power transfer distribution factors, PTDFs).

(11) In areas where NTC applies, positive PTDFs are combined with hourly NTCs (within the coordination area borders) to derive the MCCC. For both NTC and FB coordination areas, the MNCC is estimated by combining (positive and negative) PTDFs and schedules/nominations. The sum of the MCCC and the MNCC is equal to the MACZT. For bidding-zone borders with only HVDC interconnectors, a simplified approach assumes that the MACZT is equal to the NTC on the considered border.

(12) These steps allow computing the MACZT for each CNEC, coordination area and market time unit (MTU)[3], and to compare this level with Fmax. In line with Section 4.1 of the Recommendation, if/when an agreement is concluded between the TSOs of a coordination area and a non-EU country ("third country"), the flow induced by exchanges with this third country will be considered for the calculation of MACZT. Until then, the MACZT is computed both with and without the flow induced by third countries. For 2020, the United Kingdom is considered as an EU member state.

3. Calculation process

(13) The detailed calculation process relies on the following steps, in line with the Recommendation:

1. define the coordination areas,
2. define the relevant CNECs,
3. compute FB parameters for each CNEC,
4. infer the MCCC and MNCC based on FB parameters, hourly NTCs and schedules/nominations, and
5. sum the MCCC and MNCC to derive the MACZT and compare to Fmax and possible targets related to derogations and action plans.

(14) For bidding-zone borders with only HVDC interconnectors, the MACZT on the interconnectors is assumed to be equal to the hourly NTC provided by TSOs, and then, directly compared to the hourly Fmax.

(15) To ease its understanding, a visual representation of the calculation process is included in the annex.

3.1 Definition of coordination areas

(16) A coordination area is a set of bidding-zone borders within which capacity calculation is fully coordinated. A coordination area may encompass several bidding-zone borders, a single bidding-zone border, or one side of a bidding-zone border in case two different NTC values are calculated by each TSO (in which case the lower one is used for capacity allocation).

(17) Once capacity calculation methodologies (CCMs) pursuant to the CACM Regulation are implemented, coordination areas will be equal to capacity calculation regions (CCRs). Before the implementation of these CCMs, coordination areas are defined based on the level of coordination in capacity calculation for the DA timeframe. The list of coordination areas is based on information

[3] The current DA MTU is one hour.

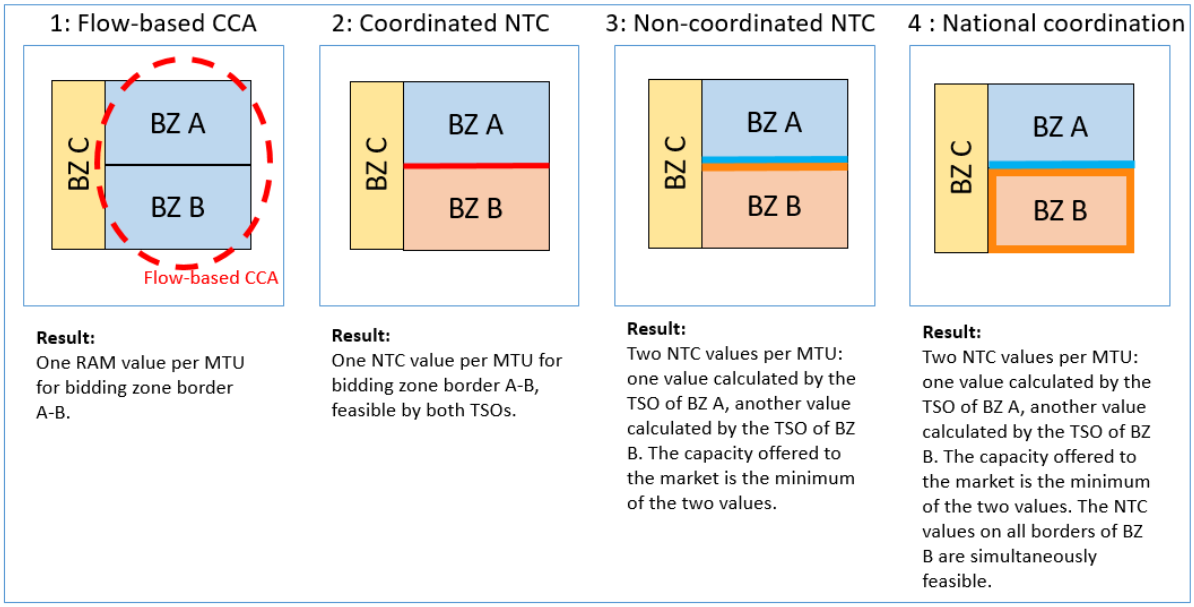
regularly collected from TSOs and NRAs. Such list is included in the MACZT report, and updated when and where necessary.

(18) The definition of coordination areas is based on the following principles:

- Where capacity calculation was defined as fully coordinated (either under the NTC or FB approach), the coordination area comprises of the whole region (i.e. set of bidding-zone borders) within which capacity was fully coordinated;
- Where capacity calculation was declared as partially coordinated or bilateral for a given bidding-zone border between two countries, the coordination area is defined as the bidding-zone border(s) which connect the two countries;
- Where capacity calculation was not coordinated on both sides of the border, the coordination area is defined by the half bidding-zone border, i.e. the bidding zone border from the perspective of only one of the two neighbouring TSOs; and
- When capacity calculation was coordinated for several half bidding-zone borders inside the same bidding-zone, the coordination area is defined by these half-bidding-zone borders.
- All bidding-zone borders within a given Member State are attributed to one specific coordination area.

(19) The figure below shows an illustration of the different types of coordination areas possible, for the border between two bidding zones A and B.

Figure 1: Types of coordination level of day ahead (DA) capacity calculation



3.2 CNECs

(20) In order to compute the MACZT, a list of CNECs is considered for each coordination area and market time unit. For FB coordination areas, the MACZT can be reliably estimated for all provided CNECs based on the margin available on this CNEC assuming no cross-zonal exchanges within the coordination area[4]. However, for NTC coordination areas, due to methodological limitations[5],

[4] See Section 5.2.1 of the Recommendation.

[5] See Annex I of the Recommendation.

the MCCC (and thus the MACZT) can be reliably estimated only for the CNECs which actively limited capacity calculation.

(21) In the CWE region, where FB capacity calculation applies, CWE TSOs are required to provide ACER with a detailed list of hourly CNECs (including Fmax values). All CNECs stemming from an internal or cross-border line, and which do not result from the application of the long-term allocated capacity ('LTA') inclusion patch[6], are included in the list of CNECs to be monitored.

For the other coordination areas, TSOs provide a list of CNECs (including Fmax values) for each market time unit of the studied time period. This list is supposed to be composed only with the CNECs that are deemed limiting by the TSOs, unless the TSOs are able to calculate MCCC for limiting and non-limiting CNECs.

If TSOs are unable to know which CNEC(s) was/were precisely limiting for each MTU, and thus declare a set of CNECs larger than the limiting ones, it is likely that the MCCC (and thus the MACZT) is underestimated for these non-limiting CNECs.

3.3 Calculation of flow-based parameters

(22) Estimating the MACZT for each CNEC (and comparing it to 70% of Fmax) requires computing the flow induced by cross-zonal trade, and thus FB parameters (including zone-to-zone PTDFs[7] and Fmax) for all considered bidding-zone borders.

(23) The computation of FB parameters requires a detailed merged network description, along with an estimate of the impact of a change in a bidding-zone net position on the injections/withdrawal of the various generators and load units within the bidding-zone, i.e. a generation shift key (GSK)[8]. The calculation should ideally be conducted for each MTU, relying on GSKs consistent with implemented capacity calculation processes.

(24) When TSOs are able to compute and provide PTDFs for each CNEC, ACER makes use of these values for the computation of MCCC and MNCC. While TSOs are increasingly able to provide PTDFs for each CNEC, ACER needs to calculate PTDFs when they are not provided.

(25) For the synchronous area of Continental Europe, when computation of flow-based parameters is performed by ACER, FB parameters are computed based on a few[9] merged grid model provided jointly by all Continental Europe TSOs. The merged grid models is composed by: the D-2 grid models used in capacity calculation (so-called "D2CF models") when available (i.e. for CWE countries) and snapshots of day-ahead grid models (so-called "DACF models") for the other countries. This combination of D2CF models and DACF models is assumed to be, at the moment, the most representative merged grid model of the grid at the time when TSOs perform the capacity calculation.

(26) Using few grid models means that:

- A grid model describes one individual set of generation, load and network patterns, which may not be fully representative of the whole time period considered.

[6] See CWE flow-based methodology at http://www.jao.eu/DynamicContent/DownloadFile?url=pd0hsynu.kqh.pdf&filename=20190411+CWE+FB+MC+approval+document_MNA+Update_ENG_FV.pdf&openInBrowser=false

[7] See Sections 5.2 and 5.3 of Recommendation. Due to limitations mentioned by TSOs, related to the UCTE file format, DC (rather than AC) PTDF calculations are conducted.

[8] i.e. a GSK or load shift key (LSK).

[9] Partly due to the limited number of CGMs provided to ACER, partly due to ACER's limited computational capacity.

- The grid models are updated to switch on all interconnectors, in order to avoid that a maintenance which took place during the modelled MTU impacts results for the whole year[10].

- No other topological action or remedial action is added to the merged grid models.

(27) Additionally, for Continental Europe, other caveats or specific actions are needed to perform the computations:

- In order to estimate the impact of exchanges over HVDC lines leaving Continental Europe on CNECs located in Continental Europe, a modelling artefact is used: some x-nodes[11] defined in the grid model are attributed to countries outside Continental Europe, to force the computation of zone-to-zone PTDFs reflecting the impact of the HVDC bidding-zone borders present in the CGM. This PTDF calculation ignores the impact of other DC bidding-zone borders.

- The merged grid models only provide information about the country within which each node is located, but not about the bidding-zone within which each node is located. The merged grid models thus do not easily allow computing zone-to-zone PTDFs for countries with multiple internal bidding-zones (such as Italy). To calculate PTDFs on internal bidding-zone borders, a modelling artefact is used: the nodes of each internal bidding-zones are attributed to bidding-zones created for this purpose[12]. The PTDFs between these newly created bidding-zones are computed, and added to the list of PTDFs computed on all other borders without this artefact.

- GSKs proportional to the generation present in the merged grid model are assumed[13], enabling the calculation of FB parameters based on the updated merged grid model.

3.4 Computing MACZT

(28) When TSOs are able to compute MCCC and MNCC in line with ACER's Recommendation, ACER considers the values provided by TSOs. When this is not possible, ACER computes, for each CNEC, coordination area and MTU, the MCCC and the MNCC as follows.

(29) Two ways to estimate the MCCC are used depending on the capacity calculation approach used in the coordinated area. For FB coordination areas, i.e. for the CWE coordination area, the margin with zero cross-zonal exchanges within this coordination area is derived from the data provided by CWE TSOs (based on nominations resulting from long-term capacity allocation). For NTC coordination areas, the MCCC is estimated in line with Section 5.2.2 of the Recommendation. This estimation combines the positive PTDFs obtained in the previous section with hourly NTC values, to obtain hourly MCCC values. In this latter case, and in order to ensure representative results, only hours during which all NTC values are available within the coordination area are retained.

(30) For all coordination areas, the MNCC is estimated in line with the second equation of Section 5.3 of the Recommendation. This equation combines the zone-to-zone PTDFs obtained according to the previous section with hourly schedules/nominations.[14] The MNCC is split between schedules

[10] Outages of internal network elements included in the merged grid model remained, and may still affect the whole results.

[11] See https://cimug.ucaiug.org/Groups/Model%20Exchange/UCTE-format.pdf. Most properties of the x-node remain identical. However, in order to ensure smooth functioning of the FB parameters calculation (especially with respect to GSKs), x-nodes with no generation are updated to set the generation level to 0.1MW.

[12] Information about the affectation of each node to an internal bidding-zone is collected from the relevant TSO.

[13] The possibility of using customised GSKs when relevant could be considered by ACER.

[14] As a result, MNCC contributions are only computed for bidding-zone borders for which zone-to-zone PTDFs are available.

on bidding-zone borders between Member States, and schedules on bidding-zone borders between a Member State and a third country.

(31) Summing the MCCC and MNCC leads to MACZT for each CNEC, coordination area and MTU. As mentioned above, two sets of MACZT results (excluding and including borders between EU and non-EU bidding-zones) are computed.

3.5 Coordination areas with only DC bidding-zone borders

(32) For coordination areas which only include bidding-zone borders with HVDC interconnectors, as TSOs are assumed to fully control the flows on these interconnectors, the monitoring process is simplified as follows, in line with Section 5.4 of the Recommendation.

(33) Usually, only one CNEC is defined by TSOs for each individual HVDC interconnector without contingency[15]. The Fmax of this CNEC is defined as the thermal capacity of the interconnector, corrected for declared unavailability periods and operational security limits related to the interconnector itself. The MACZT is assumed to be equal to the NTC declared by the TSO, or, if no NTC has been declared, to the NTC value offered to the market and available on ENTSO-E transparency platform.

(34) When the interconnector is operated by a TSO which is not one of the TSOs operating the adjacent bidding zones (the "offshore TSO", as opposed to the "onshore TSOs"), this offshore TSO may also provide its own NTC values, and/or, upon agreement with the onshore TSOs, provide the Fmax values.

(35) When a TSO does not offer the full capacity (NTC is below Fmax), the TSOs have to declare what is the cause of the limitation, declaring either the allocation constraint or the congested element (CNEC) that prevents them to do so. In the latter case, the MACZT would also be estimated on these CNECs.

3.6 Allocation constraints

(36) Section 6.2 of the Recommendation describes how to monitor the impact of allocation constraints on the MACZT effectively available on CNECs. In particular, the monitoring of external constraints (the most widely used type of allocation constraints) is described in sub-section 6.2.1 of the Recommendation.

(37) To monitor the allocation constraints, ACER requests that TSOs report at least the allocation constraints which directly restrict the net position of a given bidding-zone, or the cross-zonal capacity on a given bidding-zone border.

(38) To date, the monitoring of allocation constraints by ACER is limited to:

- Identifying and reporting on the percentage of the time when capacity calculation is limited by allocation constraints instead of by critical network elements and, where possible, identifying the TSO that applied the allocation constraint, per MTU. In the near future, ACER intends to assess the impact of the allocation constraints on the CNECs' MACZT target, in line with the Recommendation. To enable ACER's monitoring of this impact, TSOs must be able to provide information on the CNEC(s) that would be limiting cross-zonal capacity, should the allocation constraint not apply.

- When the allocation constraint takes the form of a 'technical profile', i.e. a single capacity value that constrains a combination of NTC capacities that can simultaneously be allocated on a predefined set of oriented bidding-zone border borders, ACER assesses its impact on

[15] Although TSOs may, if and where applicable, declare other CNEC(s), e.g. internal AC CNECs, for these borders.

the NTC and MACZT values in line with section 3.7 below, which makes reference to the Recommendation.

(39) In the future, ACER intends to monitor all kinds of allocation constraints. The allocation constraints already described in the Recommendation will be monitored according to it For other types of allocation constraints, the relevant TSOs should investigate how best monitor the impact of such allocation constraints with respect to the MACZT target[16].

3.7 Technical profiles

(40) When TSOs declared technical profiles, the impact on the NTC values and MACZT are studied in accordance with subsection 6.2.3 of the Recommendation.

4. Caveats

(41) When applying the methodology described above, the following main caveats and considerations apply:

- When TSOs calculate MACZT, MCCC and MNCC in line with the Recommendation, ACER considers TSOs' estimations for its reporting of the MACZT. When TSOs provide a complete set of PTDFs, but they do not estimate MCCC and/or MNCC, or not in line with the Recommendation, ACER relies exclusively on TSOs' PTDFs to compute MCCC and MNCC.

- In the absence of PTDFs, ACER computes PTDFs, based on a limited[17] number of merged grid models[18], which are unlikely to be fully in line with all hourly historical capacity calculation processes. For example, the topologies of the grid model(s) used to compute PTDFs may not be fully in line with the topologies used during capacity calculation (for example in case of outage in the network). Furthermore, remedial actions are not considered.

- GSKs proportional to the generation or load in the merged grid model are used, and are likely not fully aligned with the GSKs used during capacity calculation for bidding-zones for which customised GSKs are used by TSOs.

- Some CNECs declared by TSOs for NTC borders may not always be limiting, leading to an underestimated value of MCCC on these elements for some MTUs. This caveat is only relevant if TSOs are unable to identify the actual limiting CNEC(s) per MTU.

- Other caveats described in the Recommendation, also apply.

[16] See section 6.2.2 of the Recommendation

[17] One, or few representative grid models.

[18] When such a model is made available to ACER; currently this is only the case for Continental Europe.

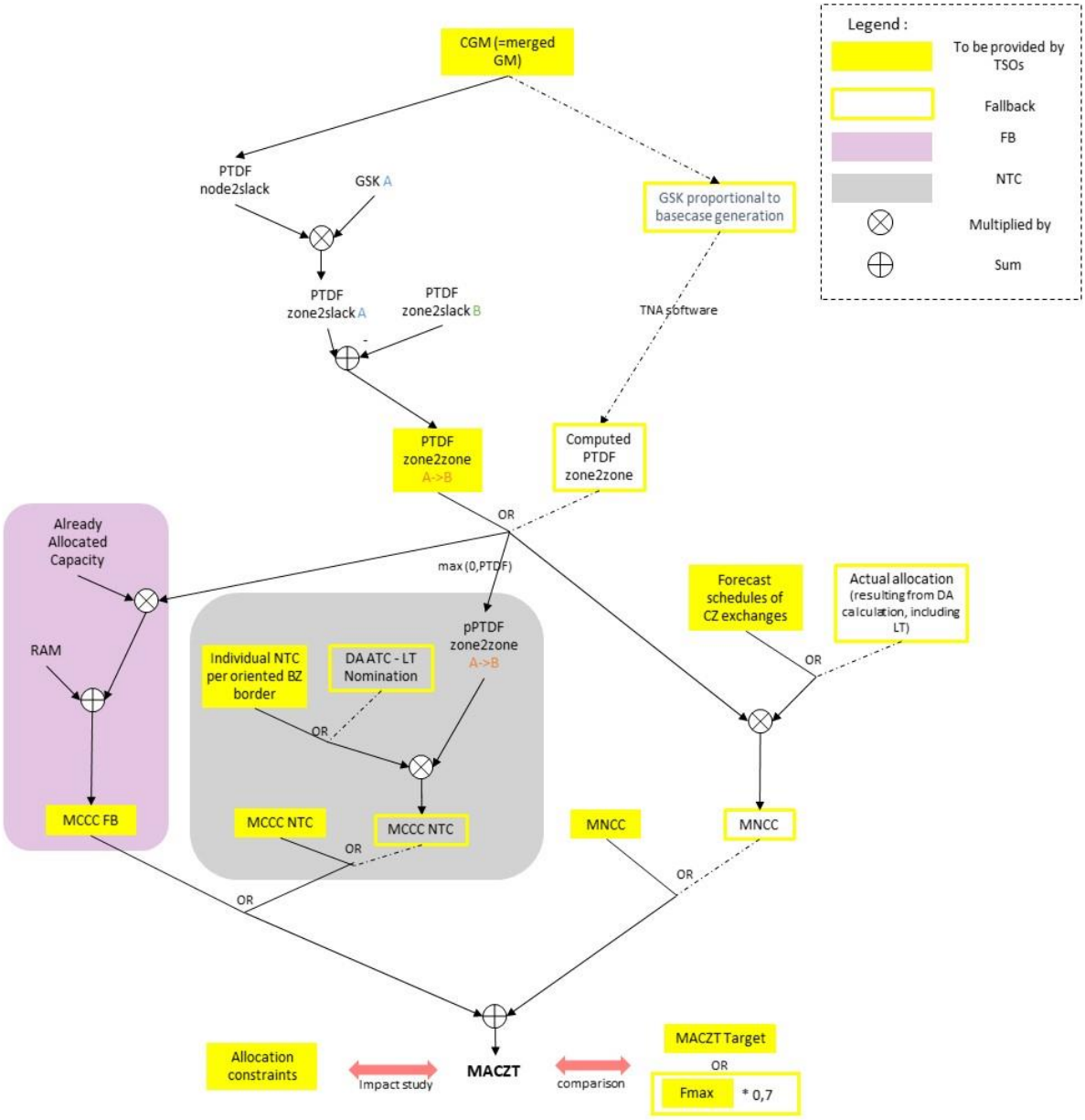
5. Data

Table 2: Summary of the data required to estimate the MACZT

Description	Unit	Time granularity	Geographic granularity	Source
Merged grid model			Synchronous area	TSOs for the synchronous area of Continental Europe
List of CNECs (only limiting ones when ACER estimates MCCC) with: - Fmax - PTDFs if calculated by the TSO - Grid model identifiers		MTU	Member State, coordination area	TSOs
DA NTC, as calculated by the TSO before alignment with the neighbouring TSOs.	MW	MTU	Bidding-zone border	TSOs, and ENTSO-E transparency platform as a fallback[19]
Forecasted exchanges	MW	MTU	Bidding-zone border	TSOs As a fall-back, DA schedule from the ENTSO-E transparency platform (or DA+ID schedule if the former is not available)
Allocation constraints and technical profiles	MW	MTU	Bidding zone or bidding-zone border(s)	TSOs

[19] When a NTC value was not declared by the TSO, and was missing on ENTSO-E transparency platform, the Agency takes the average between the previous MTU and the next MTU. When this was not possible, the Agency took the average NTC value from D-7 and D+7. When this was not possible, the NTC value is considered 0.

Annex – summary of the calculation steps and data used



Source: ACER

Notes: FB = Flow-based; DA = Day-ahead; LT = Long-term; CZ = Cross-zonal; BZ = Bidding-zone; GSK = Generation shift keys; NTC = Net Transfer Capacity