ACER

European Union Agency for the Cooperation of Energy Regulators

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REGULATORS' FEEDBACK ON INPUT DATA, SCENARIO, SENSITIVITY ANALYSES AND ASSUMPTIONS TO BE USED IN THE BIDDING ZONE REVIEW

1. INTRODUCTION

Pursuant to Article 17(2) of the bidding zone review (BZR) methodology[1], two months after the start of the BZR, TSOs must submit all information used as an input for the BZR to regulatory authorities and to ACER. Furthermore, pursuant to Article 17(3) of the same methodology, regulatory authorities and ACER may submit comments on the data provided by TSOs within six weeks; Article 17(3) also prescribes that TSOs must duly consider regulators' comments and must provide a clear and robust justification on how they were taken into account.

In this note, ACER and regulatory authorities provide their feedback on input data, scenario, sensitivity analyses and assumptions that TSOs intend to use in the BZR study[2]. Where applicable, the feedback is provided separately for the two bidding zone review regions (BZRRs)[3] affected by ACER Decision No 11/2022 on the alternative bidding zone (BZ) configurations[4], i.e. Central Europe and Nordic, for which a BZR has to be carried out. In line with recital 236 of that Decision, it has to be noted that the Baltic TSOs are still in the process of providing the necessary data for ACER to be able to decide on alternative BZ configurations for the Baltic BZRR. In case ACER would decide on any alternative configurations for this region, an analogous feedback note covering the Baltic BZR will be drafted at a later stage.

This feedback note is based on the information shared by TSOs with ACER and regulatory authorities between 7 October 2022 and 3 February 2023. In this period, TSOs delivered this information to ACER and regulatory authorities in several rounds; due to data quality issues and/or missing information, a final and consolidated delivery for both BZRRs was only achieved on 3 February 2023. Based on the received information, a first version of the present note was shared with TSOs on 13 February 2023.

During a technical discussion held between TSOs, ACER and regulatory authorities on 21 April 2023, it was found that the approach followed by TSOs for the assessment of the criterion on economic efficiency is not in line with Article 15(4) of the BZR methodology. For this reason, regulators deemed necessary to complement the present document with the addition of paragraph 3.1 ('The assessment of the criterion on economic efficiency'). The updated version of the feedback note was shared with TSOs on 3 May 2023.

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1 http://acer.europa.eu/sites/default/files/documents/Individual%20Decisions_annex/ACER%20Decision%2029-2020%20on%20the%20BZR%20-%20Annex%20I%20_%20%20BZR%20methodology_0.pdf.

2 In the present document, the specific part of the BZR that TSOs have to carry out pursuant to Article 14(6) of the Electricity Regulation is referred to as 'BZR study', to differentiate it from the overall 'BZR process' that includes further steps such as the launch of the BZR, the adoption of the BZR methodology and the adoption of alternative BZ configurations to be considered.

3 For the list of BZRRs, please refer to Article 3(2) of the BZR methodology.

4 https://acer.europa.eu/sites/default/files/documents/Individual%20Decisions/ACER%20Decision%2011-2022%20on%20alternative%20BZ%20configurations.pdf.

In case new or updated information will be provided to ACER and regulatory authorities in the course of the BZR study, regulators may amend or complement the present feedback note in due time.

2. THE NEED FOR A ROBUST AND TECHNICALLY SOUND ANALYSIS

The requirements that TSOs must follow while conducting the BZR study are set out in the BZR methodology. This methodology was extensively discussed with TSOs in the course of 2020 and it came out as a compromise between complexity (which largely relates to computational time issues) and minimum requirements[5] that would be necessary to ensure that the BZR study captures welfare changes, particularly those related to the overall costs of dispatch, when considering different alternative configurations. Introducing simplifications that go beyond the minimum requirements set out in the BZR methodology should hence be avoided.

The setup of the modelling chain is purely based on ACER Decision No 29/2020[6], adopted on 24 November 2020, and fully independent on the specific alternative bidding zone configurations proposed by ACER in its more recent Decision No 11/2022, adopted on 8 August 2022. Moreover, the need to study up to ten alternative configurations and at least one sensitivity analysis was indicated by ACER very early in the process leading to the adoption of configurations. For these reasons, ACER and regulatory authorities understand that sufficient time was given to TSOs to prepare the necessary investments in software and hardware to perform the simulations within the 12-month timeline foreseen by the Electricity Regulation.

TSOs are thus recommended to stick to the requirements prescribed in the BZR methodology and to follow the feedback provided by ACER and regulatory authorities in the present note.

3. DETAILED FEEDBACK

3.1 The assessment of the criterion on economic efficiency

Economic efficiency represents one of the key indicators for evaluating the performance of alternative BZ configurations against the status quo. Pursuant to Article 14(1)(a) and Article 15(4)(a)(i) of the BZR methodology, the geographical scope that needs to be considered when assessing the criterion on economic efficiency is the EU. This means that a single EU optimization problem needs to be solved for both terms contributing to the overall socio-economic welfare, i.e. market dispatch and remedial action optimisation (RAO). Running a fully separate optimisation problem for each BZRR and/or assuming a constant socio-economic welfare for BZRRs other than the one subject to the analysis fails to capture the interdependency across BZRRs, resulting in an underestimation of the EU socio-economic welfare.

[5] E.g., technical constraints were agreed for a given minimum threshold in the day-ahead market dispatch.

[6] https://acer.europa.eu/sites/default/files/documents/Individual%20Decisions/ACER%20Decision%2029-2020%20on%20the%20Methodology%20and%20assumptions%20that%20are%20to%20be%20used%20in%20the%20bidding%20zone%20review%20process%20and%20for%20the%20alternative%20bidding%20zone%20configurations%20to%20be%20considered_0.pdf.

Article 4(2)(a) of the BZR methodology prescribes that "*TSOs of a BZRR shall rely on the same network model(s) to reflect a given BZRR, both within and outside the considered BZRR, subject to the following simplification outside the considered BZRR. To model the network beyond the considered BZRR, TSOs shall rely on network data provided by neighbouring TSOs, which may be simplified consistently across all BZRRs to ensure feasibility of the BZ review. In case of simplification, for each neighbouring BZRR with a simplified network model, the simplified network model shall behave similarly to the detailed network model, at least with respect to electricity impedances, flows and operational security limits within the considered BZRR*". As such, considering a simplified network model for the BZRRs other than the one subject to the analysis represents a solution to take into account the mutual interactions across BZRRs, in this specific case with regard to the criterion of economic efficiency.

3.2 BZRR Central Europe

3.2.1 Dimensioning of balancing reserves

Regulators' view is that the load frequency control (LFC) block volumes should stay the same in case of a BZ reconfiguration. More in detail, the following outstanding comments on the proposed approach apply:

- The minimum dimensioning requirements are set in the system operation guideline (SOGL) at LFC block level and not at BZ level; the dimensioning at BZ level results in a significant increase of reserve needs for Germany, which is seen as an extremely conservative and hence unrealistic situation

- When the dimensioning is done on LFC block level, the assumption is that there will be available cross-zonal capacity between the BZs of this LFC block to support the "sharing" of reserves (formally speaking, it is not exactly sharing, since sharing is between and not within LFC blocks). This assumption cannot hold true at all times, since the reason for which there are multiple BZs in a LFC block is exactly the possibility of having congestions. Therefore, there should be a cross-zonal capacity allocation process in place for reserving the required cross-zonal capacity. For the Core region, there is already a methodology approved by ACER for market-based cross-zonal capacity allocation[7], with implementation deadline July 2023

- Should TSOs decide to use different reserve requirements depending on the BZ configuration, they should be able to provide evidence that this is needed through a simulation of the balancing timeframe. This simulation would have to illustrate the need for extra reserve by the lack of "sharing" possibilities. This analysis would have to be carried out for all BZs (and not only for the BZ whose configuration changes). Indeed, a split of a BZ might also positively impact the sharing capability of neighbouring BZs

- The proposed approach for Germany results in covering 140% of the actual requirement (split between automatic frequency restoration reserve (aFRR) and manual frequency restoration reserve (mFRR))

[7] Annex I to ACER Decision No 11/2021, available at: https://acer.europa.eu/sites/default/files/documents/Individual%20Decisions_annex/ACER%20Decision%2011-2021%20on%20the%20Core%20CCR%20methodology%20for%20market-based%20allocation%20-%20Annex%20I_0.pdf.

- TSOs' proposal to split FCR across BZs proportionally to the installed generating capacity (including both renewable energy sources (RES) as well as non-RES) is an arbitrary decision, which deviates from the approach that is put forward in Article 153(2)(d) of the SOGL when splitting the FCR needs among TSOs. According to the above-mentioned article, the total FCR needs in the synchronous area are allocated to each TSO based on the sum of the net generation and consumption of its control area divided by the sum of net generation and consumption of the synchronous area. For consistency reasons, it would be preferable that TSOs follow the same approach also when allocating FCR needs among BZs

Finally, for the specific case of Romania, it has to be noted that the values of reserve capacities are applicable for the year 2020 and do not reflect the values for 2025, which are likely to be higher.

3.2.2 Redispatch mark-ups

Regulators consider that opportunity costs are influenced by fuel prices, because fuel prices influence the volatility of the intraday market. An illustrative example showing that higher fuel prices increase the intraday variability, which in turn increases the opportunity cost, is provided in Annex I.

If TSOs decide to follow the German industry guideline for the estimation of redispatch mark-ups, it is thus important to adjust those mark-ups based on the day-ahead-intraday price differentials with the best available information. More practically, regulators recommend to:

- Use 2019 values as a reference for the opportunity costs of the 2025 simulation (i.e. the 'main scenario')
- Use 2022 values (or absent these, the values for the second half of 2021) as a reference for the opportunity costs for the 2028 scenario (as the latter was introduced not only to reflect the 2028 network situation, but also the current market conditions). Using the mark-ups from 2019 for the sensitivity analysis of 2028 without rescaling them would not be in line with the principles of the BZR methodology

In addition, regulators also highlight that Article 9(4)(b)(ii) of the BZR methodology explicitly mentions that redispatch mark-ups need to include at least opportunity costs and readiness costs, whereas in the German industry guideline readiness costs are set to zero. Furthermore, the same guideline does not consider the opportunity costs derived from the balancing timeframe, which constitute another relevant contribution to the overall value of the mark-ups.

3.2.3 Network models

Article 11(5) of the BZR methodology prescribes that the network model used for the BZR study has to be the same as the one used for the locational marginal pricing (LMP) analysis that preceded ACER Decision No 11/2022. Due to different modelling tools used by TSOs for the LMP analysis compared to the BZR study, ACER was informed that a conversion of network models from one format to another had to be performed by TSOs to ensure compatibility with all modelling tools used in the simulation chain of the BZR study. In the last quarter of 2022, several exchanges took place between TSOs and ACER to verify the consistency between the two network models at hand, i.e. the one used for the LMP analysis and the one that TSO intend to use for the BZR study.

Unfortunately, it was not possible for ACER to conclude on the exact match between those network models, due to the following main reasons:

- In terms of network topology, some discrepancies in the number of nodes, lines, switches, breakers and transformers are identified, whose impact on the analysis is impossible to assess ex-ante
- In terms of active network analysis, the timestamp reflected in the two network models provided to ACER was not the same, meaning that it was not possible to use a load flow calculation to compare the results between the two network models

In light of the above, regulators recommend TSOs to further investigate the impact of those discrepancies before concluding that they do not have any impact on the outcome of the study. In addition, regulators invite TSOs to use the same network model throughout the whole BZR to avoid similar issues in the future.

3.2.4 Sensitivity analyses

First, it is important to recall that the aim of a sensitivity analysis is to assess the impact that a variation of any input data has on the outcome of the study. When multiple input parameters are varied altogether in the same sensitivity analysis, it is hardly possible to disentangle the relative impact of each of them. For this reason, should TSOs consider the variation of more than one input parameters as relevant for the scope of the analysis, TSOs are recommended to perform more than one sensitivity analysis. In particular, one of them should only consider high fuel prices as input, in light of the ever-increasing likelihood that this scenario will become the 'new normal' in the target year 2025. With the aim of having as many relevant sensitivity analyses as possible, yet keeping computational time under reasonable limits, TSOs are invited to consider running other sensitivity analyses for a reduced sample of representative weeks.

Second, the sensitivity analysis for 2028 where only network and generation investments are modified is not in line with the principles laid down in the BZR methodology. Accordingly, if the sensitivity analysis is intended to capture the robustness of BZs over time, hence using the target year (2028) as a parameter, then TSOs should consider the change in investments together with (at least) the change in renewable generation, the change in demand and the decommissioning of generation units. Regulators also stress the fact that all necessary data to adapt demand for 2028 is already available to ENTSO-E/TSOs in the context of adequacy studies. As such, a sensitivity analysis where only changes in generation and network investments are considered would not be in line with the principles of the BZR methodology.

Third, if TSOs decide to carry out a sensitivity analysis for a new target year 2028, the legal provisions in force during that target year must be duly taken into account in the analysis. In particular, Article 15 and Article 16 of the Electricity Regulation prescribe that derogations and action plans linked to the fulfilment of the so-called 'minimum 70% target' are only applicable until 31 December 2025; hence, as of 1 January 2026 onwards, the 'minimum 70% target' becomes a binding requirement to all TSOs. For the above reasons, a sensitivity analysis for 2028 where targets lower than 70% are considered would not be in line with the principles of the BZR methodology.

Fourth, in line with recital 245 of ACER Decision No 11/2022, a sensitivity analysis on the elasticity value of implicit demand side response, aimed at capturing notice periods longer than day-ahead, seems even more appropriate in a scenario with high fuel prices.

Finally, the list of additional grid projects included in the sensitivity analysis for 2028 is not sufficiently clear. As done for the projects considered in the LMP analysis with target year 2025, regulators recommend TSOs to break down this table such that each row corresponds to one network project and to provide, for each project, the corresponding project ID used in the list of transmission projects included in the ten-year network development plan (TYNDP) 2022.

3.2.5 Simplifications

Technical constraints of generating units must be considered in all steps of the modelling chain. In line with Article 4(6) of the BZR methodology, these constraints must at least include minimum and maximum generating capacities, must-run constraints, ramping capabilities, minimum run-time, start-up and shut-down times.

For the RAO module, start-up and shut-down time may be simplified for all generating units pursuant to Article 9(8)(b) of the BZR methodology. In light of the extremely high run times reported by TSOs for this module, this option could be considered with priority. Analogous simplifications may be applied in the day-ahead market dispatch for the units meeting the conditions laid down in Article 7(4)(a) of the BZR methodology. In addition, it is also acceptable to consider that the commitment of units is determined by the outcome of the day-ahead market dispatch module and is fixed to its day-ahead value in the RAO module. This simplification significantly reduces the amount of integer variables to be considered in RAO and ensures that the outcome of this module respects all constraints of the optimization problem.

With regard to the RAO module, it is also important to note that all constraints listed in Article 9(3) of the BZR methodology must be duly considered in the optimization problem. Furthermore, in line with Article 9(6) of the BZR methodology, the availability and activation of non-costly remedial actions must reflect the expected operational practices of TSOs for the target year 2025.

3.3 BZRR Nordic

In the last quarter of 2022, the exchanges between Nordic TSOs and regulators mostly revolved around the consideration of the technical constraints of generation units, in particular on the modelling of start-up and shut-down times. Regulators consider that the information provided by the Nordic TSOs on the matter ensures broad alignment with the requirements of the BZR methodology.

As Nordic TSOs intend to use the same redispatch mark-ups as Central Europe TSOs, the feedback included in section 3.2.2 applies to BZRR Nordic as well.

4. CONCLUSIONS AND RECOMMENDATIONS

In line with Article 17(3) of the BZR methodology, this note illustrates regulators' feedback on input data, scenario, sensitivity analyses and assumptions that TSOs intend to use in the BZR study.

Regulators deem that there are a few key elements of the analysis that must be carefully reconsidered by TSOs. In particular, for BZRR Central Europe, the approach for the dimensioning of balancing reserves, the estimation of redispatch mark-ups and the selection of sensitivity analyses present significant shortcomings, which pose a serious threat to a robust and technically sound analysis. In addition, the discrepancies identified in the network models to be used for the BZR study with respect to the ones used for the LMP analysis require further investigation from the TSOs before concluding that those discrepancies do not have any impact on the outcome of the study. For BZRR Nordic, the same considerations for the estimation of redispatch mark-ups apply. Finally, with regard to the assessment of the criterion on economic efficiency, the approach followed by TSOs of both BZRRs fails to capture the mutual interactions across BZRRs, resulting in an underestimation of the EU socio-economic welfare.

TSOs are recommended to stick to the requirements prescribed in the BZR methodology and to follow the feedback provided by ACER and regulatory authorities in the present note. In case new or updated information will be provided to ACER and regulatory authorities in the course of the BZR study, regulators may amend or complement the present feedback note in due time.

ANNEX I: ILLUSTRATIVE EXAMPLE ON THE SCALING OF OPPORTUNITY COST WITH FUEL PRICE

We assume a system with five gas units with increasing efficiency. At a low gas price, their marginal costs are the following:

G1: 20 Euro/MWh, G2: 25 Euro/MWh, G3: 30 Euro/MWh, G4: 35 Euro/MWH, G5: 40 Euro/MWh.

We assume that G3 is marginal in day-ahead, but in intraday, each of the five units have 20% chance to be marginal. We can compute the loss of intraday opportunity to be redispatched for each unit.

- For G1 (the unit has been dispatched in day-ahead), there is no opportunity loss to be redispatched down because the intraday price cannot be lower than its marginal cost.
- For G2 (the unit has been dispatched in day-ahead), the opportunity loss to be redispatched down is given by: -0.2*(20-25) = 1 Euro/MWh (20% chance that the price is fixed by G1 at 20 Euro/MWh).
- G3 is partially dispatched in day-ahead. For the dispatched part, the opportunity loss to be redispatched down is given by: -0.2*(20-30) – 0.2*(25-30) = 3 Euro/MWh (20% chance that G1 fixes the intraday price and 20% chance that G2 fixes the intraday price). For the non-dispatched part, the opportunity loss to be redispatched up is given by: 0.2*(35-30) + 0.2*(40-30) = 3 Euro/MWh (20% chance that G4 fixes the intraday price and 20% chance that G5 fixes the intraday price).
- For G4 (the unit has not been dispatched in day-ahead), the opportunity loss to be redispatched up is given by: 0.2*(40-35) = 1 Euro/MWh (20% chance that the price is fixed by G5 at 40 Euro/MWh).
- For G5 (the unit has not been dispatched in day-ahead), there is no opportunity loss to be redispatched up because the intraday price cannot be higher than its marginal cost.

Let us now assume a high gas scenario in which the gas price is multiplied by 10. We have the following marginal costs for the different units:

G1: 200 Euro/MWh, G2: 250 Euro/MWh, G3: 300 Euro/MWh, G4: 350 Euro/MWH, G5: 400 Euro/MWh.

Again, we assume that G3 is marginal in day-ahead, but in intraday, each of the five units have 20% chance to be marginal. We can compute the loss of intraday opportunity to be redispatched for each unit.

- For G1 (the unit has been dispatched in day-ahead), there is no opportunity loss to be redispatched down because the intraday price cannot be lower than its marginal cost.
- For G2 (the unit has been dispatched in day-ahead), the opportunity loss to be redispatched down is given by: -0.2*(200-250) = 10 Euro/MWh (20% chance that the price is fixed by G1 at 200 Euro/MWh).
- G3 is partially dispatched in day-ahead. For the dispatched part, the opportunity loss to be redispatched down is given by: -0.2*(200-300) – 0.2*(250-300) = 30 Euro/MWh (20% chance that G1 fixes the intraday price and 20% chance that G2 fixes the

intraday price). For the non dispatched part, the opportunity loss to be redispatched up is given by: 0.2*(350-300) + 0.2*(400-300) = 30 Euro/MWh (20% chance that G4 fixes the intraday price and 20% chance that G5 fixes the intraday price).

- For G4 (the unit has not been dispatched in day-ahead), the opportunity loss to be redispatched up is given by: 0.2*(400-350) = 10 Euro/MWh (20% chance that the price is fixed by G5 at 400 Euro/MWh).
- For G5 (the unit has not been dispatched in day-ahead), there is no opportunity loss to be redispatched up because the intraday price cannot be higher than its marginal cost.

From this example, it can be observed that higher fuel prices increase the intraday variability (because the merit order is steeper), which in turn increases the opportunity cost. In this example, the increase of the opportunity cost is even proportional to the fuel price increase but this might be different for other technologies.